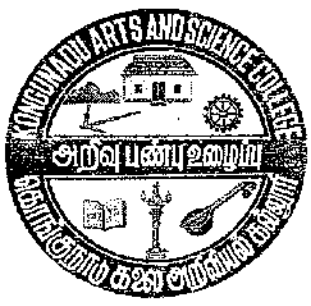
DEPARTMENT OF ZOOLOGY (UG)

SYLLABI FOR B.Sc ZOOLOGY

CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)

(APPLICABLE TO STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2017-2018 ONWARDS)



KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE – 641 029

2017-2018

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
COIMBATORE – 641 029

Course Name: **B.Sc., ZOOLOGY**

Curriculum and scheme of Examination under CBCS

(Applicable to students Admitted from the Academic Year **2017 - 2018** onwards)

Scheme of Examinations (With 4 Sem Language Papers)

Semester	Part	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam (hours)	Credits
					CIA	ESE	TOTAL		
I	I	16TML101	Language I@	6	25	75	100	3	3
	II	15ENG101	English –I	6	25	75	100	3	3
	III	17UZO101	Core 1– Non-Chordata	7	25	75	100	3	5
	III	15UZO1I1 15UBO1A1	Allied 1- Sericulture I / Botany I	5	20	55	75	3	4
			C.Pr. 1- Non Chordata and Chordata	2	-	-	-	-	-
			Allied Pr. 1. Sericulture	2	-	-	-	-	-
	IV	15EVS101	Environmental Studies**	2	-	50	50	3	2
II	I	15TML202	Language II@	6	25	75	100	3	3
	II	15ENG202	English –II	6	25	75	100	3	3
	III	17UZO202	Core 2– Chordata	7	25	75	100	3	5
	III	15UZO2I2 15UBO2A2	Allied 2- Sericulture II / Botany II	5	20	55	75	3	4
		15UZO2CL	C.Pr. 1- Non Chordata and Chordata (Based on core subjects I & II semesters)	2	40	60	100	3	2
		15UZO2IL 15UBO2AL	Allied Pr. 1. Sericulture / Botany	2	20	30	50	3	2
	IV	15VED201	Value Education- Moral and Ethics **	2	-	50	50	3	2
III	I	15TML303	Language III@	6	25	75	100	3	3
	II	15ENG303	English –III	6	25	75	100	3	3
	III	15UZO303	Core 3– Physiology	5	25	75	100	3	5
	III	15UBC 3A3	Allied 3- Biochemistry	5	20	55	75	3	4
			C.Pr. 2- Physiology and Cell Biology and Physiology	2	-	-	-	-	-
			Allied Pr. 2. Biochemistry	2	-	-	-	-	-
	IV	15UGA3S1	Skill Based subject 1- General Awareness	2	25	75	100	3	3
	IV	15TBT301/ 15TAT301/	Basic Tamil* / Advanced Tamil** (OR) Non-major	2	-	75	75	3	2

APPROVED BY THE ACADEMIC COUNCIL
Date 24/3/17 Item No: XII Page No. 1201 To 1275

28/3/17

HOD OF ZOOLOGY
KONGUNADU ARTS & SCIENCE COLLEGE
COIMBATORE-641029

	III	15UBC4AA	Allied Pr. 1. Biochemistry	2	40	60	100	3	2
		15UZO4CM	C.Pr. 2- Physiology and Cell Biology	2	40	60	100	3	2
		15UBC4AL	Allied Pr. 2. Biochemistry	2	20	30	50	3	2
	IV	15UZO4S2	Skill Based subject 2- Health education	2	25	75	100	3	3
	IV	15TBT402/ 15TAT402/ 15UWR4N2	Basic Tamil* / Advanced Tamil** (OR) Non-major elective- II**- Women's rights	2	-	75	75	3	2
V	III	15UZO505	Core 5- Genetics	5	25	75	100	3	4
	III	17UZO506	Core 6- Animal Behaviour and Evolution	5	25	75	100	3	4
	III	**16UZO507**	**Core 7– Ecology**	**5**	**25**	**75**	**100**	**3**	**4**
	III	**16UZO508**	**Core 8– Biostatistics, Biophysics and Bioinformatics**	**5**	**25**	**75**	**100**	**3**	**4**
			C.Pr.3: based on CP 5,7,8,11,12	2	-	-	-	-	-
			C.Pr.4: Based on CP 6,9,10	2	-	-	-	-	-
	III	15UZO5E1	Major Elective -1	4	25	75	100	3	5
	IV	**16UBC/UBT /UBO – 5X1**	**EDC-Extra Departmental Course**	**2**	**25**	**75**	**100**	**3**	**3**
		15UZO5IT	**Internship**						**Grade**
VI	III	15 UZO609	Core 9 – Microbiology and Immunology	4	25	75	100	3	4
	III	17 UZO610	Core 10 - Biotechnology	5	25	75	100	3	4
	III	17 UZO611	Core 11 – Developmental Biology	5	25	75	100	3	4
	III	**16 UZO612**	**Core 12 – Animal diversity**	**4**	**25**	**75**	**100**	**3**	**4**
		15UZO 6CN	C.Pr.3: based on CP 5,7,8,11,12	2	40	60	100	3	2
		15UZO 6CO	C.Pr.4: based on CP 6,9,10	2	40	60	100	3	2
	III	15UZO6E2	Major Elective 2	3	25	75	100	3	5
	III	15UZO6Z1	**Project**	**3**	**20**	**80**	**100**	**3**	**5**
	IV	15UZO6S4	Skill Based subject-4 Commercial fish culture	2	25	75	100	3	3
	V	15NCC/NSS/ YRC/ PYE101	Extension Activities*	-	50	-	50	-	1
			Total	**180**			**3800**		**140**

**- No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)
*** Project Report – 60 marks; Viva voce – 20 marks; Internal – 20 marks
**** The students shall undergo an internship training / field work for a minimum period of 2 weeks at the end of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100marks alone with the internal viva voce by the respective faculty. According to their, the grades will be awarded as given below.

Marks %	Grade
85-100	O
70-84	D
60-69	A
50-59	B
40-49	C
<40	U (Reappear)

Major Elective Papers

(2 papers are to be chosen from the following 6 papers)

1. **Economic Zoology**
2. **Pest & their Management**
3. **Vermitechnology**
4. **Wild life conservation & Management**
5. **Poultry science & management**
6. **Human genetics &Counselling**

Non-Major Elective Papers

1. **Human Rights**
2. **Women's Rights**

Extra Departmental Course (EDC)

1. **Diagnostic Biochemistry –Biochemistry Department**
2. **Medicinal botany and Human Welfare-Botany Department**
3. **Molecular Diagnostics- Biotechnology Department**

Note: In core/ allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core/allied subjects remain the same as stated below

Tally Table:

S.No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil/Hindi/Malayalam/ French/ Sanskrit	400	12
2.	II	English	400	12
3.	III	Core – Theory/Practical/Project	1700	65
		Allied	400	20
		Electives	200	10
4.	IV	Basic Tamil / Advanced Tamil (OR) Non-major elective	150	4
		Skill Based subject	400	12
		Environmental Studies	50	2
		Value Education	50	2
5.	V	Extension Activities NCC/NSS/YRC/PYE	50	1
		Total	**3800**	**140**

Note:

CBCS – Choice Based Credit system
CIA – Continuous Internal Assessment
ESE – End of Semester Examinations

25 % CIA is applicable to all theory subjects except JOC, COP and Diploma Courses, which are considered as extra credit courses.

I - SEMESTER

CORE PAPER 1 – NON-CHORDATA

TotalCredits:5 **Total Hours: 105**

Objectives

1. To make the students develop a comprehensive knowledge on the classification and characteristics of Non - Chordata.
2. To make the students understand the morphological and anatomical features of important non-chordate animals.
3. To make the students to know about the parasites (clinical and economic importance).

UNIT I **21Hrs**

Methods of classifications of Non-chordata

Phylum Protozoa: Classification and characters up to Classes with suitable examples.

Type study : Paramecium

General Topic : Parasitic protozoa

Phylum Porifera

Type study : Leucosolenia

General Topic : Canal system in sponges

UNIT II **21Hrs**

Phylum Coelenterata: Classification and characters up to Classes with suitable examples.

Type Study : Obelia

General Topic : Coral reefs

Phylum Aschelminthes : Classification and characters up to Classes with suitable examples.

Type Study : Ascaris lumbricoides

General topic : Diseases caused, Symptoms and Control measures of parasitic Worms- Wuchereria bancrofti, Pin worms

UNIT III **21Hrs**

Phylum Platy helminthes

Type study : Fasciola hepatica

General topic : Parasitic adaptations

Phylum Annelida: Classification and characters up to Classes with suitable examples.

Type Study : Leech

General topics : Metamerism in Annelids, Vermicompost production by earthworms

UNIT IV **21Hrs**

Phylum Arthropoda: Classification and characters up to Classes with suitable examples.

Type study	:	Prawn (Penaeus sp)
General topic	:	Economical importance of Arthropodes; Metamorphosis in insects

UNIT V **21Hrs**

Phylum Mollusca: Classification and characters up to Classes with suitable examples.

Type study	:	Pila globosa
General topics	:	Torsion in Gastropods, Economic importance of mollusks

Phylum Echinodermata: Classification and characters up to Classes with suitable examples.

Type study	:	Star fish
General topic	:	Larval forms of Echinoderms

Text Books

1. A Manual of Zoology - M. Ekambaranatha Iyer & Ananthakrishnan Vol I Part I& II, 1989 –S.Viswanathan Printers & publication Ltd.
2. Modern Text Book of Zoology – Invertebrata. R L Kotpal(2012), Rostagi pub.Meerut.
3. Invertebrate Zoology – Jordan, E. L & Verma, P. S. 2000. S. Chand & Co.

Reference Books

1. Barnes RD (1981) Invertebrate Zoology, Sounders college, Philadelphia.
2. Borradalle LA Potts Easthium LES & Saunders JJT (1963). The Invertebrates. Cambridge University Press.
3. Parker AJ & Haswell WA (1943) A Text Book of Zoology Vol I Mac-Millan
4. Dhami.P.S & Dhami J K. Invertebrate Zoology. S.Chand& Co., New Delhi (2009).
5. Kotpal RL. Agarwal S.K &Ketarpai RP (2008). Modern text book of Zoology – Invertebrates. Rastogi Publications, Meerut.
6. Ruppert, Edward E., Fox, Richard S. & Barnes, Robert D. (2009). Invertebrate Zoology : A functional Evolutionary Approach. 7th edition. Thomson Brooks / Cole.

I - SEMESTER

Allied A.1. SERICULTURE – I

Total Credits: 4 **Total Hours: 75**

Objectives

1. Introduce to create a self employment opportunity among students of both genders.
2. To equip the skills of rearing of silkworms and harvesting of cocoons.
3. To aware better breeding and grainage techniques.

UNIT I **15Hrs**

Introduction

Bombyx mori : Systematics, General organisation, lifecycle, Silk gland and silk formation. Origin and economic importance of sericulture industry. Mulberry and non-mulberry (Tasar, Eri & Muga) silk producing species, their distribution and food plants (Primary, Secondary & Tertiary).

UNIT II **15Hrs**

Silkworm rearing

Selection, location and orientation of rearing houses. Environmental conditions essential for rearing - temperature, humidity, ventilation and light - methods for providing optimum conditions. Different methods of rearing, quality of leaf required for different stages. Cleaning, spacing and frequency of feeding.Mounting of worms. Harvesting of cocoons.

UNIT III **15Hrs**

Silkworm pathology

Disinfection of rearing rooms and equipments - control and prevention of a. Flacherie b. Muscardine c. Grasserie and d. Pebrine. Insects injurious to silkworm larva, pupa and cocoons.

UNIT IV **15Hrs**

Silkworm Genetics

Genetic basis of variation in silkworm - multiple alleles in *Bombyxmori,* Sex-linked inheritance and mutation in *Bombyx mori.*

Breeding : Aims of silkworm breeding-Inbreeding and cross breeding - combining various qualities of races, maternal inheritance and its consideration in breeding.

Grainage techniques: various grainage techniques - selection of seed cocoons - emergence of moths - preparation and treatment of layings - refrigeration of over -wintered eggs.

Text book

1. A text book of sericulture .M.Madan Mohan Rao(2008) B.S publications,Hyderabad.
2. An introduction to sericulture.G. Ganga &Sulochanachetty(2006) Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.

Reference books

1. Comprehensive Sericulture–Vol.2 Silkworm Rearing & Silk Reeling G. Ganga (2003) Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Mulberry Cultivation, Sericulture Manual-I Dr. G. Rangaswami, Dr. Manjeet S. Jolly, FAO, UN IBH Publishing Co. Pvt. Ltd. New Delhi. (1998)
3. Moriculture. Kamal Jaiswal, Sunil P. Trivedi, B.N. Pandey, R.K. Khatri , APH Publishing Corporation, Ansari Road, Daryakanj. New Delhi 2009.
4. Rearing of silkworm and silkworm diseases by Mysore Silk Association, Bangalore. (1987).

Part IV – I SEMESTER

ENVIRONMENTAL STUDIES

Total Credits: 2 **Total Hours : 30**

Objectives

1. To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
2. To shape students into good "ecocitizens", thereby catering to global environmental needs.

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT 6 Hrs

1.1 Definition : scope and importance
1.2 **Need for public awareness***
1.3 Natural resources
1.3.1 Types of resources
Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

UNIT II ECOSYSTEMS 6 Hrs

2.1 Concept of an ecosystem
2.2 Structure and functions of an ecosystem
2.3 Producers, consumers and decomposers
2.4 Energy flow in the ecosystem
2.5 Ecological succession
2.6 Food chains, food web and ecological pyramids
2.7 **Structure and function of the following ecosystem***
Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III BIODIVERSITY AND ITS CONSERVATION 6 Hrs

3.1 Introduction – Definition – Genetic – Species and ecosystem diversity
3.2 Biogeographical classification of India
3.3 **Value of biodiversity***
3.4 Biodiversity at global, national and local levels
3.5 India as a mega – diversity Nation
3.6 Hot spot of biodiversity
3.7 Threats to biodiversity
3.8 Endangered and endemic species of India
3.9 Conservation of Biodiversity
insitu Conservation of Biodiversity – *exsitu* Conservation of Biodiversity

Text Book

1. P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov. 2004.

References

1. PurohitShammiAgarwal, A text Book of Environmental Sciences, Publisher Mrs. SaraswatiProhit, Student Edition, Behind Naswan Cinema Chopansi Road, Jodhpur.
2. Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering, Publisher S.K.Kataria& Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi – 110 006.
3. J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001.

*** Self Study (Questions may be asked from these portions also)**

Question Paper Pattern
(External only)

Duration: 3 hours TotalMarks : 50

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

II - SEMESTER

CORE PAPER 2 - CHORDATA

Total Credits: 5 **Total Hours: 105**

Objectives

1. To make the students develop a comprehensive knowledge on the classification and characteristics of major Chordata groups.
2. To make the students understand the morphological and anatomical features of important chordate animals.
3. To make the students appreciate general features, distribution and economic importance of Chordates.

Classification and characteristics. Type study includes all system except skeleton and endocrine system

UNIT I **21Hrs**

Outline classifications of Non-chordata

Prochordata: Classification and characteristics up to Classes with suitable examples

Type study	:	Amphioxus
General topic	:	Salient features and affinities of Prochordata.

Pisces: Classification and characteristics: Chondrichthyes, Osteichthyes (Crossopterigii, Dipnoi , Actinopterigii-teleostei)

Type study	:	Shark
General topics	:	Fishes available in Indian waters and their Economic importance.

UNIT II **21Hrs**

Amphibians: Classification and characteristics: (Labrynthodontia, Apoda, Urodela and Anura)

Type study	:	Frog
General topic	:	Parental care: Defense mexhanism in Amphibia

UNIT III **21Hrs**

Reptilia: Classification and characteristics:(Anapsida, Euryapsida, Parapsida, Synapsida, Diapsida, Rhynchocephalia, Squamata and Crocodilia)

Type study	:	Calotes
General topics	:	Poisonous and non-poisonous snakes, Poison apparatus and snake venom.

Aves: Classification and characteristics: (Archeornithes,Odontognathae, Palaognathae, Impennae and Neognathae)

Type study	:	Pigeon
General topic	:	Migrationin Birds, Flight adaptation

UNIT V **21Hrs**

Mammals: Classification and characteristics: (Prototheria (Monotremata), Theria (Metatheria- Marsupalia) and Eutheria)

Type study	:	Rabbit
General topics	:	Dentition in Mammals (Rabbit & Human) Ruminent stomach

Text Books

1. Thangamani, A. Prasannakumar, S. Narayanan, L.M. Arumugam.N CHORDATES 2009, Saras Publication
2. R.L.Kotpal Morden - Text book of Zoology-VERTEBRATES. Edn.2012 Rastogi Publication. Meerut.

Reference Books:

1. Nigam. H.C. Zoology of Chordates. 1972. 5thEdn. S.Nagin& Co. Publishers, Delhi.
2. EL Jordan & P.S Verma 1965.Chordate Zoology & Elements of Physiology. Preeti, Meerut.
3. J.Z. Young 1981, The life of the vertebrates. 3 Edition. Oxford University Press. Great Britan.
4. William N. McFarland et al., Vertebrate Life(1980). Macmillan Publishing Co., Inc., New York.
5. Talwar, P.K., Jhingran, A.G. Inland fishes.1991. Vol.2. Oxford & 1BH publishing Co.Pvt.Ltd. New Delhi.

II - SEMESTER

Allied A-2 - SERICULTURE –II

Total Credits: 4 **Total Hours: 75**

Objectives

1. To do Sericulture and Moriculture is essential to provide feed to silkworms.
2. To develop skills about quality and processing of cocoons.
3. To aware of reeling and byproducts of reeling for other industrial development.

UNIT I **15Hrs**

Moriculture: Distribution of varieties of mulberry - Climatic and other conditions for its growth - selection of land for cultivation. Different methods of cultivation - sexual and vegetative methods - merits and demerits.

UNIT II **15Hrs**

Weeds and weeding - pruning methods - dormancy in mulberry – manuring. Insects injurious to the mulberry gardens - bacterial and fungal diseases of mulberry.

UNIT III **15Hrs**

Silk reeling: Origin and importance of reeling industry. Selection of Raw material (cocoons). Importance of quality of cocoons - physical and commercial characteristics of cocoons - defective cocoons. Cocoons testing and classification- price fixation of raw materials.

UNIT IV **15Hrs**

Processing of raw materials: Stiffling and condition of cocoons - storage – sorting - riddling of cocoons. Boiling of cocoons - Different methods - Brushing of cocoons - Reeling techniques: Reeling equipments. Comparative study of various equipments - Charka ,cottage basins, multi end basins - automatic reeling machines.

UNIT V **15Hrs**

Importance of water in reeling. Raw silk examination - Lacing and skeining - Byproducts of reeling. Filature management: Layout of a filature - sections of a modern filature

Text books

1. A text book of sericulture. M.Madan Mohan Rao (2008) B.S publications Hyderabad.
2. An introduction to sericulture. G. Ganga & Sulochanachetty (2006) Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.

Reference books

1. Comprehensive Sericulture–Vol.2 Silkworm Rearing & Silk Reeling G. Ganga (2003) Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Mulberry Cultivation, Sericulture Manual-I Dr. G. Rangaswami, Dr. Manjeet S. Jolly, FAO, UN IBH Publishing Co. Pvt. Ltd. New Delhi. (1998)
3. Moriculture. Kamal Jaiswal, Sunil P. Trivedi, B.N. Pandey, R.K. Khatri , APH Publishing Corporation, Ansari Road, Daryakanj. New Delhi 2009.
4. Rearing of silkworm and silkworm diseases by Mysore Silk Association, Bangalore (1987).

CORE PRACTICAL – I – NON-CHORDATA AND CHORDATA

Total Credits : 2

Experiment I:

Dissection & Compound Microscope: Observation of different parts. Explain structure and functions of each part with suitable diagrams.

Focus non-chordate specimen slides under compound microscope at 10X & 40X as the case may be and describe with suitable diagram. **Slides:** Amoeba, Paramecium (WM), Ceratium, Foraminifera shell, Volvox, Cercaria larva, Nauplius lara, Zoea larva, Alima larva of squilla, and Bipinnaria larva.

Experiment II:

Virtual laboratory: Observation and description of various systems of Frog or Rat displayed over computer.

Experiment III:

Qualitative analysis of excretory products of certain vertebrates.

