Common Course Structure for other UG Degree programmers in Science

B.Sc Zoology Major

(with effect from the academic year 2020-2021 onwards)

Sem	Part	Sub Status	Subject Title	Course paper	Hrs/ Week	Credit
I	I	Language	Tamil/Other Language	1	6	4
	II	Language	Communicative English	1	6	4
	III	Core	Animal Diversity-I Invertebrata	1	4	4
	III	Add on Major (Mandatory)	Professional English forLife Sciences - I	1	4	4
	III	Major Practical – I	Animal Diversity-I Invertebrata	1	2	1
	III	Allied – I	Cell Biology, Genetics and Biotechnology / Industrial Fish and Fisheries-Biology of Fish	1	4	3
	III	Allied – I Practical – I	Cell Biology, Genetics and Biotechnology / Industrial Fish and Fisheries-Biology of Fish	1	2	1
	IV	Common	Environmental Studies	1	2	2
			Sub Total	8	30	23

Sem	Part	Sub Status	Subject Title	Course paper	Hrs/ Week	Credit
II	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4
	III	Core	Animal Diversity-II Chordata	1	4	4
	III	Add on Major (Mandatory)	Professional English for Life Sciences - II	1	4	4
	III	Major Practical – II	Animal Diversity-II Chordata	1	2	1
	III	Allied – I	Developmental Zoology, Ecology, Animal Physiology and Evolution / Industrial fish and fisheries-Capture fisheries	1	4	3
	III	Allied-I Practical – II	Developmental Zoology, Ecology, Animal Physiology and Evolution / Industrial fish and Fisheries-Capture Fisheries	1	2	1
	IV	Common	Value Based Education / / Social Harmony	1	2	2
			Sub Total	8	30	23

III	I	Language	Tamil/Other Language	1	6	4	25	75	100	30	40
	II	Language	English	1	6	4	25	75	100	30	40
	III	Core	Developmental Zoology	1	4	4	25	75	100	30	40
	III	Major Practical- III	Developmental Zoology	1	2	1	25	75	100	30	40
	III	II-Allied-I	Cell Biology, Genetics and Biotechnology / Industrial Fish and Fisheries-Biology of Fish	1	4	3	25	75	100	30	40
	III	II-Allied Practical- I	Cell Biology, Genetics and Biotechnology / Industrial Fish and Fisheries-Biology of Fish	1	2	1	50	50	100	20	40
	III	Skill Based-Core	(Any one) 1. Home Aquarium 2. Nutrition and Dietetics	1	4	4	25	75	100	30	40
	IV	Non- Major Elective	(Any one) 1. Bee Keeping 2. Clinical Biology	1	2	2	25	75	100	30	40
	IV	Common	YOGA*		2	2	25	75	100	30	40
			Sub total	**8**	**30**	**25**					
IV	I	Language	Tamil/Other Language	1	6	4	25	75	100	30	40
	II	Language	English	1	6	4	25	75	100	30	40
	III	Core	Cell and Molecular Biology	1	4	4	25	75	100	30	40
	III	Major Practical- IV	Cell and Molecular Biology	1	2	1	50	50	100	20	40
	III	II-Allied-II	Developmental Zoology, Ecology, Animal Physiology and Evolution / Industrial Fish and Fisheries-Capture Fisheries	1	4	3	25	75	100	30	40