Ammonia in water from aquarium - Urea in urine of a mammal - Uric acid in excreta of birds.

Experiment IV: Spotters.

Classify and giving reasons: Euglena, Sycon, Obelia colony, Ascaris, Earth worm, Leech, Sepia, Sea cucumber, Amphioxus, Shark, Teleost fish, Frog, Calotes, Pigeon and Rabbit.

Draw labelled sketches: T.S. of Ascaris (male & female), T.S. of Hydra,T.S. of Taenia solium proglottid, T.S. through an arm of Star fish and T.S. through pharynx of Amphioxus.

Relate structure and function: Gemmule, Nereis parapodium, Earthworm body setae, Trachea (WM) of Cockroach, Tube feet (WM) of star fish, Placiod Scales, Ctenoid scales, Cycloid scales, Carapace, quill feather, and hair of a mammal.

Write descriptive notes: Skeleton of frog : Skull, Vertebral column, Atlas, Typical vertebra, urostyle, pectoral girdle, pelvic girdle, fore limb skeleton and hind limb skeleton. Poisonous & non-poisonous snake (one each).

Biological significance: Paramecium conjugation, Opalina, Coral (any one), Peripatus (picture), Limulus, Balanoglossus, Ambystoma, Archeoptryx (picture) and fossil (any one).

Reference Books:

1. A Manual of Practical Zoology by Invertebrate – P.S.Verma, S.Chand & Company Limited, 5th Edition 1983, New Delhi.
2. A Manual of Practical Zoology by Vertebrate - P.S.Verma, S. Chand & Company Limited, 5th Edition 1983, New Delhi.
3. Advanced Practical Zoology – J. Sinha, A.K.Chatterjee & P. Chattopadhyay, Books and Allied (P) Ltd, 2nd Edition, 2011, Kolkatta.

UZO 13

15UZO2CL

QUESTION PATTERN

Time 3 hours Max 60 marks

Question I. Virtual Lab.

Identify and describe a system displayed over computer = 10 marks

Question II. Focus a specimen slide under Compound Microscope

at 10X/40X =05 marks

Question III. Qualitative analysis either Ammonia/Urea/Uric acid = 10 marks

Question IV. Spotters Identify and comment on as directed (5x5) = 25 marks

Question V. Record = 10 marks

----------X----------X----------

15UZO2IL

II - SEMESTER

Allied -A PRACTICAL –I (SERICULTURE)

Total Credits: 2

I. Moriculture:

1. Mulberry garden preparation & Maintenance
2. Preparation of Mulberry cuttings.
3. Pests & diseases of Mulberry Plant.

II. Silkworm rearing:

4. Silk worm: Life cycle.
5. Rearing house
6. Rearing equipments.
7. Pests and diseases of silkworms.

III. Eggs & Cocoons:

8. Treatment of eggs.
9. Cooking & Reeling.
10. Estimation of renditta
11. Estimation of denier.
12. Estimation of shell ratio.

IV. Field Visit/ Study Tour

15UZO2IL

MODEL QUESTION PAPER FOR ALLIED PRACTICAL I

CIA PRACTICAL EXAM

Model Practical Exam	=	10Marks
Observation Note	=	5Marks
Attendance	=	5Marks
Total	**=**	**20 Marks**

END OF SEMESTER EXAMINATION

Time = 3 hrs **MaxMarks = 30**

I – Determine _____ of Cocoon characters. 10 Marks

II – Determine _____ of Cocoon characters 6 Marks

III – Spotters – Identify and comment on A,B & C (3x3) 9 Marks

IV - Submission of Record 5 Marks

PART IV – II SEMESTER

VALUE EDUCATION – MORAL AND ETHICS

(2012-13 onwards)

Total Credits : 2 **Total Hours : 30**

Objectives

1. To inculcate knowledge about the spiritual values among students.
2. To preserve and disseminate our moral and ethical values to the future generation.

UNIT I	The Heart of Education	**6 Hrs**
UNIT II	The Value of Body and Life – Energy The Marvelous Nature of Mind	**6 Hrs**
UNIT III	Analysis of Thoughts Benefits of Blessings	**6 Hrs**
UNIT IV	Moralisation of Desire Neutralisation of Anger	**6 Hrs**
UNIT V	**Eradication of Worry*** Harmonious Relationships	**6 Hrs**

Prescribed Text Book:

Value Education for Health, Happiness and Harmony compiled by Brain Trust, Aliyar, The World Community Service Centre, Vethathiri Publications, Erode.

*** Self Study (Questions may be asked from these topics also)**

Question Paper Pattern
(External only)

Duration: 3 hours Total Marks : 50

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

III - SEMESTER

CORE PAPER -3 - PHYSIOLOGY

Total Credits: 5 **Total Hours: 75**

Objectives

1. To know the functioning of the living system.
2. To understand in physical and chemical terms, the mechanisms that operate in living organisms.
3. To create awareness about the importance of nutrition and diseases.

UNIT I Nutrition and Respiration 15Hrs

Nutrition : Types of nutrition, feeding mechanisms, Digestion - extra cellular and intracellular. Metabolism of carbohydrates, fats and protein. Vitamins and minerals.

Respiration : Types of respiration, respiratory pigments, transport of gases, Bohr's effect, chloride shift.

UNIT II Circulation and Excretion 15Hrs

Circulation : Types of heart, pacemaker, neurogenic and myogenic hearts. Blood and its composition, blood clotting. Lymphatic system and its functions.

Excretion :Ammonotelism, Ureotelism and Uricotelism. Mammalian nephron, urine formation, hormonal control of renal function.Osmoregulation in freshwater, marine and terrestrial animals.

UNIT III Nerve Physiology 15Hrs

Types of nerves, myelinated and non-myelinated nerve fibres, synapse. Origin and conduction of nerve impulse; interneuronal transmission, neuromuscular junction, neurotransmitters and reflex action.

UNIT IV Muscle Physiology 15Hrs

Structure and properties of muscles, muscle proteins, isotonic, isometric contractions - chemistry of muscle contraction - Physiology of muscle contraction, theories of muscle contraction.

UNIT V Endocrinology **15Hrs**

Structure and functions of endocrine glands - Pituitary, Thyroid, parathyroid, islets of Langerhans, adrenals, testis, ovary, pineal and thymus. Role of hormones in regulation of metabolism.

Text Books

1. Animal Physiology P.S.Verma, V.K.Agarwal (2009) S.Chand& Company Ltd., New Delhi.
2. A Text Book of Physiology. R.Parameswaran, S.Viswanathan(1993) (Printers & Publishers Pvt. Ltd.
3. Animal Physiology - K.A. Goyal and K.V. Sastry 2012. Rastogi Publications, Meerut, India.

Reference Books

1. Hoar, W.S., (1975) General and comparative Physiology, Prentice - Hall of India, Pvt., New Delhi.
2. Prosser CL and Brown Fo Comparative Animal Physiology Second Edition. WB Saunders Co Philadelphia, Toppa Co Tokyo Japan (1961).
3. Best CH & Taylor NB(1985) Physiology basis of medical practice. The Wilkins Company Baltimore.
4. Bentley PJ (1998) comparative vertebrate endocrinology Cambridge University Press UK (S.Chand & Co.)
5. Gorbman A and Bern HAA.(1983) Text book of comparative endocrinology wiley western Pvt. Ltd ., USA.
6. Schmit - Nelson.K.(1997) Animal Physiology Adaptation and environment Cambridge Univ. Press.
7. Christopher D. Moyer and Patricia M. Schulte (2007). Principles of Animal Physiology. 2nd Edition. Pearson. Benjamin - Cummings Publishing Company.

PART IV – III SEMESTER

Skill Based Subject 1 – GENERAL AWARENESS (ONLINE)

Total Credits: 3 **Total Hours : 30**

Objectives

1. To acquire knowledge in relation to various competitive examinations.
2. To create awareness about an online examination which is being followed in competitive examinations.

UNIT I **6 Hrs**

1. **Tamil and other Literatures**
   Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakthi Literature – Epics – Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry).

2. **Economics and Commerce**
   Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking.

3. **Social studies**
   Indian History – Inventions – Indian Poetry – Constitution - Judiciary – Languages – Literacy – Indian Geography – Lithosphere – Climate – Soil – Agriculture – Population.

UNIT II **6 Hrs**

4. **Numerical Aptitude**
   Objective Arithmetic : Number systems – probability – **HCF and LCM of numbers*** - decimal fractions – simplification – squareroots and cuberoots – average – percentage – profit and loss – ratio and proportion – time and work – simple interest – area, **volume and surface area*.**

5. **Verbal Aptitude**
   Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

6. **Abstract Reasoning**
   Logic Reasoning : Logic – statement – arguments – statement assumptions – Statement course of action – theme detection – deriving conclusion from passages.

   Non – verbal Reasoning : Series – analogy – classification – analytical reasoning – mirror images – water images – paper folding – paper cutting – rule detection – grouping of identical figures.

UNIT III **6 Hrs**

7. General Science and Technology

SCIENCE - Basic principles and concepts in Physics, Chemistry, Botany and Zoology.

TECHNOLOGY - Metallurgy, instrumentation, discoveries and inventions of techniques.

8. Computer Science

Historical evolution of computers – Computer applications – Data processing concepts – Computer codes and arithmetic – Hardware components – Data Structures.

9. Education

Development process of the learner – Principles of development (physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis – Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counselling.

UNIT IV **6 Hrs**

10. Library and Information Science

Library and Information Science – Basics, Computer, Library Network and others like Research, Reprography etc.

11. Sports and Games

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games – General knowledge – Sport and Olympics – First Aid.

12. Current Affairs

State, Central and International affairs: Budgets – Politics – Sports – Education – Commerce and Industry – Inventions – Science and Technology – Currency – Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research – Defence etc.

UNIT V **6 Hrs**

13. National Cadet Corps (NCC)

Introduction to the Armed Forces (Army, Navy, Air Force) – Dril – Weapon Training – Map Reading – Civil Defence.

14. National Service Scheme (NSS)

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrational setup – History of voluntary organization – Regular activities – Special camp activities – Special programmes – awards – Important days.

15. Youth Red Cross (YRC)

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross – Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers – Training programme for YRC Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

*** Self Study (Questions may be asked from these topics also)**

Text Book

1. VBC 1 – General Awareness, Question Bank, Kongunadu Arts and Science College, Coimbatore – 29, 2006.

Question Paper Pattern

Max. Marks 100

End of Semester Examination (ESE)- On-Line Examination **75 Marks**

1. 150 questions are to be given. Each question carries ½ mark.
2. In each unit, 30 questions are to be given, covering all the 5 units.

Continuous Internal Assessment (CIA) (through On-Line) **25 Marks**

a) Two Exams.	15 Marks
b) Assignment**	5 Marks
c) Attendance	5 Marks

** Each student has to submit an assignment in the topic Current Affairs area.

Part IV – III Semester

Non–Major Elective - I "Human Rights"

Total Credits: 2 **Total Hours :30**

Objectives

1. To impart knowledge of human values, ethics and human rights to the students.
2. To reinforce positive personality traits and enhance physical, mental, social ethical and spiritual well-being of the students.

UNIT I Concept of Human Values, Value Education towards Personal Development **6 Hrs**

Aim of education and value education; Evolution of value-oriented education; Concept of human values; types of values; Components of value education.

Personal Development:
Self-analysis and introspection; sensitization towards gender equality, physically-challenged, intellectually-challenged. Respect to - age, experience, maturity, family members, neighbours, co-workers.

Character Formation towards Positive Personality:
Truthfulness, Constructivity, Sacrifice, Sincerity, Self-Control, Altruism, Tolerance, Scientific vision.

UNIT II Value Education towards National and Global Development
National and International Values **6 Hrs**

Constitutional or national values - Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity.
Social Values - Pity and probity, self-control, universal brotherhood.
Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith.

Religious Values - Tolerance, wisdom, character*.
Aesthetic Values - Love and appreciation of literature and fine arts and respect for the same.
National Integration and international understanding.

UNIT III Impact of Global Development on Ethics and Values **6 Hrs**

Conflict of cross-cultural influences, mass media, cross-border education, materialistic values, professional challenges and compromise.
Modern challenges of adolescent emotions and behaviour; sex and spirituality: comparison and competition; positive and negative thoughts.
Adolescent emotions, arrogance, anger, sexual instability, selfishness, defiance.

UNIT IV Therapeutic Measures **6 Hrs**

Control of the mind through

a. Simplified physical exercise
b. Meditation – objectives, types, effect on body, mind and soul
c. Yoga – objectives, types, Asanas
d. **Activities:***
   (i) Moralisation of Desires
   (ii) Neutralisation of Anger
   (iii) Eradication of Worries
   (iv) Benefits of Blessings

UNIT V Human Rights **6 Hrs**

1. Concept of Human Rights – Indian and International Perspectives
   a. Evolution of Human Rights
   b. Definitions under Indian and International documents
2. Broad classification of Human Rights and Relevant Constitutional Provisions.
   a. Right to Life, Liberty and Dignity
   b. Right to Equality
   c. Right against Exploitation
   d. Cultural and Educational Rights
   e. Economic Rights
   f. Political Rights
   g. Social Rights
   h. Rights to Information
3. Human Rights of Women and Children
   a. Social Practice and Constitutional Safeguards
      (i) Female Foeticide and Infanticide
      (ii) Physical assault and harassment
      (iii) Domestic violence
      (iv) Conditions of working women
4. Institutions for Implementation
   a. Human Rights Commission
   b. Judiciary
5. Violations and Redressal
   a. Violation by State
   b. Violation by Individuals
   c. Nuclear weapons and terrorism
   d. Safeguards

*** Self-study(Questions may be asked from these topics also)**

Prescribed Book : Human Rights, Compiled by Bharathiar University, Coimbatore - 46

IV - SEMESTER

CORE PAPER – 4 - CELL BIOLOGY

Total Credits: 5 **Total Hours: 75**

Objectives

1. Cell biology helps to study cytological characteristics.
2. Cell biology provides to produce vaccines, monoclonical antibodies.
3. Cell biology is the platform for the emergency of different fields like genetic engineering, cell culture, biotechnology and molecular biology.

UNIT-I **15Hrs**

Microscopy: Compound and Electron Microscopes, Microtome-Stains-Nuclear and cytoplasmic stains and staining techniques. Introduction to cell and cell types. Structure of Prokaryotes and Eukaryotes.

UNIT – II **15Hrs**

Structure and function of plasma membrane, Lysosomes, Golgi bodies and Ribosomes.

UNIT – III **15Hrs**

Structure, function and origin of Endoplasmic recticulum, Mitochondria and Nucleus.

UNIT-IV **15Hrs**

Chromosome types, organization, polytene and lampbrush chromosomes, Structure and functions of centrosomes. Mitosis and meiosis, significance of crossing over spindle fibres - structure and functions.

UNIT – V **15Hrs**

Nucleic acids - Structure of DNA and RNA
DNA replication - protein synthesis - Cell aging and study of cancer cells.

Text Books

1. Text book of cytology- P.S.Verma and V.K.Agarval, (1999) S.Chand& Company (Pvt.) Ltd, New Delhi.
2. Cell Biology - N.Arumugam 6th revised edition(2007) - Saras Publications, Gomee, Shanmugapuram, Kanyakumari.

Reference Books

1. Cell & Molecular Biology S.C.Rastogi, (2010) 3rd Edition, New Age International (P) Limited, Publishiers, New Delhi.
2. Cell Biology, E.J.Ambrose, Dorothy.M.Easty(1970) Second Edition, The English language book society & Nelson, Great Britain at the camelot Press Ltd, Southampton.
3. Introduction to Cell Biology, Stephen L.Wolfe (1999) Wadsworth Publishing Company, Belmont, California, A Division of Wadsworth, Inc.
4. Cell Biology, C.B.Power(2009) Himalaya Publishing House, Mumbai.
5. Animal cytology & Evolution, M.J.D. White Third Edition, (1973) Vikas Publishing House Pvt Ltd. New Delhi.
6. Cell biology – Dr. S. P. Singh and Dr. B. S. Tomas. 11th edition (2012), Rastogi Publications, Meerut - 02, India.

IV - SEMESTER

CORE PRACTICAL II - PHYSIOLOGY AND CELL BIOLOGY

Total credits: 2

Physiology:

1. Estimation of O2 consumption in an aquatic animal (fish).
2. Total RBC count in human blood.
3. Total WBC count in human blood.
4. Salivary amylase activity with human saliva.
5. Preparation of haemin crystal in human blood.
6. Estimation of haemoglobin in human blood.
7. Blood grouping A,B,AB & O with Rh factor.
8. Preparation of blood smear (human) and observation types of leucocytes.

Cell Biology:

1. Squash preparation of onion root tip to observe mitotic stages.
2. Preparation of Buccal smear (human) to observe Barr body.

Spotters:

1. Stages of mitosis.
2. Stages of meiosis.
3. Haemocytometer.
4. Haemoglobinometer.
5. Anti-A & B serum.
6. DNA model.
7. Sphygmomanometer.
8. Glucometer.
9. Columnar epithelium
10. Ciliated epithelium.
11. Cardiac muscle TS.
12. Bone tissue TS.
13. Simple squamous epithelium.
14. Nervous tissue.
15. Frog – Blood smear.

MODEL QUESTION PAPER FOR CORE PRACTICAL II

Time 3 hours Max 60 marks

Question I. Major Experiment = 20 marks

Question II. Minor Experiment = 10 marks

Question III. Spotters (4x5) = 20 marks

Question IV. Record = 10 marks

----------x----------x----------

IV - SEMESTER

SKILL BASED SUBJECT 2 - HEALTH EDUCATION

Total Credit: 3 **Total Hours: 30**

Objectives

1. Health education helps people to follow and maintain healthy practices and life styles
2. Health education provides information about the environmental changes which are necessary for healthy life.
3. Health education discusses about the various methods to conduct professional training to improve the health status of the people

UNIT I **6Hrs**

Concept of health
Determinants of health- Indicators of Health- Personal hygiene- Public health- **Concepts of disease-**Agent- Host and Environment **Dynamics of disease transmission**
Sources and routes of transmission.

UNIT II **6Hrs**

Nutrition and health
Proteins, Carbohydrates, Fat, Trace elements- Food hygiene- Energy requirements- balanced diet- Malnutrition.

UNIT III **6Hrs**

Environment and health
Water pollution and health effects- Air pollution and health effects- Solid pollution and health effects.

UNIT IV **6Hrs**

Communicable disease
Viral and bacterial disease (AIDS, STD, Mumps, Tuberculosis, Typhoid)
Non communicable diseases
Diabetes, Cancer, Heart attack, Kidney problems.
Vector- borne diseases
Malaria.

UNIT V **6Hrs**

Health care of the community
Concept of prevention- Health care services- Health programmes in India.

Text Books

1. Health and Healthy Body- Vedanta Kerari. Ramakrishna math, Chennai
2. Total Health- Paramjit Rana 2002 English Edition, Mumbai

Reference Books

1. Health-Ruth Ann Aalthaus 1987, Scottforesman-xx.
2. Hand book of Pollution, control processes. Robert noyesjaico publishing house, Mumbai. (2001).
3. You and your health, Harnold Shyrlock, Hubert. O. Swartout Pacafic press publishing association- London, (1998).
4. Health. Bud Getchell, Rurtypipin. Jill Varnes, Stephen. D.C. Health and Company, Massachusetts, (2000).

Part IV – IV SEMESTER

Non- Major Elective - II "Women's Rights"

Total credits: 2 **Total Hours: 30**

Objectives

1. To impart specific and up-to-date information about national and international laws related to the welfare of women.
2. To create awareness about crimes against women, legal rights of women in the country and access to justice.

UNIT I LAWS, LEGAL SYSTEMS AND CHANGE **6 Hrs**

Definition - Constitutional law, CEDAW and International Human Rights – Laws and Norms – Laws and Social Context – Constitutional and Legal Framework.

UNIT II POLITICS OF LAND AND GENDER IN INDIA **6 Hrs**

Introduction – Faces of Poverty – Land as Productive Resources – Locating Identities – Women's Claims to Land – Right to Property - Case Studies.

UNIT III WOMEN'S RIGHTS: ACCESS TO JUSTICE **6 Hrs**

Introduction – Criminal Law – Crime Against Women – Domestic Violence – **Dowry Related Harassment* and Dowry Deaths*** – Molestation – Sexual Abuse and Rape – Loopholes in Practice – Law Enforcement Agency.

UNIT IV WOMEN'S RIGHTS **6 Hrs**

Violence Against Women – Domestic Violence - The Protection of Women from Domestic Violence Act, 2005 - The Marriage Validation Act, 1982 - The Hindu Widow Re-marriage Act, 1856 - The Dowry Prohibition Act, 1961

UNIT V SPECIAL WOMEN WELFARE LAWS **6 Hrs**

Sexual Harassment at Work Places – Rape and Indecent Representation – The Indecent Representation (Prohibition) Act, 1986 - Immoral Trafficking – The Immoral Traffic (Prevention) Act, 1956 - Acts Enacted for Women Development and Empowerment - Role of Rape Crisis Centers.

*** Self-study (Questions may be asked from these topics also)**

Prescribed Book :

Women's Rights Compiled by Kongunadu Arts and Science College, Coimbatore-29.

References

1. NityaRao "Good Women do not Inherit Land" Social Science Press and Orient Blackswan 2008
2. International Solidarity Network "Knowing Our Rights" An imprint of Kali for Women 2006
3. P.D. Kaushik "Women Rights" Bookwell Publication 2007
4. Aruna Goal "Violence Protective Measures for Women Development and Empowerment" Deep and Deep Publications Pvt. 2004
5. Monica Chawla "Gender Justice" Deep and Deep Publications Pvt. Ltd.2006
6. Preeti Mishra "Domestic Violence Against Women" Deep and Deep Publications Pvt. 2007
7. Clair M. Renzetti, Jeffrey L. Edleson, Raquel Kennedy Bergen, Source Book on "Violence Against Women" Sage Publications 2001.

NON-MAJOR ELECTIVES I & II
(2012 - 2013 onwards)

QUESTION PAPER PATTERN

Duration: 3 Hours **Max. Marks: 75**

Answer ALL Questions

SECTION A (5 x 5 = 25 marks)

Short answers, either or type, one question from each unit.

SECTION B (5 x 10 = 50 marks)

Essay type questions, either or type, one question from each unit.

V - SEMESTER

CORE PAPER - 5 - GENETICS

Total Credits: 4 **Total Hours: 75**

Objectives

1. To make the students develop a comprehensive knowledge of pioneers and their contributions to genetics
2. To make the students understand various principles of heredity.
3. To make the students know about the application of genetic principles in different populations.

UNIT-I 15Hrs

Mendelian principles: Mendel's monohybrid and dihybrid experiments and inferences. Interactions of genes: Incomplete dominance, co-dominance, complementarygenes, supplementary genes and duplicate genes. Multiple alleles with examples: Drosophila, coat colour in rabbit. Human blood group inheritance: ABO, Rh factor.

UNIT-II 15Hrs

Linkage in Drosophila. Crossing over: kinds of crossing over, crossing over in Drosophila, Cytological basis of crossing over - Stern's Experiment. Sex determination in Man, Drosophila, Birds and Honeybees. Sex- linked inheritance in Drosophila.

UNIT-III 15Hrs

Fine structure of gene (cistron, muton and recon). Gene mutation and chromosomal aberration.Detection of mutation by CLB Method.Mutagens:Physical and chemical.

UNIT-IV 15Hrs

Genetic code. Sex linkage in Man; Colour blindness, Haemophilia.Gene - protein relationship with reference to sickle cell anemia. Genetic disorders in Man: Klinefelter's syndrome and Turner's syndrome. Biochemical Genetics: phenylketonuria, albinism, alkaptonuria

UNIT-V 15Hrs

Inbreeding, outbreeding and hybrid vigour. Population genetics: Hardy - Weinberg law. Eugenics and Genetic counseling. Human Genome Project.

Text Books

1. A text book of Genetics – Veer Bala Rastogi(2010) 3rdEdnKadarnathRamnath, New Delhi.
2. Genetics - Verma, P.S & Agarwal V.K. (2007) S.Chand& Company Pvt. Ltd, New Delhi.

Reference book

1. Principles of Genetics - Gardner E.J. (1991) Wiley Eastern Pvt. Ltd., New Delhi.
2. Principle of Genetics – Sinnot, E.W. Dunn. L.C. Dobzhausky (2004) McGraw Hill Book Company, New York
3. Genetics- Winchester A.M.(1967) Oxfrord IBH, Madras
4. Elementary Genetics - Singleton, W.R.(1963) Van Nostrand Company, New York
5. Principles of Genetics - Robert - H - Lewin, (2002) Tata Mc. Graw Hill Publishing Company Ltd., New Delhi.
6. Principles of Genetics (6th Edition). (2011). D. Peter Snustad and Michael J. Simmons. Wiley Publishers.

V - SEMESTER

CORE PAPER -6. ANIMAL BEHAVIOUR AND EVOLUTION

Total Credits: 4 **Total Hours: 75**

Unit I: Types of behaviour

Concept and pattern of behaviour – Definition- Stereoped and Acquired behavior Innate behaviour – Taxes, Reflexes, instinct and intelligenes, patterns of motivation. Learned behaviour- Habituation, Imprinting, conditioned reflexes, insight learning. Social behaviour - Social organization in insects, birds and mammals – Colony in honeybee – Feeding behaviour – Aggressive and territorial behavior.

Unit II : Chronology

Chronology – Definition and Introduction – Biological clock and periodicity: Diurnal and Rhythmic behavior in birds and mammals – circadian rhythm – Protective adaptation. Mimicry – Protective and aggressive mimicry – Colouration- Orientation – Bird navigation – Communication – Touch and visual communication – Communication in honey bees – migration in fish – Habitat selection in Birds.

Unit – III: Reproductive Behavior

Reproductive behavior – Sexual drive – Kin selection – Courtship and mating behavior – Oestrous cycle – Parental behaviour. Pheromones – Insect and animal pheromones – Role of Pheromones in reproduction. (With special to bovine pheromones)

Unit IV : Evolution

Origin of life: Oparin- Haldane theory, Evidence for evolution from compartitive anatomy, biochemistry and Serology, Lamarckism and New Lamarkism, Darvinism: Artificial, Natural and sexual selection, Neo Darwinisim- Concept- Stabilizing, Directional and Diversifying selection-. Experimental evidence, Hugo De Veries. Mutation theory, Modern synthetic theory of evolution.

Unit- V: Geology

Geological recods- Geological time- Survey of Geological periods- Fossils: Leadand carbon method, Living fossils. Adaptive radiation in mammals, Evolution of man and hourse,

Tyep and causes.

Text books:

1. Animal Behavior- Reena Mathur (4th edition 2014) Rastogi Publications, Meerut.
2. Animal Behavior – Arora, Himalaya Publishing house, Mumbai
3. Animal behavior- Gundevia and Singh
4. Organic evolution- Veerbalarastogi, Kedarnath Ramnath Publishers
5. Organic evolution- N. Arumugan, Saras Publications.

Reference Books:

1. Animal Behavior: An Evolutionary Approah, John Alcoc , 10th edition 2013, Sinauer associates.
2. Animal Behavior (Ethology): V.K. Agarwal , 2013, S. Chand publishers.
3. Evolutionary Biology- Minkoff, E.C 1983, Addtion Wesley Publishers.
4. Evolution- Dobzhansky 1977, W. H. Freeman and Co San Francis Co.

V - SEMESTER

CORE PAPER - 7 – ECOLOGY

Total Credits: 4 **Total Hours: 75**

Objectives

1. To know the fundamental principles that govern the functioning of the environment.
2. To understand the concept of ecosystem and balance of nature.
3. To assess the relationship between environment and organisms.

UNIT – I **15Hrs**

Introduction to environment: Abiotic factors of the environment - Temperature, Light, Oxygen, Carbondioxide and biological rhythm. Biotic factors of the environment: Commensalism and mutualism.

UNIT-II **15Hrs**

Ecosystem: Compenents of Ecosysten, pond as an example of Ecosystem - Food chain- Food web-Ecological pyramid and energy flow.

UNIT-III **15Hrs**

Biogeochemical cycle - Water cycle- nitrogen and phosphorus cycles.

Population ecology: Density- Natality- Mortality- Age distribution-Population growth and Dispersal.

UNIT-IV **15Hrs**

Community ecology: characters- Structure- Dominance- Stratification- Periodicity- Ecotone-Edge effect-Ecological niches and Ecological succession.

UNIT-V **15Hrs**

Habitat ecology: Zonation-Characters-Flora and Fauna and their adaptation of aquatic habitats - fresh water, estuary and marine.

Terrestrial habitat: Physico-chemical characteristics - Forests, tundra, grasslands and deserts.

Text books

1. Animal ecology and Distribution of Animals. M. S. Jeyaraj and Veerbala Rastogi (2013), KedarnathRamnath publishers, Meerut, Delhi.
2. Concepts of Ecology by N: Arumugam (2010), Saras publications, TamilNadu.

Reference books

1. Environmental Biology - P. S. Verma and V. K. Agarwal (1999) S.Chand& co, New Delhi
2. Ecology and Environment - P. D. Sharma (2000) RostogiPublications,Meerut, India.
3. Environmental Biology - Agarval, K. C. (1987) Agro Botanical Publisher,India.
4. Ecology and Ethology - V. K. Agarwal and Usha Gupta, S.chand& Company (2002) Ramnagar New Delhi.
5. Odum, E.P.1969. Fundamentals of Ecology. W.B. Saunders publications, London.

V - SEMESTER

CORE PAPER-8- BIOSTATISTICS, BIOPHYSICS AND BIOINFORMATICS

Total Credits: 4 **Total Hours: 75**

Objectives

1. To create awareness in the collection analysis of data and interpretation of results.
2. Statistics has proved to be useful in study of all natural sciences and also applied in research work.
3. Computer application gives basic knowledge to the students and provides all kinds of information within short period through internet.

UNIT I **15Hrs**

Data Collection- Sources of Primary and Secondary data collection, Classification and Tabulations, Diagrammatic representation of data- Bar diagram, Pie diagram, Graphical presentation of data - Histogram, Frequency polygon, Frequency curve, Ogive, Pictograph.

UNIT II **15Hrs**

Measures of Central Tendency - Calculation of arithmetic mean, median and mode. Merits and demerits. Measures of dispersion - Standard deviation and standard error. Student's t- test.

UNIT III

Biophysics: Principles and Applications: P^H meter, Spectrophotometry, Electrical Conductivity, Paper Chromatography and Electrophoresis.

UNIT IV **15Hrs**

Computer operating systems: Windows - Introduction to MS Word, Excel, PowerPoint, Internet, World Wide Web (WWW), Search engines, E-mail and Computer virus.

UNIT V **15Hrs**

Bioinformatics: History, Definition and Scope, Data bases: Protein and DNA, FASTA tools and BLAST, GENBANK and EMBL.

Text books

Biostatistics

1. Palanisamy, S. and Manoharan, M. 1992. Biostatistics for biologist, Paramount Publications, Palani.
2. Ramakrishnan, P. 2009. Biostatistics, Saras publications, Nagercoil- 629002.
3. S.P. Gupta, 2006. Statistical methods. Sultan Chand and sons- 23, Daryagans, New Delhi- 110002.

Computer Applications

1. Pradeep, K. Sinha and Pritisinha. 1995. Computer Fundamentals, Concepts Systems and Applications. BPB Publications- New Delhi.

BIOINFORMATICS book

BIOINSTRUMENTATION book

Reference Books

Biostatistics

1. Gupta, S.P. 2006. Statistical methods, Sultan Chand and sons, Educational publishers, New Delhi.
2. Pillai, R.S.N. and Bhagavathi, V. 2001. Statistics, S.Chand and Co., New Delhi-5.
3. Prasad.S.2004. Elements of Biostatistics Rastogi Publications, Meeruit, India.

Computer Applications

1. Fundamentals of computers 4th edition V.Rajaram (2006). Prenlice Hall of India, Private Ltd- New Delhi- 110001.
2. Parameshwaran, R. 1997. Computer applications in Business. S. Chand and Co., New Delhi.

V - SEMESTER

Ornamental Fishery Technology

(EDC)

Aim:

The course is intended to impart thorough knowledge on all aspects related to ornamental fishes to students for skill development to independently operate a ornamental fish breeding unit. Therefore, visit to ornamental fish farms should be carried out along with the theory classes to get hands on experience.

Objectives:

1. To give overview on the potential ornamental fishes and their breeding habits
2. To develop idea about the various management practices for breeding and rearing of ornamental fishes
3. To have a basic understanding of aquarium setting and aquarium accessories involved.

Unit 1: Introduction

Introduction to aquaculture, ornamental fishes and aquarium accessories. World aquarium trade and present status. Opportunities and its challenges

Unit 2: Aquarium and accessories

Setting up of aquarium – Tank shape and size, Tank fabrication, Type of filters, Aerators and other accessories

Unit 3: Freshwater Ornamental Fishes

Aquaponics, Brood stock management and seed productions, Commercial production of goldfish, live bearers, gouramies, barbs and tetras, angel, and Molly fishes. Large scale production of fishes and aquatic plants.

Unit 4: Marine Ornamental Fishes

Diversity of marine ornamental fishes. Method of collection and transportation of live fish. Use of anesthetics. Quarantine measures. Breeding of marine ornamental fishes. Reef aquarium and live rocks. Culture and packing.

Unit 5: Aquarium Management

Sanitation and disinfection , Water quality management, Feed Management and Fish Health Management.

Text Books

1. Marine Aquarium keeping: The Sciences, Animals and Art. John Wiley & Sons, New York
2. Ramachandran.A, Breeding, Farming and Management of Fishes, CUSAT
3. Madhusoodanakurup etal – Ornamental Fish – Breeding, Farming and Trade CUSAT.
4. Jhingran,V.G. Fish and Fisheries of India.
5. Bijukumar,A. Rearing of Aquarium Fishes.
6. Rath,A.K. Freshwater Aquaculture,
7. Santhanam, et.al. a Manual of Freshwater Aquaculture

Reference Books

1. Biswas. S.P., J.N.Das, U.K.Sarkar and Lakra W.S. 2007 Ornamental fishes of North East India : An Atlas : NBFGR
2. Murthi.V.S. 2002 Marine ornamental Fishes of Lakshadweep CMFRI, Special publication p-72
3. Butting.B., Holthus, P.S. Dalding,S. 2003, Marine Aquarium Industry and conservation.
4. Oliver, K 2003. World trade in ornamental species
5. Marine Ornamental species; collection and Conservation
6. Fish Disease and Disorders, CAB international, Oxford.

VI - SEMESTER

CORE PAPER - 9 MICROBIOLOGY AND IMMUNOLOGY

Total Credits: 4 **Total Hours: 60**

Objectives

1. To aware basic knowledge on microorganisms like bacteria and virus
2. To know about economic importance in relation to Agriculture, industry and medicine.
3. To inculcate the fundamental knowledge on immunology studies focused on immune system, antigen antibody reactions and vaccinations.

UNIT I **12Hrs**

General bacteriology - Bacterial morphology, Structure, Identification and staining - Culture methods - Bacterial taxonomy.

UNIT II **12Hrs**

Morphology and chemical properties and classification of virus-ultra structure of a bacterio phage - Lytic and lysogenic cycle of bacteriophage - (In Medicine, Industry, Agriculture), Microbiology of water, soil and air, Quantification of microbes.

UNIT III **12Hrs**

Microbial Disease of Man

Causative organisms: Basic structure, Toxicity, symptoms and preventive measures; Protozoan diseases, Typhoid, Diphtheria, Whooping cough, Pneumonia, Poliomyelitis, AIDS.

UNIT IV **12Hrs**

Cells and Organs of Immune System cells of the Immune system

Cells of lymphoid and myeloid lineage. Primary lymphoid organs (thymus, bone marrow) Secondary lymphoid organs (lymph node, spleen, mucosal associated lymphoid tissue)

Types of immunity: Innate immunity and acquired immunity.

UNIT V **12Hrs**

Antigen and antibody, structure, functions and interactions. Immune Response: Primary and secondary, cell mediated and humoral immunity, Vaccination preparation types. Complements-types, Salient features and functions.

Text Books

1. Microbiology-Michael. J.Pelczar, (1993) MC Grand Hillpublications,Chennai.
2. Immunology-Dulsy Fatima &Arumugam.N(2000) Saras Publication, Nagercoil.

Reference Books

1. Microbiology-C.B.Power and Daginawala.H.F (1984) Himalaya Publishing houses Bombay.
2. General Microbiology-Roger. Y.Stanier (1992) Macmillan Publications, London.
3. Industrial Microbiology - Casida. L.E (2007) Newage International (P) limited, New Delhi.
4. The short text books of Medical Microbiology - SatishGupte, Jaypeebrothers (2006) Medical Publishers (P) Ltd - Culcutta.
5. Immunology – Duby.J (1999) - W.G.Freeman & Co, New York

VI - SEMESTER

CORE PAPER - 10 - BIOTECHNOLOGY

Total Credits: 4 **Total Hours: 75**

Objectives

1. Biotechnology helps to learn application oriented aspects
2. Biotechnology provides to learn advanced topics.
3. Biotechnology helps to understand global scenario.

UNIT – Molecular Tools of Genetic Engineering

Biotechnology definition, Scope of Biotechnology – ~~Biotechnology tree, IPR and patenting~~ Enzymes : Exonuclease, Restriction endonuclease, Reserve transcriptase, Ligase, Alkaline phosphatase, Polymerase. Cloning Vectors: Bacterial vectors – Plasmid (pBR322), Bacteriophage (λ phage), Yeast vector- Yac vector- Yec vector: Shuttle vector.

Unit - II : Techniques in Genetic Engineering

Probes – Construction and Labeling (Radioactive- Random primed method, Non-radioactive- Biotinylation method). Blotting Technique – Southern Blotting.

Unit – III: DNA Sequencing Technique

Sangar and Coulson method, DNA Microarray, Introduction of recombinant DNA (Transformation, Transduction, Electroporation). Selection of rDNA (Direct selection, Immunochemical method- RIA, Colony hybridization).

Unit- IV: Cell culture methods

Animal cell culture, Cell culture – Steps involved in the cell culture technique. Organ culture – Methods and Application. Animal cloning – Nuclear Transfer Method – Cloning in Sheep (DOLLY). Medical biotechnology – Production of Hepatitis B vaccine, Monoclonal Antibodies, Human insulin

Unit –V: Applied Biotechnology

Agricultural Biotechnology – Production of Bio-fertilizer (Rhizobium), Bio-insecticide (Bacillus thuringiensis). Industrial biotechnology – Production of Antibiotic (Penicillin), Alcohol (Ethanol). Food biotechnology – Production of SCP (Spirulina), Mushroom (White button).

Environmental biotechnology – Biodegradation , Super Bug.

1. V.Kumaran (2009). Biotechnology. Saras Publication, Kanyakumari,
2. R.C. Dubey, Biotechnology (6th Edition),

Reference books

1. V.Sathyanarayana (2005), Biotechnology ,Books and allied (P) ltd. Kolkata.
2. P.K.Gupta (2015).Elements of Biotechnology (2nd Edition). Rastogi publications.
3. Primrose, Richard Twyman (2006) Principles of Gene Manipulation and Genomics, 7th Edition. Wiley-Blackwell Publication.

VI - SEMESTER

CORE PAPER - 11 - DEVELOPMENTAL BIOLOGY

Total Credits: 4 **Total Hours: 75**

Objective

1. Development of an organism from the egg to an adult.
2. Comparative embryology deals with evolution and polygenetic significances.
3. Recent technology in embryo development and embryo transfer.

UNIT-I Theories of Development **15Hrs**

Theories of Preformation, Epigenesis, Pangenesis, Bear's law, Biogenetic law, Germplasm theory, Mosaic theory, Regulative theory, Gradient theory and Theory of Organizer

Gametogenesis : Spermatogenesis, Oogenesis, Types of egg, polarity - Symmetry

UNIT II Fertilization **15Hrs**

Sexual cycles-Hormonal control, physico-chemical aspects of fertilization. Theories of fertilization, In Vitro fertilization (IVF), Artificial insemination and Embryo transfer.

UNIT III Cleavage **15Hrs**

Planes of cleavage - Patterns of cleavage - Laws of cleavage.

Patterns of cleavage as illustrated in Amphioxus, Frog, chick and pig.

Blastulation,

Types of blastula, Fate maps

UNIT IV Gastrulation **15Hrs**

Morphogenetic movements - Gastrulation in Frog and Chick.

Organogenesis in frog

Development of Brain, Eye, Ear, Heart

UNIT V **15Hrs**

~~**Embryonic Nutrition**~~ Extra embryonic membrane

Extra embryonic membranes in chick and Pig.