	III	II-Allied Practical- II	Developmental Zoology, Ecology, Animal Physiology and Evolution / Industrial Fish and Fisheries- Capture Fisheries	1	2	1	50	50	100	20	40
	III	Skill Based -Core	(Any one) 1. Biophysics and Bioinstrumentation 2. Vermitechnology	1	4	4	25	75	100	30	40
	IV	Non- Major Elective	(Any one) 1. Public Health and Hygiene 2.Community and Social Preventive Medicine.	1	2	2	25	75	100	30	40
	V	Extension Activity	NCC/NSS/YRC/YW/PE			1	25	75	100	30	40
	IV	Common	Computer for Digital Era*			2	25	75	100	30	40
			Sub total	**8**	**30**	**26**					
V	III	Core	Ecology and Toxicology	1	5	4	25	75	100	30	40
	III	Core	Genetics	1	5	4	25	75	100	30	40
	III	Core	Animal Physiology and Biochemistry	1	5	4	25	75	100	30	40
	III	Core	Immunology and Microbiology	1	5	4	25	75	100	30	40
	III	Major Practical- V	Ecology and Toxicology and Genetics	1	3	4	50	50	100	20	40
	III	Major Practical- VI	Animal Physiology and Biochemistry	1	3		50	50	100	20	40
	III	Major Practical- VII	Immunology and Microbiology	1	2		50	50	100	20	40
	IV	Skill Based Common	Personality Development/ Effective Communication/ Youth	1	2	2	25	75	100	30	40

Common Course Structure for other UG Degree programmers in Science

B.Sc Zoology Major

(with effect from the academic year 2020-2021 onwards)

			Leadership								
			Sub total	**8**	**30**	**22**					
VI	III	Core	Evolution	1	5	4	25	75	100	30	40
	III	Core	Animal Biotechnology	1	5	4	25	75	100	30	40
	III	Core	Biostatistics, Computer Applications & Bioinformatics	1	5	4	25	75	100	30	40
	III	Major Elective	Group A (Any one) 1. Sericulture 2. Economic Entomology 3. Dairy farming	1	5	4	25	75	100	30	40
	III	Major Elective	Group B (Any one) 1. Apiculture 2. Food and Food Processing Technology 3. Poultry Science	1	4	4	25	75	100	30	40
	III	Major Practical- VIII	Evolution and Animal Biotechnology	1	2	4	50	50	100	20	40
	III	Major Practical- IX	Biostatistics, Computer Applications & Bioinformatics	1	2		50	50	100	20	40
	III	Major Elective Practical- X	Corresponding Major Electives	1	2		50	50	100	20	40
			Sub total	8	**30**	**24**					

All practical examinations are at the end of each semester

*Extra credit for extra hours
Total number of hours: 180
Total number of credits : 142

COURSE OBJECTIVES:

- To introduce the students of Zoology to current trends and practices in Biology and status of animals.
- To restructure syllabus in a job oriented manner.
- To prepare the students of Zoology of this university will be well equipped to meet the demands of various competitive examinations.
- To inculcate the temperament of research on recent developments in the students of UG course of this branch.

ELIGIBILITY FOR ADMISSION:

Those who have passed Higher Secondary Examination conducted by the Board of Hr. Sec. Education - TN/ CBSE/ ICSE or Equivalent examination accepted by the syndicate of MSU with Biology/ Zoology/ as one of the subjects in Part III are eligible for admission to B.Sc., ZOOLOGY COURSE

DURATION OF THE COURSE:

The students shall undergo the prescribed course of study for a period of not less than three academic years (Six semesters). Each semester contains 90 working days.

MARK ASSESSMENT:

There is a separate passing minimum for the external and overall components. Distribution of marks between External and Internal Assessment is

For Theory: 75 : 25

For Practical: 50 : 50

Passing minimum of 40% for external and overall components.

Internal Marks for Theory (Core, Skill Based, Non- Major Elective, Elective, Common & Allied) shall be allotted in the following:

The average of the best two test marks from three compulsory tests.

Each test is of one hour duration for 20 Marks

Assignment- 05 Marks

Common Course Structure for other UG Degree programmers in Science

B.Sc Zoology Major

(with effect from the academic year 2020-2021 onwards)

Total-25 Marks

Internal Marks for Practical shall be allotted in the following manner.

Experimental Work-25 Marks; Regularity-25 Marks; Total- 50 Marks

QUESTION PATTERN: (EXTERNAL)

THEORY

Time: 3hrs **Maximum: 75 marks**

Question paper will consist of

Part-A: Q. No: 1-10

Objective type (2 questions from each unit) **(10x1=10 marks)**

Part-B: Q. No: 11-15

Descriptive – short answer (Internal choice from each unit -2 questions for each)

(5x5=25 marks)

Part-C: Q. No: 16-20

Essay type Questions (Internal choice from each unit- 2 question

for each) **(5x8=40 marks)**

PRACTICAL

Time: 3 hrs **Maximum: 50 marks**

Major Practical –	15 marks
Minor Practical –	10 marks
Identification (Spot tests) -	20 marks
Observation Note -	05 marks
Total -	50 marks

.**Elective Subject**: One among the three given subjects will be selected.