Placentation in mammals.

Experimental Embryology

Gradients Spemann s experiments on organizer.

Text Books

1. A text book of Embryology Dr. N. Arumugam (2010) Saras Publications, New Delhi.
2. Chordate Embryology. P.S. Verma, (2012).V.K. Agarwal, S. Chand Company Ltd., New Delhi.

Reference Book

1. Developmental Biology. Scott. F. Gilbert (2010) Sinauee Associates Inc.
2. An Introduction to Embryology - Balanisky (2008), B.I. Saunder's Company, Pub. Philadelphia.
3. Developmental Biology - Beril, D.B (2002) Naeosa publishing house Pvt Ltd New Delhi.
4. Foundation of Embryology- B.M. and Carlson, B.M (2007) Tata McGraw Hill. New Delhi.
5. CHR. P. Raven (1959) Pergamon Press. New York.

16UZO612

VI - SEMESTER

Bio

CORE PAPER - 12 – ~~ANIMAL~~ DIVERSITY and Animal behaviour

Total Credits: 5 **Total Hours: 60**

Objectives

1. To understand the present status of Fauna.
2. It creates an awareness of conservation of Endangered Fauna.
3. It helps to understand the comparison of ancient and recent information about the biodiversity.

UNIT I RV **12Hrs**

Biodiversity – Concept and Definition, Latitude and longitude diversity, Types of biodiversity – Problems inventorying species – Biodiversity Hot spots – Western Ghats. IUCN Threatened categories – Selected endangered animals of India.

UNIT II RV **12Hrs**

Peoples participation in Biodiversity conservation – Causes of decline of biodiversity – Sustainable Development / Biogeography USR

UNIT III CSR **12Hrs**

Processes responsible for species richness and extinction – Metapopulation concept – Current and future species extinction rates , Biodiversity Measurement.

UNIT IV CSR **12Hrs**

Ecosystem Diversity: Wetland ecosystem – Marine ecosystem – Estuarian ecosystem – Mangrove ecosystem, Biodiversity Act.

UNIT V ML **12Hrs**

Conservation of Biodiversity : Invitro conservation – DNA barcoding – Test tube gene bank – Field gene bank – Sacred groves, Stalavrikshas – Future strategy for the conservation of Biodiversity, Animal Ethics.

Text books

1. An advanced text book of biodiversity, Principles and practice. Dr. K. Krishnamoorthy, Oxford and IBH publication company Pvt. Ltd, New Delhi. 2003.
2. Organic evolution. Mohan P. Arora, Himalaya publishing house, Mumbai, 2002.
3. Biodiversity principles and conservation. U. Kumar and Mahendrajeet Asija, Student edition, Jodhpur. Ed.2. 2005.

References

1. Genes and evolution. A.P. Jha, Macmillan publishers India Ltd. New Delhi, Ed.1. 1993.
2. Biodiversity. Ramamurthy Rallapalli and Geetha Bali, APH Publishing Corporation, New Delhi, 2002.
2. Evolution and the Diversity of Life. Ernst Mayr, The Belknap Press Hardvard Univ. Press. London, Ed.4. 1997.
3. Evolution, Monroe W Strickberger, Jones and Bartlett publication, New Delhi, Ed.3. 2000.
4. Glimpses of Biodiversity. B. B. Hosetti, Daya Publishing House, New Delhi, 2002.
5. Biodiversity in India. T .Pullaiah, Regency publication, New Delhi, Vol 4, 2006.
6. Organic evolution. Veer Bala Rastogi, Kedarnath Ramnath Publishers, Uttar Pradesh, 2007.

VI - SEMESTER

CORE PRACTICAL - III - {cp.3,5,7,8,11,13,14}

Total Credit: 2

ECOLOGY

I. Analysis of water – Pond and Sewage.

1. Estimation of dissolved oxygen
2. Salinity
3. pH
4. Carbonates and bicarbonates
5. Carbondioxide

II. Qualitative analysis of plankton (any five) & mounting.

III. Study of intertidal rocky, sandy and muddy shore fauna (any three examples) with their specific adaptations.

DEVELOPMENTAL BIOLOGY

Frog embryology slides: Stages of cleavage – 2 cell stage, 4 cell stage, 8 cell stage, Blastula and Gastrula.

1. Chick embryology - Stages of development 24hr, 48hr, 72hr & 96hr.
2. Placenta of Pig, Sheep and Man.

FIELD STUDY

1. Visit to coastal area to study the intertidal fauna

SERICULTURE

1. Study of life history of *Bombyxmori* using live specimens.
2. Practical knowledge of methods of Silkworm rearing. Visit to Silkworm rearing center.
3. Assessment of cocoon characters- Shell ratio, Denier and Renditta.

VERMICULTURE

1. Rearing of earthworm.
2. Preparation of Vermibed.

PESTS AND THEIR CONTROL

Spotters: Identify and comment on

1. Coconut pest
2. Brinjal pest
3. Mosquitoes (Adults of Culex and Aedes)
4. House fly
5. Bed bug
6. Head louse

DNA, protein sequence, phylogeny

Bio statistics - Ht of 5 students, length [illegible]

Freq. distribution table, mean, histogram

MODEL QUESTION PAPER FOR CORE PRACTICAL III

CIA PRACTICAL EXAM

Model Practical Exam	=	25 Marks
Observation Note	=	10 Marks
Attendance	=	5 Marks
Total	**=**	**40 Marks**

END OF SEMESTER EXAMINATION

Time- 3 Hours **Max Marks-60**

Q I : Major Experiment	-	20 Marks
Q II : Minor Experiment	-	15 Marks
Q III :Spotters 3x5	-	15 Marks
Q IV : Record	-	10 Marks
Total	-	**60 Marks**

VI - SEMESTER

CORE PRACTICAL-IV-{cp.6,9,10}

Total Credit: 2

1. Sterilization Techniques.
2. Media preparation.
3. Distribution of microbes in air and water media.
4. Isolation of DNA from a tissue sample.
5. Isolation of protein by precipitation method.
6. Determination of protein content.
7. Isolation and determination of Carbohydrate from a sample.
8. Determination of Microbiological quality of milk by MBR Test.
9. Hanging drop culture of cells from an animal source.
10. MPN test.
11. Gel electrophoresis (Demonstration only).
12. Determination of phosphatase activity.
13. Spoilage of food products theory.
14. Visit to industries related to Biotechnology.

Spotters

1. Electrophoretic instruments.
2. Vaccine (Viral vaccine)
3. Antibiotic (Penicillin)
4. Laminar air flow chamber
5. Plant saplings produced through plant tissue culture
6. Spirulina (SCP) Biopesticides (Neem, Pongamia)
7. Biofertilizer (Azolla)
8. Mushrooms
9. Nitrogen fixing plant
10. Vermicompost
11. Autoclave
12. Cell culture media
13. Insulin (commercial)

MODEL QUESTION PAPER FOR CORE PRACTICAL IV

CIA PRACTICAL EXAM

Model Practical Exam	=	25 Marks
Observation Note	=	10 Marks
Attendance	=	5 Marks
Total	=	**40Marks**

END OF SEMESTER EXAMINATION

Time-3Hours **MaxMarks-60**

Q I: Major Experiment	-	20Marks
Q II : Minor Experiment	-	15 Marks
Q III :Spotters 3x5	-	15 Marks
Q IV :Record	-	10 Marks
Total	-	**60 Marks**

MAJOR ELECTIVE PAPER 1. ECONOMIC ZOOLOGY

Total Credits: 5 **Total Hours: 60**

Objectives

1. To understand the significance of sustainable agriculture, organic farming and waste management using Vermitechnology
2. To acquire knowledge on sericulture, Apiculture and lac culture rearing and harvesting techniques.
3. To inculcate knowledge on poultry and animal husbandry aspects.

UNIT I **12Hrs**

VERMICULTURE & VERMITECHNOLOGY

Vermiculture - Selection of suitable species based on their characteristics, Vermicomposting and their advantages, role of earthworms in sustainable agriculture and organic farming, Miscellaneous uses of earthworms (Poltry, Fisheries and Medicine).

UNIT II **12Hrs**

SERICULTURE

Types of silkworms - Life cycle - Rearing methods - Harvesting - Processing of Silk - Marketing of Cocoons - Economic importance of sericulture - Problems in sericulture.

UNIT III **12Hrs**

APICULTURE AND LAC CULTURE

Types of honey bees - Diseases and pests of bees and lac insects - Harvesting and processing of honey and lac - Marketing of honey and lac - economic importance of apiculture & lac culture.Problems in apiculture and lac culture.

UNIT IV **12Hrs**

POULTRY FARMING

Types of birds for poultry - Diseases and pests of bird - Egg and meat production - poultry feed - Marketing of poultry products - Economic importance of poultry keeping - problems in poultry keeping.

UNIT V **12Hrs**

ANIMAL HUSBANDRY

Types of animals for animal husbandry - Disease and pests of animals - Milk and meat production - Processing of milk and meat products - Marking- Economic importance of animal husbandry - problems in animal husbandry.

Text Books

1. Bhatnagar, R.K and Paltra, R. K. Vermiculture and Vermicomposting. Kalyani Publishers, New Delhi, 1996.
2. Vasantharaj David, B and T. Kumarasami, Elements of Economic Entomology, Popular Book depot, Madras -15, 1982.
3. D.B. Tembhare, Modern Entomology, Himalaya publishing house – Delhi, 1997.
4. M. Madan Mohan Rao. A Text Book of Sericulture. B.S. Publications, Hyderabad. 1998.
5. Ed. Lokeshwar, R. Hand Book of Animal Husbandry, ICAR, New Delhi. 2002.
6. D.R. Khanna & P.R. Yadav , Biology of fishes, Discovery Publishing House, New Delhi. 2004.

Reference Books

1. Nayar K.K and T.N. Anathakrishnan and B.V. David. - General and applied Entomology, Tata McGraw Hill publishing Co. Ltd., New Delhi. pp.589, 1983.
2. Richard and Owen, A.D.Text Book of Entomology. Imms, Vol.I & II Ed. by ELBS, 1997.
3. P.G. Fenemore, A. Prakash, Applied Entomology, New age international (P) publishers - New delhi.2, 2002.
4. Manju Yadav, Economic Zoology, Discovery Publishing House, New Delhi. 2003.
5. Fred V.Theobald, Economic Zoology, Print well Publisher. Jaipur. India, 1989.

MAJOR ELECTIVE- 2 PESTS AND THEIR MANAGEMENT

Total Credits: 5 **Total Hours: 45**

Objectives

1. As an elective subject, applied aspect of Zoology is being included.
2. Study on crop protection is necessary for food grain production.
3. To focuss economical importance mainly in relation to agricultural and medicinal topics.

UNIT I **9Hrs**

Insects of agricultural importance - types of damage on crops - insects in relation to plant diseases.

UNIT II **9Hrs**

Biology, nature of damage on crops and control measures of one major pest of each of the following crops: paddy, sugarcane, cotton and coconut.

UNIT III **9Hrs**

Biology, nature of damage on crops and control measures of plant nematodes, mites, crabs, snails, birds and rats.

UNIT IV **9Hrs**

Insects in relation to public health- biology, role of insect vectors of human and control measures of mosquitoes, house flies, bed bug and head louse.

UNIT V **9Hrs**

Insect pests of stored produces- rice weevil *(Sitophilusoryzae),* Red flour beetle *(Triboliumcastaneum)* and Pulse beetle *(Callosbruchuschinensis).*

Text Books

1. Vasantharaj David. B and T. Kumarasami 1982. Elements of Economic Entomology, Popular Book depot, Madras-15.
2. D.B. Tembhare - Modern Entomology- (2000) Himalaya Publishing House- Delhi.
3. General & Applied Entomology TN Anantha Krishnan 2007. Tata Mc Gran Hill Pub. Co.Ltd.

Reference Books

1. Nayar K.K & T.N. Anathakrishnan and B.V. David. 1983 - General & applied Entomology, Tata McGraw Hill publishing Co. Ltd., New Delhi.pp. 589
2. Applied Entomology - 2002 P.G. Fenemore, A. Prakash New age International (P) publishers- New Delhi.

Reference Book

1. Vermicompost - Crown Jewel of organic farming, R.D. Kale, Author publication, 4-Archana apartment, (S-1), 12th cross, Margosa Rd. Malleswaram, Bangalore-560 003, India (2006).
2. A Hand book of organic forming, Arun K.Sharma, Agrobios, Jothpur, India (2002).
3. The Earthworm book, S.A.Ismail. other India press. Goa 403 507, India (2005).
4. Earthworms in Agriculture, Talashilkar & Dosani. Published by Agrobios (India). Chopasani Road Jodhpur- 342003.
5. The complete technology book on " Vermiculture and Vermicompost" published by National Institute of Industrial Research, Delhi(2004).

MAJOR ELECTIVE PAPER 4

WILD LIFE ECOLOGY AND MANAGEMENT

Total Credits: 5 **Total Hours: 45**

Objectives

1. To make the students understand and appreciate biodiversity and the Act to protect the wild species.
2. To make the students learn different techniques to study wild life and develop knowledge of the benefits of ecosystem.
3. To make the students analytically know about various methods to conserve biodiversity.

UNIT I **9Hrs**

Ecosystem aquatic ecosystem- Pond, terrestrial ecosystem- forest trophic relations in ecosystems, foodchain, foodweb, ecological pyramids - productivity of ecosystem-primary and secondary production. Energy flow in ecosystem. Biotic community and ecological niche.

UNIT II **9Hrs**

Wild life of India – Ecological sub regions of India. Endangered flora and fauna. Wild life management in India - Indian board for wild life. Protected areas network. National parks and sanctuaries. Special projects for endangered species.

UNIT III **9Hrs**

BIODIVERSITY

Biodiversity-kinds of biodiversity; Biogeography-continental shift, zoogeography, biodiversity hot spots, endemicity; biodiversity assessment; Endagered species-Indian Wild life protection Actl972 and International Redlist Species Criteria, concept and assessment

UNIT IV **9Hrs**

FIELD SAMPLING TECHNIQUES

Population estimation-concept, line transect, quadrate sampling; Animal Trapping Techniques – Pitfall funnel, Sherman traps; marking and recapture techniques; use of indirect evidences in species inventory; Basic methods in behavioral and food habit studies; Wildlife management techniques.

UNIT V **9Hrs**

ECOSYSTEM SERVICES

Animal plant interactions-pollinators, seed dispersal, biological pest control, vector; Wildlife products - food, medicine, Germplasm, domestication; Ecological balance - prey predator relationships. herbivory and scavengers.

Text Book:

1. Ecology and Environment. P.D.Sharma. 2009/10th Ed. Rastrogi publications. Meerut.
2. Concepts in Wild Life Management Hoselli BB (2008) Daya publishing house New Delhi 110002.

References

1. Ecology and evolution of communities. Cody, M.L.and J.M Diamond 1975.Harvard University Press.Cambridge. Wildlife Management Techniques. Giles.H. 1984. Natraj Publishers, Dehra Dun.
2. Fundamentals of Wildlife Management. Gopal, R. 1992. Justice Home. Allahabad. Biodiversity - Gaston, K.J. 1996.
3. A biology of numbers and difference. Blackwell Science, Oxford. Ecology. V.K.Agarwal and Usha Gupta. 2004. 1st Ed. S.Chand and Company Ltd.New Delhi.
4. Environmental Studies. D.K.Asthana and Meerut Asthana. 2006 1st Ed. (Reprint 2007). S. Chand and company Ltd. New Delhi.
5. Fundamentals of Ecology. Madhab Chandra Desh and Sathya Prakash Desh. 2009. 3rd Ed. Tata McGraw Hill Education Pvt.Ltd. New Delhi.

MAJOR ELECTIVE PAPER – 5. POULTRY SCIENCE AND MANAGEMENT

Total Credits:5 **Total Hours:45**

Objective

1. To make the students develop knowledge on the history and the role of poultry in rural development and its structure.
2. To make the students learn methods of rearing, breeding and production of poultry.
3. To make the students know about the preparation of feed antibiotics, vaccines and marketing.

UNIT I **9Hrs**

History and importance of Poultry farming, Role of the Poultry in rural development, employment potential, Economics and contribution to national productivity; Egg production, Table bird production, manure as by-product. Anatomy and physiology of poultry birds with reference to digestive and reproductive system.

UNIT II **9Hrs**

Breeds of poultry birds and scientific methods of breeding Hybrid and cross breed. Indian and exotic selecting chicks and parents for production factors in selection, Hatching, selecting eggs for hatching, Natural and artificial incubations, Types of incubators. Maintenance of temperature and humidity sterilization of room during hatching, separation and selling.

UNIT III **9Hrs**

Poultry house and equipment, space requirement, types of house, number birds, equipments for feeding, protection from enemies and adverse conditions.

UNIT IV **9Hrs**

Nutrition of Poultry birds, requirement according to age feed formulation, classification of feed stuffs. Milling by products, distilleries and brewery by products. Availability of raw materials and their cost, food grinders and mixtures, use of antibiotics.

UNIT V **9Hrs**

Brooding and rearin, sexing, vaccination, natural and artificial breeding, types of brooding, temp. requirement culling. Debreaking, characters of good layers and broilers caponettes and and capons, rearing of chicks.

Text Books

1. A Hand book of poultry practice. Keith Wilson (2007) 2nd Ed. Agrobios (India), Jodhpur.
2. The poultry science L.C.R. Norris Elye. 2005. Biotech books.Delhi.35.

3 add-1 book

Reference Books

1. Economic Zoology: Manju Yadav.2003. 1st Ed. Discovery publishing house. New Delhi
2 Feeding of Poultry. B. Pande. V.R.Reddy, V.R.Sadagopen and A.K.Shrinivasan. 1984 (reprinted 1997), Indian council of Agricultural research. Power Printers New Delhi.
3 Poultry farm guide. Dr.R.Venkatakrishnan, 1995. 1st Ed. Balaji publications. Madras.
4 Hand book of Animal Husbandry Indian Council of Agricultural Research 1997. 2nd Ed. (reprint) published by Dr.R.D.Sharma, Director Directratre of Publications and information on Agriculture. New Delhi.

MAJOR ELECTIVE 6 - HUMAN GENETICS AND COUNSELLING

Total Credits: 5 **Total Hours: 45**

Objectives

1. To make the students develop knowledge on the blood types, transfusion and diseases.
2. To make the students know about applications of aminocentesis, dermatoglyphics and Population genetics.
3. To make the students learn applications of Genetic engineering and Genetic counseling.

UNIT I **9Hrs**

Blood groups (major types) Blood transfusion, Erythroblastosisfoetalis.

Physiology and genetic of blood groups.

UNIT II **9Hrs**

Aminocentesis, Dermatoglyphics: Terminology, methods of observation and printing, dermatoglyphic features of syndrome.

UNIT III **9Hrs**

Population genetics, Hardy-Weinberg principle and its application in human population.

UNIT IV **9Hrs**

Genetic engineering and its applications in human being, Cancer, AIDS.

UNIT V **9Hrs**

Genetic counseling, definition, aims, procedure in genetic counseling and its limitation. Pedigree chart and its uses.

Text Books

1. Genetics. Veer Bala Rastrogi. 2009 (reprint 2010) 3rd Ed. Kadarnath Ramnath publishers. Meerut. New Delhi.
2. Genetics. Alice Marcus.2009.MJP Publishers, Chennai.

References

1. Ursula Goodenough(1984)–3rd Edit. Saunders College Publishing.
2. Genetics by H. Eldon Sutton, Robert P. Wagner (1985) - Macmillan publishing company New York.
3. Basic Human Genetics. Elaine J. Mange and Arthur P. Mange (1991). 2nd Edit. Sinaver Associates Inc. publishers Sunder land.
4. Principles of Genetics. Robert H. Tamarin. 2002. 7th Ed. Tata McGraw Hill publication company Ltd. New Delhi.
5. Applied Genetics. C.Emmanuel, S. Ignachimuthu and S.Vincent. 2006. MJP Publishers, Chennai.
6. Genetics. Susan L. Elrod and William D.Stansfield. Adapted by G. Bhowmik 2009 4th Ed. Mc Graw - Hill publication company Ltd. New Delhi.
7. Cell and Molecular Biology. P.J.Russel, S.L.Wolte, P.E.Hertz, C.Sterr and B.Mc Millan.2009 1st Ed. (Indianprint), Cengage learning India Pvt. Ltd. New Delhi.

17UZO6S4

VI - SEMESTER

SKILL BASED SUBJECT 4 : COMMERICIAL FISH CULTURE

Total Credits: 3 **Total Hours: 30**

Objectives

1. Developing the knowledge in characteristics, structure and resources of fisheries.
2. Increase sector performance by production, culture practices and farm management.
3. Develop the trade and contribution to the economy.

UNIT I **Introduction** **6Hrs**

i. Scope of fish culture.

ii. Freshwater resources- ponds, lakes, rivers, dams

UNIT II **Commercially important fish species** **6Hrs**

Criteria for species collection, Murrels, major carps, minor carps and others.

UNIT III **Fish Pond** **6Hrs**

Site selection, design and construction of artificial ponds. Water quality characteristics and management, culture practices.

UNIT IV **Nutritional requirement** **6Hrs**

Feeding habits, supplementary feed, artificial feed and feed formulation.

UNIT V **Farm Management** **6Hrs**

Weed control, harvesting of fishes and economics.

Text books

1. C.B.L Srivasta 2002, A text book of fishery science and Indian fisheries, kitab Mahal, Allahabad.
2. Dr. N. Arumugam2008, Aquaculture, Saras Publication, Nagercoil.

Reference books

1. Santhanam, R. 1990. *Fisheries Science*, Daya publishing House, New Delhi.
2. Rath, R.K. 2000. Fresh water Aquaculture, Scientific (India), Jodhpur.
3. Venkataramanujam, K. Ramanathan, N., and Venkataramani, V.K. 1997. *Introduction to Fishery Science*, Janshi, Tuticorin.

15UZO1A1

I - SEMESTER

Allied A. Paper I. NON-CHORDATA AND CHORDATA

Total Credits:4 **Total Hours: 75**

(For Chemistry, Plant Biology and Plant Biotechnology & Biochemistry)

Objectives

1. To learn the animal distribution.
2. To understand the functions of all living system.
3. To improve the knowledge of Non - Chordata and their significance in biology.

UNIT I **15Hrs**

Phylum Protozoa : Paramecium
Phylum Porifera : Leucosolenia
Phylum Coelenterata : Obelia

UNIT II **15Hrs**

Phylum Platyhelminthes : Fasciola hepatica
Phylum Aschelminthes : Ascaris lumbricoides
Phylum Annelida : Earthworm - Megascolexmauritii

UNIT III **15Hrs**

Phylum Arthropoda : Cockroach
Phylum Mollusca : Pila
Phylim Echinodermata : Starfish

UNIT IV **15Hrs**

Phylum Chordata : Shark, Frog, Calotes (Excluding endoskeleton)

UNIT V **15Hrs**

Pigeon, Rabbit (Excluding endoskeleton)

Text Books

1. N. SoundaraPandian, T. Murugan, N.C.Nair, S Leelavathi and Prof. N. Arumugam 2010.Invertebrate Zoology Vol. 1, Seventh revised edition ,Saras Publications, Nagercoil, Tamilnadu.
2. Thangamani, L.M. Narayanan, S.Prasannakumar and Prof. N. Arumugam 2010.Chordate Zoology Vol.2.Seventh revised edition,Saras Publications, Nagercoil, Tamilnadu.

Reference Books

1. Prof. M. Ekambaranatha Ayyar and Prof. T.N.Ananthakrishnan - S.Viswanathan 1981.Manual of Zoology Vol. 1 & Vol.2.Printers & Publishers Pvt.Ltd, Chennai.
2. R.L. Kotpal, 2009. Modern Text book Zoology INVERTEBRATES (Animal Diversity- 1). Rastogi Publications, Meerut - India.
3. R.L. Kotpal, 2009. Modern Text book Zoology CHORDATES (Animal Diversity - II) Rastogi Publications, Meerut - India.

II - SEMESTER

Allied A-Paper 2 CELL BIOLOGY, GENETICS, EMBRYOLOGY, PHYSIOLOGY, ECOLOGY & EVOLUTION

Total Credits: 4 **Total Hours: 75**

(For Chemistry, Plant Biology and Plant Biotechnology & Biochemistry)

Objectives

1. To learn the outline of Zoology.
2. To understand the basic concepts of Zoology.
3. To learn the relationship between organism and environment.

UNIT I **15Hrs**

Structure of an animal cell, structure and functions of Mitochondria, Golgi body, Centrosome, Lysosomes and Nucleus.Mendel's laws of inheritence, Human genetic disorders-haemophilia and colour blindness.

UNIT II **15Hrs**

Types of vertebrate eggs. Cleavage, blastulation and gastrulation in Frog

UNIT III **15Hrs**

Nutrition in man-Food constituents and enzymes, digestion and absorption.

UNIT IV **15Hrs**

Ecosystem and its components, food chain, energy flow, Pollution of water, air and noise.

UNITV **15Hrs**

Evidences of Evolution - morphological, anatomical, embryological and biochemical. Theories of evolution - Lamarkism, Darwinism and De Vries, Mutation theory.

MAJOR ELECTIVE 3 – ENVIRONMENTAL BIOLOGY AND TOXICOLOGY

Total Credits: 5 **Total Hours: 90**

Objectives

1. To assess the environmental quality and management.
2. To understand the impact of environmental change on plants & animals.
3. To create awareness about environmental education, toxicity and sustainable development.

UNIT I AIR POLLUTION 18Hrs

Air pollutants, sources of Air pollution, Effects on the environment -acid rain, green house effect and ozone depletion, Effects on the living organisms including man, Control methods of air pollution.

UNIT II WATER POLLUTION 18Hrs

Water pollutants, sources of water pollution, Types of Pollution (Organic, Pesticidal, Heavy metal and Oil pollution), Effects on the living organisms including man, Control methods of water pollution.

UNIT III SOIL, NOISE, THERMAL AND RADIOACTIVE POLLUTION 18Hrs

Soil pollution - Sources and their effects on the environment and organisms including man, solid waste management.

Noise Pollution - Sources of noise and their effects on the environment, organisms including man and Control of Noise pollution.

Thermal and radioactive pollution - Sources and their effects on the environment, organisms including man and Control of Thermal and Radioactive pollution.

UNIT IV ENVIRONMENTAL QUALITY, AWARENESS AND MANAGEMENT 18Hrs

Ecoindicators and the environment, Environmental education and Awareness, Environmental monitoring and environmental impact assessment (EIA), Environmental management and bioremediation.

UNIT V TOXICOLOGY 18Hrs

Scope and significance, Classification, Toxic substances, Absorption and Excretion of toxicants, Toxicity – Mode of action of toxicants,Toxicity-Acute and chronic toxicity.Impacts of toxicants, Toxicological testing methods – Evaluation of toxicity in organisms-LC_{50} in aquatic Organisms,LD_{50} in terrestrial organisms

Text Books

1. Environmental Biology and Toxicology - P.D.Sharma, Rastogi publications, India, 2012.
2. Environmental Biology - Biswarup Mukherjee, Tata McGraw Hill publishing company Ltd. New Delhi 1st reprint-1997.

Reference Books

1. Water pollution - Causes, effects and control - P.K. Goel, New Age International Pvt. Ltd. Publishers, New Delhi, 1996.
2. Environmental water pollution and its control - G.R.Chattwal, M.C. Mehra, J. Katyal, M. Satake, Mohan Katyal, T. Nagatiro, Ahmol Publications, New Delhi, 1989.
3. Environmental Air pollution and its control - G.R. Chattwal, M.C. Mehra, J. Katyal, M. Satake, Mohan Katyal, T. Nagahiro, Anmol Publications, New Delhi, 1989.
4. Environmental pollution - Jimmy Katayal and M. Satake, Anmol publication Pvt. Ltd., New Delhi, 2001.
5. Environmental Pollution - causes, effects and control - P. PurohitAgarwal, Agrobios publishes, India, 2006.
6. Concepts of Ecology- Edward John Kormondy 4th Edition- Printice Hall of India, New Delhi, 1969.
7. Toxicology principles and methods – M.A. Subramanium, M.J. Publishers, Chennai, 2004.
8. Water quality Monitoring and Assessment – Editor - Voudouris, Intech Publishers 2012.

MAJOR ELECTIVE PAPER – 4

POULTRY SCIENCE AND MANAGEMENT

Total Credits:5 **Total Hours:90**

Objective

1. To make the students develop knowledge on the history and the role of poultry in rural development and its structure.
2. To make the students learn methods of rearing, breeding and production of poultry.
3. To make the students know about the preparation of feed antibiotics, vaccines and marketing.

UNIT I **18Hrs**

History and importance of Poultry farming, Role of the Poultry in rural development, employment potential, Economics and contribution to national productivity, Egg production, Table bird production, manure as by-product. Anatomy and physiology of poultry birds with reference to digestive and reproductive system.

UNIT II **18Hrs**

Breeds of poultry birds and scientific methods of breeding Hybrid and cross breed. Indian and exotic selecting chicks and parents for production factors in selection, Hatching, selecting eggs for hatching, Natural and artificial incubations, Types of incubators. Maintenance of temperature and humidity sterilization of room during hatching, separation and selling.

UNIT III **18Hrs**

Poultry house and equipment, space requirement, types of house, number birds, equipments for feeding, protection from enemies and adverse conditions.

UNIT IV **18Hrs**

Nutrition of Poultry birds, requirement according to age feed formulation, classification of feed stuffs. Milling by products, distilleries and brewery by products. Availability of raw materials and their cost, food grinders and mixtures, use of antibiotics.

UNIT V **15Hrs**

Brooding and rearin, sexing, vaccination, natural and artificial breeding, types of brooding, temp. requirement culling. Debreaking, characters of good layers and broilers caponettes and and capons, rearing of chicks.

Text Books

1. A Hand book of poultry practice. Keith Wilson (2007) 2nd Ed. Agrobios (India), Jodhpur.
2. The poultry science L.C.R. Norris Elye. 2005. Biotech books.Delhi.35.

Reference Books

1 Economic Zoology: Manju Yadav.2003. 1st Ed. Discovery publishing house. New Delhi.

2 Feeding of Poultry. B.Pande.V.R.Reddy, V.R.Sadagopen and A.K.Shrinivasan.1984 (reprinted 1997), Indian council of Agricultural research. Power Printers New Delhi.

3 Poultry farm guide. Dr.R.Venkatakrishnan, 1995. 1st Ed. Balaji publications. Madras.

4 Hand book of Animal Husbandry Indian Council of Agricultural Research 1997. 2nd Ed. (reprint) published by Dr.R.D.Sharma, Director Directratre of Publications and information on Agriculture. New Delhi.

JOC-ECO TOURISM

UNIT I BASIC CONCEPTS IN TOURISM

Definition of Tourism- Technologies Related to Tourism- Elements of Tourism- Growth of Tourism- Basic Patterns of Tourism- Special Patterns of Tourism- Sectors in the Tourism Industry.

UNIT II PROTECTIVE MEASURES

Environment (protection) Act- Air (prevention & control of pollution) Act- Water (prevention & control of pollution) Act- Wild Life (protection) Act- Forest (Conservation) Act.

UNIT III ROLE OF INFORMATION TECHNOLOGY

Advent of Information Technology in the tourism industry: impact of Information Technology in the tourism industry.

UNIT IV TRAVEL FORMALITIES

Passport and Visa Formalities- Health Documents- Health Preventive Measures for Travelers- Travel Insurance.

UNIT V MITIGATION MEASURES

Tsunami, Earthquake, Cyclone, Flood, Global Warming, Land slides, Soil erosion and Volcanoes Impact of Tourism on Environment.

Text books

1. A text book of Environmental Studies. P. Arul, Environment Agency, Chennai, 2004
2. Tourism Management and Marketing- A.K. Bhatia, Sterling publications, New Delhi, 1997.

Reference Books

1. Facts on Tourism- R. ShanthaKumari- 1st edit.- Imprint- Chennai Shantha Publishers (1996).
2. South India Tourist Guide-VatsalaIyengar and MalathiRahavan3rdEdit.Vasan book depot (1997).
3. Ecology and Environment- P.D. Sharma, Rastogi Publications, Meerut, India (1993).
4. Biodiversity – Principles and Conservation- Second Edition. U. Kumar & MahenderaJeetAsija. Student Edition Chopasani Road, Jodhpur. (2005)

JOC- VERMITECHNOLOGY

UNIT I

Introduction to Earthworm - origin and evolution - Distribution - different species of earthworm.General body structure - External characters - Body wall - Food and feeding habits digestive system -Gut microflora and their importance -Reproductive system cocoon formation.

UNIT II

Role of Earthworms in sustainable agriculture - organic farming - Earthworm activities -soil fertility and texture - soil areation.Vermitechnology - Definition -History - in other countries -in India.

UNIT III

Advantages of vermiculture - Vermi - cast - Decomposition of bio-degradable Wastes and vermicomposing - vermiculture in pollution abatement -Miscellaneous usages of vermiculture. Vermiculture - General Planning -Selection of suitable species -Basic characteristics of suitable species - Description of suitable species - Maintenance of Base culture.

UNIT IV

Vermicomposting - Advantages of vermicomposting - small scale vermicomposting -large scale vermicomposing.Type of vermicomposing -requirements for vermicomposting - vermicomposting schemes - Maintenance of vermicomposting.

UNITV

Recycling of different wastes by vermi composting - Organic wastes - Solid wastes - Municipal wastes - Animal Drug - Agricultural wastes.Application of Vermicompost -In horticulture - in agriculture-Quality management- storage -pricing- marketing.Vermitechnology- by products- economy.

Text books

1. Vermiculture and Vermicomposting. Bhatnagar, R.K. and Palta, R.K., Kalyani publishers, New Delhi (1996).
2. A hand book of Organic Farming, Arun K. Sharma, Agrobios, Jodhpur, India (2002)
3. The Earthworm book, S.A. Ismail. Other India press, Goa - 403 507, India (2005)

Reference Books

1. Vermicompost- Crown Jewel of organic farming. R. D. Kale, Author publication, 4- Archana apartment, (S-l), 12 cross, Margosa Rd, Malleswaram, Banglore-560 003, India (2006).
2. A Hand book of organic forming, ArunK.Sharma, Agrobios, Jothpur, India (2002).
3. The Earthworm book, S.A.Ismail. other India press. Goa 403 507, India (2005).
4. Earthworms in Agriculture, Talashilkar&Dosani. Published by Agrobios (India).Chopasani Road Jodhpur- 342003.
5. The complete technology book on " Vermiculture and Vermicompost" published by National Institute of Industrial Research, Delhi(2004).

JOC - Ornamental fish culture Technology 15PZO2J2

Aim:

The course is intended to impart thorough knowledge on all aspects related to ornamental fishes to students for make them equipped to independently operate a ornamental fish breeding unit. Therefore, visit to ornamental fish farms should be carried out along with the theory classes to get hands on experience.

Objectives :

1. To give overview on the potential ornamental fishes and their breeding habits
2. To develop idea about the various management practices for breeding and rearing of ornamental fishes
3. To have a basic understanding of aquarium setting and aquarium accessories involved.

Unit 1: Introduction

Introduction to aquarium, ornamental fishes and aquarium accessories. World aquarium trade and present status. Design and construction of public fresh water and marine aquaria. Aerators and filters. Water quality requirements. Temperature control. Biofilters in aquarium.

Aquarium Management

Cleaning the aquarium; maintenance of water quality. Control of snail and algal growth. Handling, care and transportation of fish. Temperature acclimation, oxygen packing.

Unit 2: Freshwater Ornamental Fishes

Species of ornamental fishes; their taxonomy and biology- Live bearers, Gold fish and koi, Gourami, Barbs and Tetras, angel fish, cichlids. Maturation, secondary sexual characters, breeding habits, spawning, parental care, fertilization and development of eggs. Hatching, larval rearing and their health.

Unit 3: Commercial Production of Freshwater Ornamental Fishes

Requirements and design for the commercial production units of ornamental fishes. Commercial production of goldfish, live bearers, gouramies, barbs and tetras, angel fish. Natural ponds for the mass production of ornamental fishes and their economics.

Unit 4: Marine Ornamental Fishes

Marine ornamental fishes – varieties and their habitat. Major marine ornamental fish resources of India. Method of collection and transportation of live fish. Use of anesthetics. Quarantine measures. Breeding of marine ornamental fishes. Reef aquarium and live rocks. Other ornamental organisms – anemones, worms, lobsters, shrimps, octopus, starfish and their economic value.

Unit 5: Nutrition and Disease

Nutritional requirements of aquarium fishes. Different kinds of feeds. Culture of fish food organisms; Preparation of dry feeds; feeding methods. Use of pigments for colour enhancement. Larval feeds and feeding. Provision of nutrients and optimum environmental conditions for their growth. Identification of common parasites infecting ornamental fishes. Study of bacterial, viral, fungal diseases of ornamental fishes and their control and prophylaxis. infecting ornamental fishes.

Text Books

1. Marine Aquarium keeping : The Sciences, Animals and Art. John Wiley & Sons, New York
2. Ramachandran.A, Breeding, Farming and Management of Fishes, CUSAT
3. Madhusoodanakurup etal – Ornamental Fish – Breeding, Farming and Trade CUSAT.
4. Jhingran,V.G. Fish and Fisheries of India.
5. Santhanam, et.al. a Manual of Freshwater Aquaculture

Reference Books

1. Murthi.V.S. 2002 Marine ornamental Fishes of Lakshadweep CMFRI, Special publication 72
2. Butting.B., Holthus, P.S. Dalding,S. 2003, Marine Aquarium Industry and conservation.
3. Oliver, K 2003. World trade in ornamental species
4. Marine Ornamental species; collection,..... and Conservation
5. Fish Disease and Disorders, CAB international, Oxford.

Component for Project:

CIA / ESE	Particulars	Project Out of 200 Marks (PG)
CIA	Project Review	30
	Regularity	10
	Total Internal Marks	**40**
*ESE	Project Report Present	120
	Viva Voce	40
	Total External Marks	**160**
Total Marks(CIA+ESE)		**200**

*** Project report and Viva voce will be evaluated jointly by both the Project Supervisor (faculty of the Department) and an External Examiner.**

QUESTION PAPER PATERN for CIA and ESE

THEORY

Maximum marks 75

Section A (10X1=10marks)

Q.NO.1to10:Mutiple choice types alone with four distracters each.

Section B (5X5=25marks)

Q.NO.11to15:Either orshort notes type questions (one question 'a'or 'b'from each unit).

Section C (5X8=40marks)

Q.NO.16to20:Either or essay type questions(one question 'a'or 'b'from each unit).

Break up Marks for CIA of Theory

CIA Exam	-	15
Assignment	-	5
Attendance	-	5
Total	-	25

****

Text Books

1. Prof. N.Arumugam and R. Meyyan, 2010. Cell Biology, Genetics and Evolution. Seventh edition. Saras Publications, Nagercoil, Tamilnadu
2. Prof. N.Arumugam, 2010. Embryology, Ecology and Physiology. Seventh edition.Saras Publications, Nagercoil, Tamilnadu.

Reference Books

1. P.S. Verma and V.K. Agarwal, 1999.Cytology, Genetics & Embryology. S.Chand & Company Ltd, New Delhi.
2. Veer Bala Rastogi and M. S. Jayaraj 2008. Physiology, Ecology and Evolution. Kedar Nath Ram Nath Publishers, Meerut, New Delhi.

15UZO2AL

II - SEMESTER

Allied – A - PRACTICAL – I

Total Credits : 2

Experiment I:

Virtual laboratory: Observation of various systems of any one Invertebrate & Frog or Rat (Digestive system, Arterial system, Venous system, Reproductive system - male & female) over computer.

Experiment II: Spotters

Animals: Paramecium conjugation, Sycon, Obelia colony, Liver fuke, Earth worm, Prawn, Pila, Star fish, Amphioxus, Shark, Toad, Chameleon, Horn Bill and Bat.

Cell Biology: Columnar epithelium & Bone tissue T.S.

Cell division: Stages of Mitosis: Interphase, Prophase, Metaphase, Anaphase and Telophase.

Genetic Syndromes : Downs, Klinefelter and Turner's (Picture).

Adaptive radiation: Fore limb Skeleton of vertebrates (Picture).

Embryology: Frog : ovum (picture), spermatozoa (Picture), 2 cell stage, 4 cell stage, 8 cell stage: Blastula (VS), Gastrula VS and Tadpole (4mmWM).

Experiment III:

Ecology: Observation of Plankton (any five).