To enrich the **skill development** of the students following courses in their premises are conducted Effective Communication/ Personality development /Youth Leadership.

SEMESTER I

CORE PAPER: 1.1- ANIMAL DIVERSITY- I : INVERTEBRATA

4 Hrs. /Week **4 Credits**

OBJECTIVES:

To elucidate the importance of taxonomy.

To know the methods of nomenclature,

To realize the differences between Protozoa and Metazoa

To study the structure, functional organization, adaptations and the economic importance of lower and higher Invertebrates.

OUTCOME:

Students can identify the distribution, biological status and the importance of the Invertebrate animals.

UNIT I

Introduction to Principles of Taxonomy – Binominal Nomenclature.

Protozoa: General Characters and Classification up to classes with the examples.

Type study: *Paramecium:* Morphology – Nutrition – Osmoregulation – Excretion – Reproduction: binary fission and conjugation.

General Structure, Life cycle, Pathogeny and Control Measures of the following:

(a) *Entamoeba histolytica (b) Plasmodium.*

Porifera: General Characters and Classification up to classes with the names of the examples.

Type study: *Leucosolenia* – External morphology – Body wall – Reproduction.

General topic: Canal system in sponges.

(12L)

UNIT II

Coelenterata: General Characters and Classification up to classes with the names of the examples.

Type study: Obelia – External Characters (structure of the colony) – Life history.

General Topics: Corals, Coral reefs and their significance.

Platyhelminthes: General Characters and Classification up to classes with the names of the examples.

General topic: (i) External Morphology and life cycle of *Fasciola hepatica.*

(ii) Parasitic adaptations of Platyhelminthes.

(12L)

UNIT III

Aschelminthes (Nematoda): External Morphology, Life cycle, Pathogeny, Parasitic adaptations and Control measures of the following:

- *Ascarislumbricoides* (Round worm)
- *Dracunculusmedinensis* (Guinea worm)
- *Wuchereriabancrofti* (Filarial worm)

Annelida: General Characters and Classification up to classes with the names of the examples.

General topics: (i) Metamerism in Annelida.

(ii) Biological significance of Earthworm.

(12L)

UNIT IV

Arthropoda: General Characters and Classification up to class with the names of the examples. **Type study**: *Penaeus*: External Characters–Appendages, Compound eye, Reproductive system and Life cycle.

General topics:

(i) Social life in insects – Honey Bees

(ii)Beneficial insects – Honey bee, Lac insects and Silk moth

(iii)External Characters, economic importance and control measures of the pests of agricultural crops (Coconut & Paddy)

(a) Oryctes rhinoceros (b) Leptocorisaacuta

(12L)

UNIT V

Mollusca: General Characters and Classification up to classes with the names of the examples. **Type study:** *Pila globosa*: External characters, Shell, Mantle cavity, Anatomy of Digestive system and Reproductive system.

General topics: (i) Pearl Culture and Pearl Industry in India.

(ii) Cephalopods as Advanced Molluscs.

Echinodermata: General Characters and Classification up to classes with the names of the example.

Type study : Star fish: External Characters, Water Vascular System.

General topic: Larval forms of Echinodermata and their Phylogenetic significance.

(12L)

(TOTAL : 60L)

REFERENCE BOOKS:

Animal Diversity – I : Invertebrata

1. Arora, M.P.Non – Chordates ,Himalaya Publishing House, Ramdoot, Dr.Bhalero Marg (Kelewadi) Gurgan, Mumbai-400004.
2. Barrington, E.J.W.,Invertebrate structure and function.Boston – Houghton. Miffin and ELBS, London.
3. Bhamrah,H.S.et.al. A text book of Invertebrates. Alilnol Publications Private Limited,4374/4B.Ansari Road, Dayaganj,New Delhi – 110002.
4. Brusca, Invertebrates, ANE Books, Avantika,Niwas,19 Doraiswamy Road, T.Nagar,Chennai-600 017.
5. EkambaranathaIyer,M.: A Manual of Zoology Part I. Invertebrata, S. Viswanathan (Printers and Publishers)Pvt.Ltd,Chennai.
6. Jan,A. Pechenik, Biology of the Invertebrates, Tata McGraw-Hill Publishing Company Limited,No.444/1 Sri EkambaraNaicker Industrial state,Alalpakkam, Porur,Chennai-600 016.

7. Jordan,E.L.and P.S. Verma. Invertebrate Zoology (Edition).S. Chand and Company Limited,7361 Ram Nagar,QutabRoad,New Delhi-110055.
8. Kotpal R.L. Modern Text Book of Zoology, INVERTEBRATES (Edition). Rastogi Publications, Gangotri, Shivaji Road, Meerut-250 002.
9. Mahanta Rita and I.K. Bhattacharyya. Invertebrate Zoology. Kalyani Publishers, B1/1299, Rajaendar Nagpur, Ludhiana-141008.
10. Parker and Haswell. A text Book of Zoology, Invertebrates Volume I. AITBS Publishers and Distributors,J5/6 Krishna Nagar, Delhi-110051
11. Verma, A. Invertebrates: Protozoa to Echinodermata. Naros Publishing House Private Limited.3536 Greams Road, Thousand Lights, Chennai - 6000

B.Sc ZOOLOGY (CHOICE BASED CREDIT SYSTEM – CBCS)
MAJOR PRACTICAL SYLLABUS
(FOR THOSE WHO JOINED THE COURSE IN THE YEAR 2020-2021 ONWARDS)
SEMESTER I

PRACTICAL - I
ANIMAL DIVERSITY I- INVERTEBRATA

2 Hrs/Week **Credits 1**

1. **Dissection and Mountings:**
   Cockroach- Nervous System, Digestive System, Trachea, Salivary Apparatus.
2. **Museum specimens, slides , models and charts:**
   Paramecium- entire, binary fission, conjugation, Plasmodium, Marine sponge, Obelia colony, Medusae of Obelia, Madrepora, Ascaris male and female, Fasciola, Earthworm, Nereis, Chaetopterus, Leech, Honey Bee, Leptocorisa, Oryctes, Nauplius larva, Sepia, Octopus, Pinctada, Star fish, Bipinnaria larva, Sea cucumber

I SEMESTER
Professional English Syllabus
CORE PAPER: 1.2 PROFESSIONAL ENGLISH FOR LIFE SCIENCES –I

4 Hrs/ Week **Credits 4**
Weightage : 4 credits **Duration: 90 hours**

OBJECTIVES:

To develop the language skills of students by offering adequate practice in professional contexts.

To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year life sciences students.

To focus on developing students' knowledge of domain specific registers and the required language skills.

To develop strategic competence that will help in efficient communication.

To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

Recognise their own ability to improve their own competence in using the language.

Use language for speaking with confidence in an intelligible and acceptable manner.

Understand the importance of reading for life.

Read independently unfamiliar texts with comprehension.

Understand the importance of writing in academic life.

Write simple sentences without committing error of spelling or grammar(Outcomes based on guidelines in UGC LOCF –Generic Elective) NB: All four skills are taught based on texts/passages.

UNIT1:

COMMUNICATION:

Listening: Listening to audio text and answering questions-Listening to Instructions-Speaking: Pair work and small group work. Reading: Comprehension passages –Differentiate between facts and opinion. Writing: Developing a story with pictures. Vocabulary: Register specific -Incorporated into the LSRW tasks.

UNIT 2:

DESCRIPTION:

Listening: Listening to process description.-Drawing a flow chart.Speaking: Role play (formal context). Reading: Skimming/Scanning-Reading passages on products, equipment and gadgets. Writing: Process Description –Compare and Contrast. Paragraph- Sentence Definition and Extended definition- Free writing. Vocabulary: Register specific -Incorporated into the LSRWtasks.