Reference Books:

1. P.S.Verma, 1983. A Manual of Practical Zoology by Invertebrate. 5th Edition. S.Chand & Company Limited, New Delhi.
2. P.S.Verma, 1983. A Manual of Practical Zoology by Vertebrate. 5th Edition. S.Chand & Company Limited, New Delhi.
3. J.Sinha, A.K.Chatterjee and P.Chattopadhyay, 2011. Advanced Practical Zoology. 2nd Edition. Books and Allied (P) Ltd, Kolkatta.

QUESTION PATTERN

Time 3 hours **Max 30 marks**

Question I. Virtual laboratory

(one of the systems – identification & notes) = 7 marks

Question II. Spotters – Identify and Comment on (5x3) = 15 marks

Question III. Observe any one plankton from the given sample = 03 marks

Question IV. Record = 05 marks

----------x----------x----------

QUESTION PAPER PATTERN for CIA and ESE

Theory (Core)

Maximum marks 75

Section A (10 x 1 = 10 marks)

Q.No. 1 to 10 : Multiple choice type alone with four distractors each.

Section B (5 x 5 = 25 marks)

Q.No. 11 to 15 : Either or / short notes type questions (one question 'a' or 'b' from each unit).

Section C (5 x 8 = 40 marks)

Q.No. 16 to 20 : Either or / essay type questions (one question 'a' or 'b' from each unit).

Break up Marks for CIA of Theory

CIA Exam	-	15
Assignment	-	5
Attendance	-	5
Total		25

****

QUESTION PAPER PATTERN for CIA and ESE

Theory (Allied)

Maximum marks 55

Section A (10 x 1 = 10 marks)

Q.No. 1 to 10: Multiple choice types alone with four distractors each.

Section B (5 x 3= 15 marks)

Q.No. 11 to 15 : Either or / short notes type questions (one question 'a' or 'b' from each unit).

Section C (5 x 6 = 30 marks)

Q.No. 16 to 20 : Either or / essay type questions (one question 'a' or 'b' from each unit).

Break up Marks for CIA of Theory

CIA Exam	-	10
Assignment	-	5
Attendance	-	5
Total	-	20

****

MAJOR ELECTIVE PAPERS

(2 papers are to be chosen from the following 4 papers)

1. Environmental Biology
2. Wild life ecology and Management
3. Environmental Biology & Toxicology.
4. Poultry science & Management

NON -MAJOR ELECTIVE PAPERS

(2 papers are to be chosen from the following 4 papers)

1. Nutrition and Dietitics
2. Ecotourism
3. **Nanobiotechnology**
4. Human genetics & Counselling

Tally Table:

Part	Subject	No. of Subjects	Total Marks	Credits
I	Core – Theory / Practical / Project	18	1800	70
	Major Elective Paper	2	200	10
	Non Major Elective Paper	2	200	10
	Grand Total	**22**	**2200**	**90**

Note:

CBCS – Choice Based Credit System
CIA – Continuous Internal Assessment
ESE – End of Semester Examinations

25 % CIA is applicable to all theory subjects except JOC, ALC, COP and Diploma Courses, which are considered as extra credit courses.

I - SEMESTER

PAPER -1 ANIMAL PHYSIOLOGY

Total Credits: 5 **Total Hours: 90**

Objectives

1. To know the functions of the organ and organ system.
2. To study the catabolism of nutrients.
3. Physiological adaptation of organs at different environment.

UNIT I DIGESTION AND NUTRITION 18Hrs

Nutritional Aspects: Role of Protein, carbohydrate, lipid, mineral and dietary fibers in nutrition. Energy Metabolism: Introduction, Caloric value of foods, BMR, factors influencing BMR, physiological variations of BMR, respiratory quotient, (RQ), Factors affecting respiratory quotient.

UNIT II RESPIRATION 18Hrs

Comparison of respiration in different animals. Process of gaseous exchange, Transport of oxygen and CO2 ,Factors affecting O2, and CO2 transport ,Effects of Hypoxia, Oxygen therapy, Control of respiration, Regulation of respiration during exercise, Physiological adaptations at high altitude and deep sea.

UNIT III CIRCULATION 18Hrs

Blood and its component, its role and functions, types of blood pigments, structure and function, comparative anatomy of vertebrate heart, types of heart, cardiac cycle and its control. Plasma proteins, types, characteristics and its clinical importance. Haematological abnormalities (anaemia, leucopenia, leucocytosis, Thromboctopenia) Blood pressure, cardiac cycle and ECG.

UNIT IV MUSCLE PHYSIOLOGY AND EXCRETION 18Hrs

Ultra structure of muscle fibre, muscle proteins, mechanism of muscle contractions. Comparison of vertebrate kidney, patterns of nitrogen elimination, mechanism of urine formation, Osmoregulation in fishes, Acid base balance. Regulation of excretion.

UNIT V ENDOCRINE GLANDS AND REPRODUCTION 18Hrs

Pituitary, Thyroid, Parathyroid, Adrenal and Pancreatic glands, Gastro intestinal hormones. Reproductive hormones. Neuro endocrinal regulation and Feedback mechanism.

Text Books:-

1. Essentials of Animal physiology-S.C. Rastogi, New Age International (P) Ltd., Publishers, (2003).
2. Text books of human physiology-Saradhasubramaniam K and P.Madhavankutty, S. Chand Company Ltd., (2007).

Reference Books:-

1. Text book of medical physiology-M.M. Chatterjee, RanaShinde, Jupee Brothers, Medical Publishers, Pvt. Ltd., (1992).
3. Text books of animal physiology-(1990) R.Nagabushanam-Emkay Publication.
4. General and Comparative Physiology-(1984) William S. Hoar, Prentice Hall of India. New Delhi.
5. Animal physiology and Biochemistry –Singh H.R and Neeraj Kumar (2007) Vishal publications, Jalandhar.
6. Text book of Physiology. (2010) R.Chandramouli Jaypee Brothers Publications.
7. Animal Physiology – K.A.Goyal and K.V.Sastry 2012.

17PZO102

I – SEMESTER

PAPER-2 CELL AND MOLECULAR BIOLOGY AND BIOCHEMISTRY

Total Credits: 4 **Total Hours: 75**

Objective

1. To aware about cell membrane and cyto skeletons structure and functions.
2. To know about nucleus, DNA, protein synthesis, cancer and ageing.
3. To inculcate the knowledge on structure and functions of carbohydrate, protein, lipid, free radicals and anti-oxidants.

UNIT I **15Hrs**

Cell Membrane

Ultra structure and composition of cell membrane, Cell transport, types of cell junction - cell communication. Endoplasmic reticulum, microfilaments and microtubules.

UNIT II **15Hrs**

Nucleus

Types, structure and composition of DNA. C value paradox, Satellite DNA and its role. Chromosomes, Giant Chromosomes, Cell cycle and cell signaling, Interphase nucleus, Chromosomal movement during cell division.

UNIT III **15Hrs**

Protein Synthesis

DNA and RNA types and their structure and functions, Transcription, Translation. Post translational modifications, uncontrolled cell growth (Cancer), Biology of aging.

↳ in prokaryotes & Eukaryotes

UNIT IV **15Hrs**

Biomolecules and Metabolism

Mono, di and Polysaccharides – structure of pentose (Ribose) and Hexoses (Glucose and fructose)-Glycolysis, Krebcycle, Glyconeogenesis: HMP Pathway, Glycogenolysis.

Amino acids, Structure and Classification, essential and non essential amino acid. Protein classification, structure and function of Hemoglobin Deamination, Transamination and transdeamination. Classification, saturated and unsaturated fatty acids, cholesterol structure. Enzymes-Classification-Mechanism of action. Beta oxidation of lipids.

UNIT V **15Hrs**

Bimolecular structure

Conformation of protein (Ramchadran plot), secondary, tertiary and quartnary structure domain, motifs and folds. Conformations of nucleic acids (A,B,Z forms), t-RNA, m-RNA. Stability of proteins and nucleic acid structure.

Text books

1. Cell and Molecular Biology-P.K.Gupta-2010; Rastogi Publications.
2. Fundamentals of Biochemistry for Medical students-AmbikaShanmugam, Published by author,10,111-cross street, West C.I.T.Nagar, Chennai.

Reference books

1. The cell; A Molecular Approach, Geoffrey M Cooper, Robert E Heusman (7th Edn 2016), Sinculler Associates Inc.,
2. Cell Biology: Gerald karp (7th Edn 2013), Wiley publishers.
3. Molecular Cell biology : Harvey lodish et al., (8th Edn 2016), Macmillan
4. Fundamentals of Biochemistry: Donald Voet, Judith G. Voet . John Wiley & Sons, 2010. (4th Edn).
5. The principles of Biochemistry. Lehninger. A.L., D.L. Nelson and M.M.Cox., CBS Publishers & Distributors, New Delhi, India. (1993).
6. Text book of Biochemistry. D.M. Vasudevan & SreeKumari. S, Jaypee brothers, Medical publishers (P) Ltd. New Delhi (2007).
7. Fundamentals of Biochemistry. 2016. Life at the Molecular Level, 4th Edition. Donald Voet, Judith G. Voet, Charlotte W. Pratt

17PZO103

I - SEMESTER

CORE PAPER - 3 - BIOTECHNOLOGY

Total Credits: 5 **Total Hours: 90**

Objectives

1. To learn more advanced and application oriented subjects.
2. It helps to learn the various techniques by the combination of both biology and Information technology.
3. To understand the importance of Human genome project and the necessities of drug designing

Unit I :Animal biotechnology

Tissues and cells culture methods of animals. Types of tissue culture medium, Primary culture, stable cell lines, Gene transfer techniques used in animal cells and eggs, Somatic cell fusion, Stem cell culture and preservation, Applications of cell culture and organ culture, Trangenic animals and their applications.

Unit II: Industrial and enzyme biotechnology

Fermentation, types and designs, Upstream and downstream processing, Production of alcohols, enzymes, vitamins and single cell proteins and their recovery and purifications. Immobilization of enzymes and its applications. Production and application of monoclonal and polyclonal antibody, Gene knockout in bacterial and eukaryotic organisms.

Unit III: Recombinant DNA technology

r-DNA technology, scope and tools in r-DNA technology, Methods of introduction of genes, Isolation of genes, Gene fragments amplification, restriction enzymes, linkers and adapters, Cloning vectors, Gene library, enzyme systems, expression vectors, Selection and screening of recombinants, Recovery of cells containing r-DNA.

Unit IV: Agricultural and Environmental biotechnology

Agricultural biotechnology- Genetically modified micro-organisms, Agrobacterium as a natural genetic engineer, Bacterial biofertilizer- Rhizobium, Azospirillum inoculants, Nitrogen, Phosphate and Sulphate fixing mechanisms, Green manuring- Cyanobacterium inoculants, VAM fungi. Bioremediation, use of genetically engineered bacterial strains, Bioremediation of dyes, Biomining and Biosorption, Biosafety and Bioethics.

Unit V: Medical Biotechnology

Medical biotechnology- Production of antibiotics, hormones, vaccines, interferons, interleukins, tissue-plasminogen activator, Molecular marker in forensic science- RFLP, RAPD, AFLP, VNTR and microsatellite, PCR, DNA microarray. Gene therapy- somatic and germ cell line gene therapy.

Text Books

1. A Text Book of Biotechnology - R.C.Dubey, S.Chand&Co.Publications (2012)
2. Text book of Biotechnology- B.D.Singh, Kalyani Publishers.

Reference Books

1. Advances in Bio technology - S.N.Jogdand. Fifth revised edition 2005. Published by Himalaya publishing house.
2. Gene cloning and DNA analysis - T.A.Brown, fourth edition, Blackwell Publishing 2001.
3. Principles of gene manipulation and genomics- Primose; Richard twyman (7^{th} edition, 2006), Wiley Publishers.
4. Benjamin Levin. Gene IX. 2008. Tokyo University Press, Oxford New York, Tokyo.

17PZO104

I SEMESTER

PAPER 4 – AQUACULTURE

Total Credits: 5 **Total Hours: 75**

Objectives

1. To explore the aquatic resources of the edible and economically important organisms.
2. To provide self employment oppotunities and knowledge for students undergoing Zoology.
3. To make use of the inland waters and marine potential to substitute the protien requirements by the human population.

UNIT I Principle of Aquaculture 14Hrs

Principles of Aquaculture- The need for Aquaculture, Over view of national and international Aquaculture. Systems of aqua culture –Extensive, Semi-intensive, intensive, and super intensive aqua culture, traditional aqua culture.

UNIT II Culture of Fishes 15Hrs

Qualities of culturable species of fishes, Types of culture - Monoculture, Polyculture, pond culture, pen culture, cage culture, running water culture, zero water exchange system, culture sewage fish culture, Paddy fish culture , brackish water culture marine fish culture , integrated fish farming .

UNIT III Aquaculture Engineering 15Hrs

Preliminary survey, site selection, topography, location, design and construction of hatcheries, race ways and farm complex. Tide fed and pump fed farms, creeks ,estuarine and marine water source utilization. Design and construction of ponds and dykes. Water distribution system- main feeder channel, drainage channel. Types of inlet and outlet and their construction

UNIT IV 16Hrs

Criteria for selection of candidate species for aquaculture. Live feed culture and its nutritional value. Proximate composition of live feed and Green algae, Blue green algae, Spirulina, Diatoms, Rotifers, cladocea, feed for formulation, Manufacturing , Feed additives

UNIT V Fish diseases and Management **15Hrs**

Significance of fish disease in relation to aquaculture. Host,pathogen and environment interaction. Pathogenecity and mechanism of bacterial, viral and fungal infections of finfish and shellfish. Conventional and rapid diagnostic technique. Health management in aquaculture. Drugs, chemicals, antibiotics and probiotics used in aquaculture and their mode of action. Quarantine and health certification in aqua culture

Text book

1. Kamaheshwar Pandey and J.P. Shukla, 2005.Fish and fisheries. Rastogi Publications, Meerut, India.
2. B.Ahilan and N.Felix, 2008.Text book of Aquaculture. Daya Publishing House New Delhi, India.

Reference books

1. V.G. Jhingran, 1991.Fish and fisheries of India. Hindustan Publish Corporation, Delhi..
2. Bardach JE, Rhyther JH & Mc. Larney WO. 1972. Aquaculture Farming and Husbandry of Freshwater and Marine Organisms. John Wiley & Sons..
3.Boyd, C. E. and Tucker, C. S. 1992. Water Quality and Pond Soil Analyses for Aquaculture, Alabama Agricultural Experimental Station, Auburn University.
4. ICAR. 2006. Handbook of Fisheries and Aquaculture. ICAR.
5.De Silva SS & Anderson TA. 1995. Fish Nutrition in Aquaculture. Chapman & Hall Aquaculture Series.
6. Andrews C, Excell A & Carrington N. 1988. The Manual of Fish Health. Salamander Books.
7.Shankar KM & Mohan CV. 2002. Fish and Shellfish Health Management. UNESCO Publ. Wedmeyer G, Meyer FP & Smith L. 1999. Environmental Stress and Fish Diseases. Narendra Publ. House..
8.Pillay TVR & Kutty MN. 2005. Aquaculture: Principles and Practices. 2nd Ed. Blackwell.

17PZO205

II - SEMESTER

CORE PAPER-5- BIOSTATISTICS, BIOPHYSICS AND BIOINFORMATICS

Total Credits: 5 **Total Hours: 90**

Objectives

1. To create awareness on collection, analysis of data and interpretation of results.
2. To know the level of significance after analysis of data and also applied in research work.
3. To know the bioelectric potentials of cell membranes and neurons.

Unit I : Sampling and Tabulation

Variables in biology, Collection, Classification and Tabulation of data, Frequency distribution, Diagrammatic and graphical representation of statistical data, Sampling techniques, Measures of central Tendencies- Mean, Median, Mode, Standard Deviation and Standard error.

Unit II: Test of Significance

Hypothesis testing and estimation, Measures of relationship- Correlation, simple, partial and multiple – Regression analysis, Definitions and applications of Chi-square test, "t" test and "F" test. Analysis of variance (ANOVA) - one way and two way classified data, Application of SPSS in biology.

Unit III: Biophysical methods (CV) Include biostat probability

Laws of thermodynamics, Oxidation and Reduction reactions, Redox potentials, High energy compounds. Bioenergetics and Enzyme kinetics. UV-Visible spectroscopy and ESR spectroscopy.

Unit IV Bioelectricity

Ionic distribution and origin of membrane potential, resting and action potential of nerves. Mechanisms of action potential and its measurements. Nerve impulse propagation and conduction of nerve impulses.

Unit V: Biological databases

Generalized and Specialized DNA databases with examples. NCBI- Genbank, EMBL, FASTA format - BLAST, maximum parsimony, multiple sequence alignment. Phylogenetic analysis, prediction of protein structure (PDB), molecular docking and drug designing.

Text book

1. Biostatistics for biology - Palanichamy, S. Manoharan, Paramount Publications, Palani (1992).

1. Statistics, Pillai, R.S.N. and Bhagavathi,
2. Biophysics – VasanthaPattabhi, N.Gautham. Narosa publishing house, New Delhi, Chennai, Mumbai & Calcutta (2002).
3. A text book of Biophysis. Dr.R.N.Roy New Central book agencies (P) Ltd. Chintamoni Das Lane, Calcutta (1996).

Reference Books

1. Satistical methods-S.P.Gupta Sultan Chand & Sons publications,New Delhi(2001).
2. An introduction to Biostatistics - P.S.S. SundarRao and J. Richard, Prentice, Hall of India Pvt. Ltd., New Delhi (2003).
3. Fundamentals of biostatistics, Irfan Ali khan and AtiyaKhanumUkaaz publications, Andrapradesh, India (2004).
4. Text book of Medical physiology- C.Guyton and John E.Hall. 11th edition Sounders – An Imprint of Elsevier, New Delhi, India (2006).
5. Text book of Medical Biophysics Dr. R.N .Roy. Books and Allied (P) Ltd. Chintamoni Das Lane, Calcutta (2001).
6. Text book of Medical physiology- C.Guyton and John E. Hall. Essentials of Animal Physiology- S.C. Rastrogi. New age International (P) Ltd. Publications, New Delhi (2001)

17PZO206

II - SEMESTER

CORE PAPER – 6 – MOLECULAR GENETICS

Total Credits: 5 **Total Hours : 90**

Objectives:

1. To make the students understand the components of genetic material.
2. To make the students appreciate the way by which the biological information is transmitted.
3. To make the students know about the relation between diseases and genes.

UNIT I STRUCTURE OF GENETIC MATERIAL 18Hrs

Chromatin structure and nucleosome concept, organization &function of genetic material, Repetitive DNA, Overlapping genes, Split genes, Pseudogenes, Mitochondrial DNA. Types and structure of RNA, Trasposons.

UNIT-2: GENE EXPRESSION:

Genetic structure and analysis of eukaryotic genomes. Gene regulation in prokaryotes and eukaryotes, Gene clustering, Mechanism of positive and negative control of gene expression. Translational and transcriptional control of regulatory mechanism of expression, Environmental effects on gene regulation. Gene silencing & Epigenetics (Environmental influences).

UNIT III MUTATION 18Hrs

Polygenetic inheritance - crossing over - Inborn errors of metabolism - mutation, molecular basis of mutation - Transition and Transversion - spontaneous and induced mutations, Single Nucleotide Polymorphism and genetic disorders.

UNIT IV HEREDITY AND VARIATION

Linkage maps, tetrad analysis, Mapping with molecular markers. Lod score for linkage testing, Karyotyping, Pedigree analysis. Heritability & its measurements, QTL mapping.

UNIT-5: ONCOLOGY

Viral oncogenes, Activation of proto-oncogenes, Tumour suppressor genes, Regulation of gene expression by oncoproteins, Signal transduction by oncoproteins.cell cycle check points.

Text Books

1. Gupta PK. (2005) Genetics. III Edn. Rastogi Publication, India.
4. Stanley R, John E, Cronon Jr. David Freifled. (1994). Microbial Genetics. II Edn. Jones and BrttLett Publishers. Inc.
5. Kannan.I. (2010). Immunology. MJP Publishers. India.

Reference books

1. Weaver and Hedrick. (1997). Genetics. III Edn. WMC Brown Publishers. McGraw Hill Companies. Inc.
2. Robert H. Lewin. (2002). Principles of Genetics.VII Edn. Tata Mc Graw Hill Publishing Company Ltd. New Delhi.
3. Benjamin Lewin. (1997). Genes. Tokyo University Press, Oxford New York, Tokyo.
4. Strickberger. MW.(2010). Genetics. II edn. Macmillon Publication. New York.
5. Gardner, M. J. Simmons, D. P. Snustad. Principles of genetics. 2006. John Wiley & Sons.
6. Benjamin Levin. Gene IX. 2008. Tokyo University Press, Oxford New York, Tokyo.