UNIT 3:

NEGOTIATION STRATEGIES:

Listening: Listening to interviews of specialists / Inventors in fields(Subject specific). Speaking: Brainstorming. (Mind mapping).Small group discussions- (Subject-Specific). Reading: Longer Reading text.Writing: Essay Writing (250 words). Vocabulary: Register specific -Incorporated into the LSRW tasks

UNIT 4:

PRESENTATION SKILLS:

Listening: Listening to lectures.Speaking: Short talks.Reading: Reading Comprehension passages. Writing: Writing: Recommendations-Interpreting Visuals inputs. Vocabulary:Register specific -Incorporated into the LSRW tasks.

UNIT 5:

CRITICAL THINKING SKILLS:

Listening: Listening comprehension-Listening for information.Speaking: Making presentations (with PPT-practice).Reading: Comprehension passages –Note making.Comprehension: Motivational article on Professional Competence,Professional Ethics and Life Skills). Writing: Problem and Solution essay–Creative writing –Summary writing. Vocabulary: Register specific -Incorporated into the LSRW tasks.

SEMESTER I

ENVIRONMENTAL STUDIES FORUNDER GRADUATE COURSES

PART IV-COMPULSORYPAPER- PAPER 1.4

ENVIRONMENTAL STUDIES

2Hrs/ Week **Credits 2**

OBJECTIVES

The scope of environmental studies is very wide and it deals with many areas like i) Conservation of natural resources, ii) ecological aspects, iii) pollution of the surrounding natural resources, iv) controlling the pollution, v) social issues connected to it, and vi) impacts of human population on the environment**.**

UNIT I: THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES.

Definition, scope and importance. Natural resources and associated problems:

a) Forest resources: Use and over-exploitation, deforestation, timber extraction, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, dams-benefits and problems, water conservation and watershed management.

c) Mineral resources: Use and exploitation, environmental effects.

d) Food resources: World food problems, changes, effects of modern agriculture, fertilizer-pesticide problems.

e) Energy resources: Growing energy needs, renewable and non- renewable energy sources, alternate energy sources.

f) Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion and desertification.

UNIT II: ECOSYSTEMS

a) Forest Ecosystem b)Grassland Ecosystem c)Desert ecosystem d)Aquatic Ecosystem (Ponds, rivers, oceans, estuaries). Energy flow in the ecosystem -Ecological succession-Food Chains-Food Webs and Ecological Pyramids.

UNIT III: BIODIVERSITY AND ITS CONSERVATION

Introduction &Definition: Genetic, species and ecosystem diversity. Biogeographical classification of India. Values of Biodiversity-Biodiversity at global, national and local levels-India as a mega-diversity nation- Hot-Spots of biodiversity- Threats to biodiversity-Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT IV: ENVIRONMENTAL POLLUTION

Definition-Causes, effects and control measures of:-a)Air Pollution b)Water Pollution c)Soil Pollution d)Marine Pollution e) Noise Pollution f) Thermal Pollution. Solid Waste Management-Disaster Management: Floods, earthquake, cyclone and landslides.

UNIT V: SOCIAL ISSUES AND THE ENVIRONMENT

Climatic change, global warming, acid rain, ozone depletion. Wasteland reclamation. Consumerism and Waste products, use and through plastics. Environment Protection Act-Air (Prevention and Control of Pollution) Act -Water (Prevention and Control of Pollution) Act- Wildlife Protection Act -Forest Conservation Act-Population Explosion —Family Welfare Programme-Human Rights.

Learning Outcome

- Students enabled to have thorough knowledge of environment.
- Students came to know their responsibilities to care and protect the environment.
- Students could understand their role to establish sustained environment.

REFERENCES:

1.G.S. Vijayalakshmi, A.G. Murugesan and N. Sukumaran. 2006. Basics ofEnvironmental Science, Manonmaniam Sundaranar University Publications,Tirunelveli , pp.160.

2. Agarwal. K.C. 2001. Environmental Biology, Nidi Publications Limited, Bikaner..

3. A.K.De. 1999. Environmental Chemistry, Wiley Eastern Limited, India.

4. Jadhav,H. and Bhosale, V.M.1995. Environmental Protection and Laws,Himalaya Publishing House, Delhi. pp284.

5. Odum, E.P. Fundamentals of Ecology1971., W.B.Saunders Co.,USA., P.No.574.

SEMESTER –I I

CORE PAPER: 2.1 - ANIMAL DIVERSITY –II: CHORDATA

4 Hrs/Week **4 Credits**

OBJECTIVE:

To exemplify the intermediary position of Protochordates between invertebrates and vertebrates, and to study the structure, functional organization, adaptations and the economic importance of lower and higher chordates.

OUTCOME:

To understand the knowledge of habits and habitats and biology of vertebrates.

UNIT I

Introduction to Chordata: General Characters (Diagnostic characters and additional characters)and Classification up to classes with the name of the examples.

Protochordates: General Characters and Classification up to orders with the name of the examples.

Type study: *Amphioxus*-External features- Digestive and Excretory system.

External features and Biological significance of the following

(a) Ascidian (b*) Balanoglossuss*

Agnatha: *Petromyzon*- External morphology, Ammocoetes Larva

(12L)

UNIT II

Pisces: General Characters and Classification up to sub-classes with the names of the examples

Type study*:* *Scoliodon* (shark) -External characters, Placoid scales, Digestive system, Respiratory system, Receptor organs, Urinogenital system.

General topics:(i) Accessory respiratory organs in fishes (ii) Migration of fishes

(iii) Parental care in fishes

(12L)

UNIT III

Amphibia: General Characters and Classification up to orders with the name of the example.

External features and Biological significance of the following Examples:

(a) *Rhachophorus (b) Ambystoma* (c) Axolotl Larva.

General topic: Parental care in Amphibia

Reptilia: General Characters and Classification up to orders with the name of the examples

External features and Biological significance of the following Examples:

(a) *Chelonemydas* (b) Chamaeleon (c) Draco (d) Cobra

General topics:

(i) Identification of poisonous and non-poisonous snakes of South India (ii) Poison apparatus- Biting mechanism- venom- First aid for snake bite-Antivenom.

(12L)

UNIT IV

Aves: General Characters and Classification up to subclasses with the names of the examples.

Type study: *Columba livia* (Pigeon)-External characters-Flight muscles-Digestive system-Respiratory system-Urinogenital system

General topics: (i) Migration of Birds (ii) Flight adaptations in Birds

(12L)

UNIT V

Mammalia: General Characters and Classification up to subclasses with the names of the examples.

Type study: Rabbit –External morphology – Digestive system – Respiratory system- Heart- Structure of Brain- Reproductive system.

General topics: (i) Egg laying mammals (ii) Adaptations of aquatic mammals (iii) Dentition in mammals.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS: Animal Diversity- II: Chordata

1. Alexander, R.M. The Chordates Cambridge University Press.
2. Bhamrah, H.S. et al. A text book of chordates.Anmol publication Limited, 4374/4B Ansari Road,Daryaganj, New Delhi 110002.
3. Ekambaranatha Ayyar,M. and T.N.Ananthakrishnan. A Manual of Zoology Vol.II(chordate).S.Viswanathan (Printers and Publishers)Pvt.Ltd.,Chennai.
4. Jordan E.L. and P.S Verma.Chordata Zoology (11th Edition).S.Chand and Company Limited, 7361 Ram Nager,QutabRoad,New Delhi-110 055.
5. Kardong, K. Vertebrates:ComparativeAnatomy,Function,Evolution.Tata Mc Graw Hill publishing Company Limited,444/1.Sri EkambaraNaickerIndustial estate,Alapakkam,Porur,Chennai-600 116.
6. Kotpal.R.L.Modem Text Book of Zoology-vertebrates.RastogiPublications, Gangotri,Shivaji Road,Meerut-250 002.
7. Kulshrestha,S.K.Comparative Anatomy of Vertebrates,Anmol Publishers a.Private limited,4374/14B,Ansari Road,Daryaganj.New Delhi-110 002.
8. Mahanta Rita and I,K.Bhattacharyya.VertebrateZoology,Kalyanipublishers,B-1/1299,Rajinder Nagar,Ludhiana-141008.
9. Nigam,H.C.Biology of Chrodates.Vishal Publishing Company,BooksMarket,Old Railway Road,Jalandhar-144008.
10. Pough,R.H., C.M.Janis and J.B. Heiser. Vertebrate life.Pearson Education (Singapore) Pvt.Limited;Indian Branch-482 FIE Patpaganj,Delhi-110092.
11. Prasad, S.N.andKashyapVasantika,P.Text Book of Vertebrate Zoology,New Age International publishers,4835/24 Ansari Road,Daryaganj,New Delhi-110002.
12. Young,J.L.Life of Vertebrates.Oxford at the clarendon press,London.