17PZO207

II – SEMESTER

PAPER-7 MICROBIOLOGY AND IMMUNOLOGY

Total Credits: 4 **Total Hours:90**

Objectives

1. To aware the knowledge of microorganisms of different media like water, soil, sewage and human body and sterilization techniques.
2. To know the importance of microorganisms involved in agriculture, food processing and medicine.
3. To aware the basic knowledge of immunology and disorders of human beings.

Unit I- History and Scope of Microbiology

Classification of microbes, Economic importance of bacteria, DNA and RNA viruses, Colony morphology and growth, Growth curve and Growth kinetics, Recombination in bacteria, Genetic applications of bacteria and viruses.

Unit II: Food and Environmental microbiology

Microbes of milk and food methods of detection, Pasteurization and food poisoning; food preservation. Micro-organisms in extreme environments- thermophilic, methanogenic and holophilic. Photosynthetic bacteria, Cyanobacteria, Archaea of cold regions and space. Role of microbes in environment protection and management. Normal microflora of human body. Basic concepts, Disinfection- physical and chemical agents.

Unit III: Pathology and microbial control

Pathogenecity, Infection, Virulence – Causative agents, Modes of transmission, Control measures of diseases – Pneumonia, TB, Diphtheria, Leprosy, Tetanus, Typhoid, Polio, Syphilis, Gonorrhoea, AIDS, Viral Hepatitis A and B. Physical and chemical methods. Antimicrobial agents (Antibiotics).

Unit IV: Immunity

Cells and molecules involved in innate and adaptive immunity, Antigen, Antigenicity and Immunogenecity. B and T cell epitopes, Structure and function, of antibody molecules, generation of antibody diversity, Monoclonal antibodies, antibody interactions, MHC molecules, Antigen processing and Presentation, Activation and differentiation of B and T cells, B and T cell receptors.

Unit V: Immune Response

Humoral and Cell mediated immune responses, Primary and secondary immune modulation, the complement system, Toll – like receptors, Cell – mediated effector functions, inflammation, hypersensitivity and auto- immunity, immune response during bacterial (Tuberculosis), Parasitic (Malaria) and Viral (HIV) infections, Congenital and acquired immunodeficiencies, vaccines.

Text books

1. A textbook of Microbiology. P.Chakraborthy, New central book Agency P.L Calcutta, 700 009, India (1995)
2. General Microbiology - Vol I & II - Powar.C.B. Daginawala. H.F. Himalaya publishing House, Mumbai- 400 004.(2001)
3. Micro biology General and Applied A. Mani, A.M.Selvaraj, L.M.Narayanan and N.Arumugam 2013, Saras Publication.

Reference

1. Microbiology. L.Pelizar Jr. M. J.Chan, E.C.S.TataMcGraw Hill company (1993).
2. Cellular and Molecular Immunology Sixth Edition A.K.Abbas and A.Lichtman Elsevier/Saunders(2007)
3. Essential of immunology-Hidemann,W.H. Elsevier science publishing.co.inc (1980)
4. Plant pathology, R.S.Mehrotra, Tata McGraw Hill Publishing company limited, New Delhi.(1990)
5. Textbook of Microbiology- sixth Edition. R. Ananthanarayanan & C. K.Jayaram Paniker. Orient Longman Private Ltd.., Chennai. (2000)

15PZ02CL

II - SEMESTER

CORE PRACTICAL - I [1,2,5,6]

Total Credits: 2

ANIMAL PHYSIOLOGY

1. Determination of the rate of activity of salivary amylase (human saliva) by titration in relation to temperature and calculation of Q_{10}.
2. Amylase activity in relation to pH and calculation of Q_{10}.
3. Biological response of animals to various osmotic concentrations and their effects
   a. Change in weight of Earthworm in heterosmotic media
   b. Active uptake of Na^+ and Cl^- ionsof a fish from the environmental water and change in salinity.
4. Determination of rate of ammonia excretion by a fish in different media.
5. Effect of temperature on the oxygen consumption of a fish and calculation of Q_{10}

BIOCHEMISTRY

1. Quantitative estimation of carbohydrates in liver of an animal.
2. Quantitative estimation of proteins in muscles of an animal
3. Quantitative estimation of lipids in the given animal tissue.
4. Preparation of Heamin crystals from human blood.
5. Quantitative estimation of Hemoglobin in human blood.
6. Determination of urea in the given sample.

BIOPHYSICS (Demonstration only)

1. Recording of BP in man
2. Recording of ECG in Man (Demonstration only).
3. Verification of Beer Lamberts Law using spectrophotometer.
4. Separation of aminoacids by circular paper chromatography (Demonstration only).

MOLECULAR GENETICS AND MOLECULAR BIOLOGY

1. Study of polytene chromosome in the Drosophila larva.
2. Determination of RBC counting in Human blood.
3. Determination of differential count in Human blood.

SPOTTERS

1. pH meter
2. Haemoglobinometer
3. Spectrophotometer
4. Centrifuge
5. Spygnomanometer
6. ECG recorded strip

MODEL QUESTION PATTERN FOR CORE PRACTICAL I

CIA Practical Exam

Model Practical Exam	= 25 - Marks
Observation Note	= 10 - Marks
Attendance	= 5 - Marks
Total	= **40 - Marks**

END OF SEMESTER EXAMINATION

Time-4 Hours **Max Marks-60**

Q I: Major Experiment	– 20 marks
Q II: Minor Experiment - 1	– 10 marks
Minor Experiment – 2	– 10 marks
Q III: Spotters 2x5	_ 10 marks
Q IV: Record	_ 10 marks
Total	_ **60 marks**

II - SEMESTER

CORE PRACTICAL - II [c.p. 3, 4]

Total Credits: 2

BIOTECHNOLOGY

1. Isolation of DNA from animal Tissue
2. Electrophoretic localization of DNA on agarose gel.
3. Purification of an enzyme on gel column. (Demonstration).
4. Primary culture of animal cell / tissue.
5. Hanging drop technique
6. Measurement of cell number in a culture.
7. Preparation of culture media for bacteria
8. Isolation of microbes from water media
9. Bacteriological testing of milk

Spotters

10. Medicinal plants
11. Bio-diesel plants
12. Use of the following instruments/ techniques
    a. Autoclave.
    b. Carrel flask
    c. Liquid N2 chamber
    d. Electrophoretic instruments
    e. Northern and Southern blot.
    f. Vermicompost

BIOINFORMATICS

1. Application of bioinformatics tools – Gen Bank and SCOP.
2. Molecular docking(protein docking)
3. Dendrogram (Cluster Analysis)
4. Preparation of slides in MS PowerPoint
5. Database - creation and querying in MS- Access - Web - browsing and E-Mailing.
6. DNA Library (Demo only)

BIOSTATISTICS

1. Construction of frequency distribution for a given sample.
2. Construction of Histogram and frequency polygon for the frequency distribution Calculation of Mean, Median, Mode for the distribution.
3. Calculation of Standard deviation for the frequency distribution.
4. Calculation of correlation co-efficient for the given data.
5. Application of Student's t test in the given samples.
6. Calculation of F value for the given data.(One way method)

BIODIVERSITY

1. Observation of Endangered plants - in Biospheres reserves in India-By field trip.
2. Observation of Endangered animals - in National parks and sanctuaries-By field trip
3. Systematic position and Biodiversity status of the given specimen (any ten specimen)

   A detailed tour report to be submitted during the practical examination which carries 5 marks.

MODEL QUESTION PATTERN FOR CORE PRACTICAL II

CIA Practical Exam

Model Practical Exam	=	25 -Marks
Observation Note	=	10 - Marks
Attendance	=	5 - Marks
Total	=	**40- Marks**

END OF SEMESTER EXAMINATION

Time-3Hours **Max Marks-60**

Q I: Major Experiment	- 20 marks
Q II: Minor Experiment	- 5 marks
Q III: Spotters 3x5	- 15 marks
Q IV: Record	- 10 marks
Total	- **60 marks**

III - SEMESTER

PAPER 8- ENTOMOLOGY

Total Credits: 5 **Total Hours: 75**

Objectives

1. To know taxonomical position and collection aspects of insects.
2. Inculcating the knowledge of morphology and physiology of insects.
3. To know the knowledge about growth and metamorphosis in insects.

UNIT I CLASSIFICATION AND INSECT COLLECTION **15Hrs**

Classification up to order with example for each order.

Identification of Insects using keys.

Insect Collection: Methods, Preservation and Significance

UNIT II COMPARATIVE MORPHOLOGY **15Hrs**

Mouth parts, Head, Thorax, Abdomen, Genitalia and Appendages

Integument-Structure, Chemistry, Synthesis of chitin, Sclerotization and Tanning

UNIT III STRUCTURE AND PHYSIOLOGY **15Hrs**

Digestive system, Respiratory system and Circulatory system

UNIT IV **15Hrs**

Excretory system, Nervous system, Sense organs and Reproductive system

UNIT V INSECT GROWTH **15Hrs**

Insect growth and development, Metamorphosis and its control.

INSECT ENDOCRINOLOGY

Endocrine Glands
Hormones and Neurohormones - their functions.

Text Books

1. Vasantharaj David .B and T.Kumarasami 2011. Elements of Economic Entomology, Popular Book depot, Madras -15
2. D.B.Tembhare (2009) Modern Entomology -Himalaya publishing house -Delhi

add 2, 4, 5

Reference Books

1. Nayar K.K and T.N.Anathakrishnan and B.V.David. (1983) - General and Applied Entomology,Tata McGraw Hill publishing Co. Ltd., New Delhi.pp.589.
2. Imms, A.D (1972) Text Book of Entomology. Vol. I & II Ed. by Richard & Owen. ELBS.
3. P.G. Fenemore& A. Prakash (2002) Applied Entomology. New age international (P) publishers - New Delhi-2.
4. Chapman R.F(2002) The insects structure and function, fourth edition - Cambridge university press United Kingdom.
5. V.B.Wigglesworth-(1979) The principles of insect physiology, ELBS and Chapman and Hall. U.K.

17PZO309

III - SEMESTER

CORE PAPER – 9. BIO-INSTRUMENTATION

Total Credits: 4 **Total Hours: 75**

Objective

1. The sample preparation and applications of the biological instruments are of vital importance in post graduate studies.
2. To know the working principles of the instruments which are necessary for the projects and research studies.
3. The instruments, which are being handled in the practical classes, the students should be aware of it thoroughly.
4. Principle, description, sample preparation and applications of instruments of biological studies.

Unit-1: Systems Biology& Microscopic techniques:

Optics and Principles of light microscope and phase contrast microscope, electron microscopy- structure and function of TEM, SEM. Fluresence microscope and Confocal microscope.

Unit-2: Separation of Biomolecules

Paper & Column chromatography, Thin layer chromatography, Ion exchange & Affinity chromatography, Gas chromatography, High pressure liquid chromatography (HPLC), Electrophoresis: Polyacrylamide gel electrophoresis (PAGE) – SDS, Agarose gel electrophoresis, Isoelectric focusing. Blotting techniques- Southern blotting, Northern blotting& Western blotting.

Unit-3: Colorimetry, Spectrophotometry and Spectroscopy:

Ultra filtration units, principles and mechanism of colorimeter, UV- Visible spectrophotometry. Centrifugation – types and working principles. Nuclear Magnetic Resonance spectroscopy (NMR), Raman spectroscopy, Mass spectroscopy, Fourier transform infrared spectroscopy (FTIR).

Unit-4: Radioisotope Detection and Measurement:

Radio Immuno Assay - Enzyme Linked Immuno Sorbent Assay (ELISA), Ionization chamber, GM counter, Solid and liquid scintillation counters, Autoradiography assays.

Unit-5: Biotechnological and histology tools

Isolation of genomic DNA and Plasmid DNA, Flow cytometry, FISH & GISH, DNA microarray, Gel documentation, Hybridoma technology and their applications. Microtome, Staining techniques, Fixation and sectioning of tissue, embryos and cells.

Text books

1. Bajpai, P.K., 2008. Biological Instrumentation and methodology. S. Chand & Co. Ltd. New Delhi. P. 251.
2. Asokan, P. 2002. Analytical Biochemistry (Biochemical Techniques) Chinna Publications. Melvisharam, Vellore, TN.
3. C. R. Kothari. 2004. Research Methodology: Methods and Techniques. New Age International (P) Ltd., New Delhi.

Reference books

1. Mahinder Singh, 2005. A Text Book of Analytical Chemistry - Instrumental Techniques Dominant Publishers & Distributors. New Delhi - p. 185.
2. Douglas A. Skoog. 1985. Principle of Instrumental Analysis. Saunders College Publishing Tokyo p. 875.
3. Currell, Graham, 2008 Analytical Instrumentation- Performance Characteristics and qualities, John Wiley & Sons. New York.
4. Robyt, J.F. and White B.J. 1987 Biochemical Techniques, Brooks and Coles.
5. Wilson K and Walker J. 2000 Practical Biochemistry Principles and Techniques. Cambridge Univ. Press.
6. Veerakumari, L, 2010. Bioinstrumentation, M J P – Publishers, Chennai.

III SEMESTER
CORE PAPER 10 DEVELOPMENTAL BIOLOGY

Total hours :75

Total Credits:5

Objectives

1. To understand experiments on the developing embryo.
2. To inculcate knowledge on malformations in embryo and their effects
3. To know harmonic balance during embryonic development.

UNIT - I GAMETOGENESIS 15 Hrs

Primodial germ cells and their origin – Spermatogenesis – Oogenesis and Vitellogenesis – Comparison of spermatogenesis and oogenesis — Role of hormones on oogenesis and ovulation in Human, invitro fertilization (IVF) in Human.

FERTILIZATION

Activation of egg - Mechanism of fertilization – Metabolic activities during fertilization, stem cell biology

UNIT- II DIFFERENTIATION 15 Hrs

Cleavage : Theories of cleavage – Cleavage planes & patterns — Molecular changes during cleavage in Human, Types of blastula.

Gastrulation : Major events of gastrulation – Mechanism of Gastrulation in Mammals.

UNIT- III ORGANOGENESIS IN MAMMALS 15 Hrs

Development: Development of Brain, Heart and Kidney.

EMBRYONIC NUTRITION

Placenta : types, Physiology and Hormonal control during pregnancy and lactation.

UNIT- IV INDUCTION 15 Hrs

Primary organizer : Spemann's experiments and conclusions – Types of embryonic Induction (Primary, Secondary, chain of induction) –Experiments on Chemical nature of

inducing substance – Mechanism of induction (surface interaction, regional specificity and theories) – Competence.

UNIT - V **REGENERATION** **15 Hrs**

Definition and Types of regeneration – Major events of regeneration in invertebrates Physiological changes during regeneration – Factors influencing regeneration, Wolffian regeneration

TERATOGENESIS

Definition – Chemical agents causing congenital abnormalities – Genetic teratogenesis – Environmental teratogenesis.

Text Books :

1. Chordate Embryology – P.S. Verma and V.K. Agarwal, S.Chand Publication company Ltd., New Delhi 2014.
2. Developmental Biology – Veer Bala Rastogi and M.S. Jayaraj, Keendarnath Ramnath Publication Edition -1 (2008).
3. An Introduction to Embryology – Balinsky .B.L. , W.B. Sounders Company Publication Philadelphia, (2008).
4. Elements of Developmental Biology - Jain, P.C, Vishal Publication, New Delhi1998.

Reference Books :

1. Foundations of Embryology – Bruce .M. Carlson – McGraw Hill Publishing companies (2007).
2. Developmental Biology – Scott F. Gilbert Sinaver Amociates Sunderland. (2008)
3. An Outline of Developmental physiology, CHR. P. Raven Pergamon Press. New York. London (1959).
4. Developmental Biology – S.Banerjee Dominant Publishers and Distributers, New Delhi. (2005)
5. A Textbook of Chordate Embryology - Munish Kainth, Wisdom Press, Dominant Book publications. (2013)
6. Developmental Biology- Berril & Corp - Mc Graw Hill Book Company, mc., New York.
7. Vertebrate Embryology- McEwen, R.S.,. Oxford and IBH publishing co., New Delhi. 1969

16PZO411

IV - SEMESTER

CORE PAPER -11: BIODIVERSITY AND EVOLUTION

Total Credits: 5 **Total Hours: 75**

Objectives

1. To understand the present status of Fauna and Flora.
2. If create an awareness of conservation of Endangered Fauna and Flora.
3. If helps to understand the strategies for minimizing the Global warming.

UNIT I **15Hrs**

Biodiversity concept and definition - Values of biodiversity - Methodologies for valuation of biodiversity. Bio geographic Zones of India, Bioreserves, types of Biodiversity and biodiversity hot spots

UNIT II **15Hrs**

Conservation of biodiversity- Loss of biodiversity - Factors causing the loss of biodiversity. Threatened species - IUCN - Red Data book. Cryopreservation and genetic markers.

UNIT III **15Hrs**

Biodiversity and Wild life management- - project Tiger, project Elephant, Captive breeding programme. Wild life sanctuaries and National parks in India.

UNIT IV EVOLUTION **15Hrs**

Isolation: Definition- types of isolation- isolating mechanisms: prezygotic and postzygotic; Barriers- role of isolating mechanisms in organic evolution.

Speciation: Definition: species- race- deme; Species concept: Biological species- Phylogenetic species. Modes of speciation: Instantaneous speciation- gradual speciation. Sympatric and allopatric speciation.

UNIT V **15Hrs**

Genetics and evolution: Selection- genetic load- mutation- genetic drift/ (meiotic drive) - migration pressure- their evolutionary significance. Role of transposons in evolution, Hardy Weinberg Equilibrium.

Text books Biodiversity B.D Singh

1. Evolution: P.S. Verma& V. K. Agarwal - S. Chand & Company Ltd. New Delhi.Ed.1.2008.
2. Biodiversity: Supriyochakraborty. Pointer Publishers. India. Ed.1.2007.
3. Biodiversity and sustainable development: M. L. Narasaiah. Discovery Publishing House. New Delhi- Ed.1.2005.
4. Environmental Biodiversity- P.R. Yadav and S. R. Mishra. Discovery Publishing House New Delhi.Ed.1. 2004.
5. An advanced text book of biodiversity, principles and practice Dr.K.Krishnamoorthy(2005).
6. Organic evolution by Mohan P. Arora(1998).

References

1. Genes and evolution: A.P. Jha. - Macmillan India Ltd. New Delhi..Ed.1.1993.
2. Biodiversity- RamamurthiRallapalli and Teetha Bali- APH Publishing corporation. New Delhi 2002.
2. Evolution and the Diversity of Life-Ernst Mayr.The Belknap Press Hardvard Univ.Press.London,Ed.4. 1997.
3. Evolution. Monroe W Strickberger.CBS Publishers and Distributors.Delhi.Ed.1. 1994.
4. Glimpses of Biodiversity- B.B. Hosetti(2002) Daya Publishing House.
5. Biodiversity in India-T.Pullaiah 2006 Regency.
6. Organic evolution –Rastogi 1999 kedarnath Publishing House.

15PZO412

IV - SEMESTER

PAPER – 12. APPLIED ENTOMOLOGY

Total Credits: 5 **Total Hours: 90**

Objectives

1. To acquire the information on sericulture and apiculture for giving job opportunities to our students.
2. To learn knowledge on disease causing insects.
3. To inculcate knowledge on pests of agriculture, stored grain pests and their control measures.

UNIT I **18Hrs**

Sericulture - Types of silkworms - Silkworm culture- rearing techniques, Moriculure- varieties of food plants of silkworms - Silkworm diseases and control measures - Harvesting of cocoons - reeling.

UNIT II **18Hrs**

Apiculture - Kinds of honey bees - Morphology - life cycle - Bee keeping - social behaviour - Diseases and enemies of honey bees - extraction of honey. Care and management of apiary.

UNIT III **18Hrs**

Medical Entomology : Morphology, life cycle, disease caused by and control measures of Mosquitoes, House flies ,Bed bug, Head louse and Cockroach.