SEMESTER II

MSU/ 2020-21 / UG-Colleges /Part-III (B.Sc. Zoology) / Semester – II / Major Practical - II

PRACTICAL- II
ANIMAL DIVERSITY -II : CHORDATA

2 Hrs/Week **Credits 1**

1. **Dissections and Mountings:**

- **Shark** – Placoid Scales.
- **Shark** – Digestive system (Demonstration only) – model / chart / CD – students have to draw the diagram and write detailed account of the digestive system in the observation note book.
- **Frog** – Arterial system (Demonstration only) – model / chart / CD – students have to draw the diagram and write detailed account of the arterial system in the observation note book.
- **Frog** – Brain (demonstration only) – model / chart / CD – students have to draw the diagram of dorsal and ventral view and write detailed account of the brain in the observation note book.
- **Rabbit** /**Rat**– Urinogenital system (Demonstration only) – model / chart / CD – students have to draw the diagram and write detailed account of the urinogenital system in the observation note book
- **Rabbit/Rat** – Heart (demonstration only) – model / chart / CD – students have to draw the diagram of external and internal structure and write detailed account of the heart in the observation note book

2. **Museum Specimens, Slides, Models and Charts**

Amphioxus, Balanoglossus, Ascidian, Petromyzon, Narcine, Hippocampus, Sardinella, Anabas, Ichthyophis, Rhacophorus, Bufo, Ambystoma, Axolotl larva, Chelone mydas, Chameleon, Draco, Cobra, Dryophis, Sea snake, Pigeon, Kingfisher, Bat.

II SEMESTER

Professional English Syllabus (Mandatory)

ADD ON CORE PAPER: 2.2 PROFESSIONAL ENGLISH FOR LIFE SCIENCES –II

4 Hrs/ Week **Credits 4**

Weightage : 4 credits **Duration: 90 hours**

OBJECTIVES:

The Professional Communication Skills Course is intended to help Learners in Arts and Science colleges,

• Develop their competence in the use of English with particular reference to the workplace situation.

• Enhance the creativity of the students, which will enable them to think of innovative ways to solve issues in the workplace.

• Develop their competence and competitiveness and thereby improve their employability skills.

• Help students with a research bent of mind develop their skills in writing reports and research proposals.

UNIT I:

COMMUNICATIVE COMPETENCE

Listening – Listening to two talks/lectures by specialists on selected subject specific topics - (TED Talks) and answering comprehension exercises (inferential questions)

Speaking: Small group discussions (the discussions could be based on the listening and reading passages- open ended questions

Reading: Two subject-based reading texts followed by comprehension activities/exercises

Writing: Summary writing based on the reading passages.

(18L)

UNIT II:

PERSUASIVE COMMUNICATION:

Listening: listening to a product launch- sensitizing learners to the nuances of persuasive communication

Speaking: debates – Just-A Minute Activities

Reading: reading texts on advertisements (on products relevant to the subject areas) and answering inferential questions 3

(18L)

Writing: dialogue writing- writing an argumentative /persuasive essay.