UNIT IV **18Hrs**

Agricultural Entomology

A. Crop pests : Biology, life cycle, damages and control measures of

1. Paddy pests :	Rice stem borer	- **Scirpophagaincertulas**
	Brown Plant hopper	- **Nilaparvatalugens**
2. Coconut pests:	Rhinoceros beetle	- **Oryctes rhinoceros**

3. Red palm weevil	:	Shoot borer	- **Chiloinfuscatellus**
		Top borer	- **Scirphophagaexcerptalis**
4.Cotton pests	:	Tobacco cut worm	- **Spodoteralitura**
		American boll worm	- **Helicoverpaarmigera**

B. Stored Produce pests

1. Rice	:	**Sitophilusoryzae**
2. Flour	:	**Triboliumcastaneum**
3. Green gram	:	**Bruchuschinensis**

UNIT V **18Hrs**

Pest control methods (General) - Cultural, mechanical, physical, legal, biological & Chemical. Recent pest control – Ionizing radiation, Chemosterilants, Genetic manipulation, hormones, insect attractants (pheromones), Repellants, antifeedants, Electromagnetic energy, manipulation of animal behaviour and Integrated Pest Management(IPM). Outline classification of pesticides, mode of action of organophosphorus and pyrethroid pesticides.

Text Books

1. Vasantharaj David. B and T.Kumarasami (2011).Elements of Economic Entomology, Popular Book depot, Madras -15
2. D.B. Tembhare (2009) Modern Entomology -Himalaya publishing house -Delhi

Reference Books

1. Nayar K.K and T.N. Anathakrishnan and B.V. David.1983-General and Applied Entomology.Tata McGraw Hill publishing Co. Ltd., New Delhi.pp.589.
2. Imms, A.D.Text Book of Entomology (1997). Vol.I & II Ed. by Richard & Owen.ELBS.
3. P.G. Fenemore,& A. Prakash (2002) Applied Entomology- New age international (P) publishers -New Delhi.2.
4. Chapman R.F(2002) The insects structure and function, fourth edition - Cambridge university press United Kingdom.
5. V.B.Wigglesworth-(1979)-The principles of insect physiology, ELBS and Chapman and Hall. U.K.

IV - SEMESTER

PRACTICAL III - ENVIRONMENTAL BIOLOGY & TOXICOLOGY

Total Credits: 2

I. Analysis of water - Pond / Pool water; / River water; Sewage/ Effluent

1. pH
2. Total dissolved solids (TDS,TSS)
3. Dissloved carbondioxide
4. Dissloved oxygen
5. Hardness (Temporary - carbonates, bicarbonates, Permanent - calcium, magnesium, chlorides, sulphates phosphate nitrates and silicate
6. BOD and COD (Demonstration only)

II. Analysis of soil - Clayey soil, Sandy soil, Garden soil and Red soil

1. Soil moisture
2. Soil texture
3. Chlorides
4. Sulphates
5. Nitrates
6. Phosphates
7. Silicates
8. Humus

III. Biological analysis

1. Qualitative analysis of organisms (Pollution indicators) such as diatoms / algae, flagellates, ciliates, annelids, insects mollusks and fish
2. Biological analysis of sewage water and industrial effluent.
3. Estimation of chlorophyll content in the leaves as an indicator of pollution.
4. Microbiological study in water and soil.

IV. Toxicological Testing methods

LC50, LD_{50}

V. Lab and Field Study

1) Detailed study of Pond/ Lake ecosystems
    a. Physico-chemical parameters
    b. Qualitative and quantitative analysis of plankton
2) Measurement of noise pollution
3) Estimation of Primary productivity in fresh water habitat

VI. Field Trip

1. Visit to - Drinking water treatment Plant; Sewage water treatment plant and District Environmental Laboratory.

VII. Submission of the following at the time Practical Examination without which the students will not be permitted to write the examination.

1. A minimum of 5 whole mounts of Plankton - 5 marks.
2. Bonafide Record - 10 Mark

MODEL QUESTION PATTERN FOR CORE PRACTICAL III

CIA Practical Exam

Model Practical Exam	=	25 Marks
Observation Note	=	10 Marks
Attendance	=	5 Marks
Total	=	**40 Marks**

END OF SEMESTER EXAMINATION

Time-3Hours **Max Marks-60**

Q I: Estimation of water sample (Major Experiment)	–	15marks
Q II: Estimation of soil sample (Minor Experiment)	–	10 marks
Q III Estimation of Chlorophyll	–	10 marks
Q IV: Spotters (2)	–	10 marks
Q V Submission of slide	–	5 marks
Q VI: Record	–	10 marks
Total	–	**60 marks**

IV - SEMESTER

PRACTICAL IV - ENTOMOLOGY (GENERAL & APPLIED)

Total Credits: 2

1. Identification of insects

Key to insect identification (10 insects of different orders)

2. Mounting

Mouth parts based on their types(5 types)

Genitalia-male and female(3 pairs)

3. Dissection

Digestive System, Nervous System, Reproductive System of any five insects of different orders.

4. Physiology (Cockroach)

Analysis of Digestive enzymes

Qualitative analysis of Haemocytes, protein, carbohydrate and lipid.

5. Sericulture (Silkworm-Bombyxmori)

Study of egg, larva, pupa and adult-Life cycle,Pests and Diseases.

Reeling- Assessment of Cocoon characters,Denier, Shell ratio, Renditta.

6. Apiculture

Bee hive, Honey comb, Types honey bees, Caste differentiation, Pests and diseases of honey bees.

7. Medical Entomology

Identification-Mosquitoes, Housefly, Bed bug and Head Louse.

8. Crop pests

Identification of pests (one in each) of coconut, cotton, sugarcane, paddy

9. Stored grain pests

Identification of rice pest-Sitophilus; wheat pest- Tribolium; Green gram pest-Bruchus

10. Submission : Insect box

i) Insects Only Photographic album

ii) Slides – Whole mounting of 10 small insects.

Field visit

MODEL QUESTION PATTERN FOR CORE PRACTICAL -IV

CIA Practical Exam

Modal Practical Exam	= 25 -Marks
Observation Note	= 10 - Marks
Attendance	= 5 - Marks
Total	= **40- Marks**

END OF SEMESTER EXAMINATION

Time-3Hours **Max Marks-60**

Q I: Major Dissection	-	15 marks
Q II: Minor Dissection	-	10marks
Q III: Spotters (2 x 5)	-	10 marks
Q IV Submission of slides	-	10 marks
Q.V Submission of Insect(album)	-	5 marks
Q VI: Record	-	10 marks
Total	-	**60 marks**

NON-MAJOR ELECTIVE – 1. NUTRITION & DIETITICS

Total Credits: 5 **Total Hours: 60**

Objectives

1. Protect health and saving lives by developing knowledge and expertise in the field.
2. Procedure recognized clinical, public health and management skill.
3. Qualified to work as nutritionist and dietitian in the hospital and other specialized areas such as community and public health and food industry sector.

UNIT I STATUS OF NUTRITION **12Hrs**

Status of nutrition –Global, India and Tamilnadu levels. Nutritional value of Rice, Wheat, Millet, Milk, Fish and Egg. Food exchange list, Basic dietary calculations.

UNIT II NUTRITIONAL NEEDS OF DIFFERENT DISEASES **12Hrs**

Ntritional deficiency and management - diabetes, obesity, underweight, cardiovascular diseases, gastrointestinal diseases and hyper tension, Nutritional requirement during pregnancy.

UNIT III NUTRITION DURING INFANCY **12Hrs**

Growth and development - Advantages of breast feeding - Difference between human milk and Cow's milk - Factors to be considered in bottle feeding - Different milk formulae. Weaning foods ; meaning - need and uses of growth chart to monitor development - Nutritional requirement of infants (upto 1 year) Weaning foods developed by different organizations.

UNIT IV NUTRITIONAL NEEDS OF PRE-SCHOOL CHILDREN (1-5 YEARS) **12Hrs**

Factors to be considered in planning meals - Eating problems of children and their management - Preparation of supplementary foods using available low foods.

Nutrition for school children: Nutrition requirement - Meal planning.

UNIT V **12Hrs**

Nutrition during adolescence - Growth - nutritional requirements special need for girls - menarche.

Nutritional needs of adults (Men and women) - in relation to occupation - meal planning.

Nutrition during old age - Nutritional problems of aged and their management

Text books

1. Dietetics –Sri Lakshmi.B.2011. New age International publishers New Delhi.
2. Passmore, D.P., Break, J.P.1986. Human Nutrition and Dietetics, English Language Book society, Livingston.

Reference Books

1. Anita. F.P. 1986. Clinical Dietetics and Nutrition, Anita. F., Oxford paper back edition, Calcutta.
2. Emma. S.Weighley, Donna.H, Muellar, 1997. Basic nutrition, Prantice hall INC, New Jersey.
3. Anita, F.P. 1997. Clinical Dietetics and Nutrition, 4th edition, Oxford University Press, New Delhi.
4. M.Swaminathan, 1978. Hand book of food and Nutrition, published by the Printing and Publishing Co., Ltd., Bangalore.
5. Rosi, M.S. 1987 A Laboratory hand book for Dietetics, 4th Edition, McMillan Publishing Corporation, New York.

NON-MAJOR ELECTIVE 2 – ECO TOURISM

Total Credits: 5 **Total Hours: 60**

Objectives

1. **To learn the importance of tourism.**
2. **To understand the Laws& policies related to tourism.**
3. **To understand the benefits of tourism.**
4. **To save the environment tourism.**

UNIT I **12 Hrs**

Definition of Tourism - Terminologies Related To Tourism - Elements of Tourism -Growth of Tourism - Basic Patterns of Tourism - Special Patterns of Tourism -Sectors In The Tourism Industry.

UNIT II **12 Hrs**

Definition - Destination of A's Necessary For A Tourist Destination - Learning To Locate Places by Using Latitudes and Longitudes - International, National & Regional Organizations for Tourism.

UNIT III **12 Hrs**

Advent of Information Technology in the Tourism Industry: Impact of Information Technology in the Tourism Industry.

UNIT IV **12 Hrs**

Travel Formalities - Passport and Visa Formalities - Health Documents - Health Preventive Measures for Travelers - Travel Insurance.

UNIT V **12Hrs**

Tsunami, Earthquake, Cyclone, Flood, Global warming, Land slides, Soil erosion and volcanoes

Textbooks

1. A text book of Environmental Studies. P. Arul, Environmental Agency, Chennai. 2004.
2. Tourism Management And Marketing -A.K.Bhattia (1997).

Reference books

1. Facts On Tourism - R. ShanthaKumari
2. South India Tourist Guide - VatsalaIyengar and MalathiRagavan.
3. Ecology and Environment -P.D.Sharma, Rastogi Publications, Meerut, India.

NON MAJOR ELECTIVE 3 - NANOBIOTECHNOLOGY

Total Credits: 5 **Total Hours: 60**

Objective

1. Understand the basic knowledge of Nanobiotechnology
2. Undersatnd the application of nanomaterials in biotechnology
3. Nanotechnological knowledge on the DNA, Proteins, Nucleic acids, drug delivery and biomedicine etc.

Unit I: Nanotechnology and Nanoparticles

Nanotechnology- Introduction, Scope, History, applications. Types of Nanoparticles.

Unit II: Properties and characterizations

Synthesis of nanoparticles- green and microbial synthesis. Characterization of nanoparticles- UV-Vis, X –ray diffraction, EDAX and FTIR.

Unit III: Applications of Nano – materials in Biosystems

Applications of nanomaterials in agriculture, medicine. Impacts of nanomaterials on environments.

Unit IV: Nanomaterials and Diagnostics/ Drug delivery and Therapeutics

DNA coupled Nanomaterials and drug delivary. Metal / metal oxide Nanoparticles (Antibacterila/ Antifungal/Antiviral) Antisotropic and magnetic particles (Hyperthermia).

Unit V: Concept of Nanotoxicity

Types of toxicity based on route of entry, nature of toxin. Cytotoxicity, Genotoxicity, Invivo testol assay.

Textbooks

1. Introduction to nanocomposite materials. Properties, Processing, characterization. Thomas E., Twardowski (2007). DES tech Publications, USA.
2. RK, Rathy, "Nanotechnology" 1st edition, S. Chand Publisher 2009.
3. Sidharth Baliyan, "Basics of Nanotechnology" Anmol Publications PVT. Ltd.
4. CM, Niemeyer, C. A. "Nanotechnology: Concepts, Applications and Perspectives", Wiley- VCH, 2004.
5. P.P. Simeonova, N. Opopol and M.I. Luster, "Nanotechnology- Toxicological Issues and Environmental Safety", Springer 2006.

References

1. Vinod Labhasetwar and Diandra L. Leslie, "Biomedical Applications of nanotechnology", A john Willy & Son inc, NJ, USA, 2007.
2. Challa, S.S.R. Kumar, Josef Hormes, Carola Leushaer, "Nanofabrication Towards Biomedical Applications, Techniques, Tools, Applications and impact, Wiley- VCH, 2005.
3. Zafar Vyamadzi (2008). Reference handbook of nanotoxicology.
4. Houdy. P, Lahmani M. Marano F. (2011). Nanoethics and Nanotoxicology. Spriger, Verlag Berlin Heidelberg.

NON-MAJOR ELECTIVE 4 - HUMAN GENETICS AND COUNSELLING

Total Credits: 5 **Total Hours: 60**

Objectives

1. To make the students develop knowledge on the blood types, transfusion and diseases.
2. To make the students know about applications of aminocentesis, dermatoglyphics and Population genetics.
3. To make the students learn applications of Genetic engineering and Genetic counseling.

UNIT I **12Hrs**

Blood groups (major types) Blood transfusion, Erythroblastosisfoetalis.

Physiology and genetic of blood groups.

UNIT II **12Hrs**

Aminocentesis, Dermatoglyphics: Terminology, methods of observation and printing, dermatoglyphic features of syndrome.

UNIT III **12Hrs**

Population genetics, Hardy-Weinberg principle and its application in human population.

UNIT IV **12Hrs**

Genetic engineering and its applications in human being, Cancer, AIDS.

UNIT V **12Hrs**

Genetic counseling, definition, aims, procedure in genetic counseling and its limitation.Pedigree chart and its uses.

Text Books

1. Genetics. Veer BalaRastrogi. 2009 (reprint 2010) 3rd Ed. KadarnathRamnath publishers. Meerut. New Delhi.
2. Genetics. Alice Marcus.2009.MJP Publishers, Chennai.

References

1. Genetics by H. Eldon Sutton, Robert P. Wagner (1985) - Macmillian publishing company New York.
2. Basic Human Genetics. Elaine J. Mange and Arthur P. Mange (1991). 2nd Edit. Sinaver Associates Inc. publishers Sunder land.
3. Principles of Genetics. Robert H. Tamarin. 2002. 7th Ed. Tata McGraw Hill publication company Ltd. New Delhi.
4. Applied Genetics. C.Emmanuel, S. Ignachimuthu and S.Vincent. 2006. MJP Publishers, Chennai.
5. Genetics. Susan L. Elrod and William D.Stansfield. Adapted by G. Bhowmik 2009 4th Ed. McGraw-Hillpublication company Ltd. New Delhi.
6. Cell and Molecular Biology. P.J.Russel, S.L.Wolte, P.E.Hertz,C.Sterr and B.Mc Millan.2009 1st Ed. (Indianprint), Cengage learningIndia Pvt. Ltd. New Delhi.

MAJOR ELECTIVE PAPER 1 - ENVIRONMENTAL BIOLOGY

Total Credits: 5 **Total Hours: 60**

Objectives

1. To understand the normal functioning of the relevant part of the environment.
2. To understand how an organism fits into its environment.
3. To create awareness about the conservation of natural resources.
4. To know the importance and significance of space ecology.

UNIT I ATMOSPHERE 12Hrs

Composition and Structure, Climatic factors - Air, Light, Temperature, Atmospheric Pressure, Wind, Humidity and Rainfall

UNIT II HYDROSPHERE 12Hrs

Water resources, hydrological cycle, physico-chemical and biological characteristics of ponds, lakes, rivers, estuaries, mangroves and sea.

UNIT III LITHOSPHERE 12Hrs

Soil formation, components of soil, physico-chemical properties of soil, structure, texture and classification of soil, Soil organisms, Soil erosion (degradation).

UNIT IV ENERGY AND ENVIRONMENT 12Hrs

Concept of energy, Sources of energy, Measurements of primary production, Energy flow in ecosystem. Conservation of Natural resources - Minerals, forest, Agriculture, Afforestation, Wild life management, freshwater fish culture.

UNIT V 12Hrs

Radiation Ecology – Radiation environment – Remote sensing, Radio Telemery as a tools for ecological research, Space ecology – Exobiology – Hazards of space travel – Regenerating system.

Text Books

1. Ecology and Environment - P.D. Sharma Rastogi Publications, India, 2012.
2. Environmental Biology – Biswarup Mukerjee, Tata McGraw Hill publishing company Ltd New Delhi, 1997.

Reference Books

1. Introduction to Environmental Science - Joesph M. Moran, Michael, P. Morgan, James, H. Wiesma, Published by W.H. Freeman and Company, Sanfrancisco, 1991.
2. Environmental Biology - K.C. Agarwal, Agro Botanical Publishers (India), 1989.
3. Limnology - Charles R. Goldman, Alexander J. Horsno Mcgraw - Hill International book company, New Delhi, 1983.
4. Introduction to Soil Science - Dilip Kumar, DasKalyani Publishers, New Delhi, 2010.
5. Concept of Ecology-Edward John Kormondy - Prentice Hall Publishers New Delhi, 1969.
6. Fundamentals of Ecology - E.P. Odum, 3rd edition, W.B. Saunders & Co, Philadelphia, 1971.
7. Ecology Environmental Science and Conservation – J.P.Singh, S.P.Singh and S.R.Gupta – S.Chand Publishers, New Delhi 2014.

MAJOR ELECTIVE PAPER 2

WILD LIFE ECOLOGY AND MANAGEMENT

Total Credits: 5 **Total Hours: 60**

Objectives

1. To make the students understand and appreciate biodiversity and the Act to protect the wild species.
2. To make the students learn different techniques to study wild life and develop knowledge of the benefits of ecosystem.
3. To make the students analytically know about various methods to conserve biodiversity.

UNIT I **12Hrs**

Ecosystem aquatic ecosystem- Pond ,terrestrial ecosystem- forest trophic relations in ecosystems, foodchain,foodweb, ecological pyramids-productivity of ecosystem-primary and secondary production.Energy flow in ecosystem.Biotic community and ecological niche.

UNIT II **12Hrs**

Wild life of India – Ecological sub regions of India.Endangered flora and fauna.Wild life management in India-Indian board for wild life.Protected areas network.National parks and sanctuaries.Special projects for endangered species.

UNIT III BIODIVERSITY **12Hrs**

Biodiversity-kinds of biodiversity; Biogeography-continental shift, zoogeography, biodiversity hot spots, endemicity; biodiversity assessment; Endagered species-Indian Wild life protection Actl972 and International Redlist Species Criteria, concept and assessment

UNIT IV FIELD SAMPLING TECHNIQUES **12Hrs**

Population estimation-concept, line transect, quadrate sampling; Animal Trapping Techniques. -Pitfall.funnel, Sherman traps; marking and recapture techniques; use of indirect evidences in species inventory; Basic methods in behavioral and food habit studies; Wildlife management techniques.

UNIT V ECOSYSTEM SERVICES 12Hrs

Animal plant interactions-pollinators, seed dispersal, biological pest control, vector; Wildlife products-food, medicine, Germplasm, domestication;Ecological balance-prey predator relationships.herbivory and scavengers.

Text Book:

1. Ecology and Environment. P.D.Sharma.2009/10th Ed. Rastrogi publications. Meerut.
2. Concepts in Wild Life Management Hoselli BB (2008) Daya publishing house New Delhi 110002.

References

1. Ecology and evolution of communities. Cody, M.L.and J.M Diamond 1975.Harvard University Press. Cambridge. Wildlife Management Techniques. Giles.H. 1984. Natraj Publishers, Dehra Dun.
2. Fundamentals of Wildlife Management. Gopal, R. 1992. Justice Home. Allahabad. Biodiversity-Gaston, K.J. 1996.
3. A biology of numbers and difference. Blackwell Science, Oxford. Ecology. V.K.Agarwal and Usha Gupta. 2004. 1st Ed. S.Chand and Company Ltd.New Delhi.
4. Environmental Studies. D.K.Asthana and Meerut Asthana. 2006 1st Ed. (Reprint 2007).S. Chand and company Ltd. New Delhi.
5. Fundamentals of Ecology. Madhab Chandra Desh and SathyaPrakashDesh. 2009. 3rd Ed. Tata McGraw Hill Education Pvt.Ltd. New Delhi.