UNIT III:

GITAL COMPETENCE:

Listening to interviews (subject related)

Speaking: Interviews with subject specialists (using video conferencing skills)

Creating Vlogs (How to become a vlogger and use vlogging to nurture interests – subject related)

Reading: Selected sample of Web Page (subject area)

Writing: Creating Web Pages

Reading Comprehension: Essay on Digital Competence for Academic and Professional Life.

The essay will address all aspects of digital competence in relation to MS Office and how they can be utilized in relation to work in the subject area.

(18 L)

UNIT IV:

CREATIVITY AND IMAGINATION

Listening to short (2 to 5 minutes) academic videos (prepared by EMRC/ other MOOC videos on Indian academic sites – E.g. https://www.youtube.com/watch?v=tpvicScuDy0)

Speaking: Making oral presentations through short films – subject based

Reading : Essay on Creativity and Imagination (subject based)

Writing – Basic Script Writing for short films (subject based)

- Creating blogs, flyers and brochures (subject based)
- Poster making – writing slogans/captions (subject based)

(18 L)

UNIT V:

WORKPLACE COMMUNICATION & BASICS OF ACADEMIC WRITING

Speaking: Short academic presentation using PowerPoint

Reading & Writing: Product Profiles, Circulars, Minutes of Meeting.

Writing an introduction, paraphrasing

Punctuation (period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis)

Capitalization (use of upper case)

(18 L)

(TOTAL: 90L)

SEMESTER II

COMMON PAPER 2.4A (Any one)

PART IV: VALUE BASED EDUCATION

2Hrs/ Week **Credits 2**

OBJECTIVE:

To enable the students to understand the social realities and to inculcate an essential value system towards building a health society.

UNIT I:

Social Justice: Definition –need –parameters of social justice –factors responsible for social injustice –caste and gender –contributions of social reformers.

UNIT II:

Human Rights and Marginalized People -Concept of Human Rights –Principles of human rights –human rights and Indian constitution –Rights of Women and children –violence against women –Rights of marginalized People –like women, children, dalits, minorities, physically challenged etc.

UNIT III:

Social Issues and Communal Harmony: Social issues –causes and magnitude -alcoholism, drug addiction, poverty, unemployment etc –communal harmony –concept –religion and its place in public in public domain –separation of religion from politics –secularism role of civil society.

UNIT IV:

Media Education and Globalized World Scenario: Mass media –functions –characteristics –need and purpose of media literacy –effects and influence --youth and children –media power –socio cultural and political consequences mass mediated culture --consumeristic culture –Globalization –new media-prospects and challenges.

UNIT V:

Values and Ethics: Personal values –family values –social values –cultural values –Professional values –and overall ethics –duties and responsibilities

SEMESTER II
COMMON PAPER: 2.4B (Any one)

Part IV: SOCIAL HARMONY

2Hrs/Week **Credits 2**

OBJECTIVE:

This course is offered with an objective to provide a basic understanding for the undergraduate students on the need and potential of the youth in developing the nation through volunteerism and positive approach.

UNIT I:

Citizenship- Basic Features of Constitution of India –Consumer awareness and the legal rights of the consumer –Introduction to RTI.

UNIT II:

Community Mobilization- Mapping of community stakeholders -Designing the message in the context of the problem and the culture of the community -Identifying methods of mobilization -Youth –adult partnership.

UNIT III:

Volunteerism and Shramdan- Indian Tradition of volunteerism -Needs & Importance of volunteerism -Motivation and Constraints of Volunteerism -Shramdan as a part of volunteerism.

UNIT IV:

Civil/Self Defense- Civil defense service, aims and objectives of civil defense -Needs for self defense –Self defense training.

UNIT V:

Social Harmony and National Integration-Indian History and Culture -Role of youth in peace-building and conflict resolution -Role of youth in Nation building

REFERENCES:

Constitution of India & Indian polity –Ganesa Subramanian

Community mobilization: methods & models –R.R. Prasad

https://en.wikipedia.org/wiki/volunteering

http://wikieducator.org/shramdaan.

Self Defense: The Self Defense Guide for Beginners

Life-styleFacets of Indian culture –Vidya, Rajaram, kalpana

Role of youth in nation building –Mohan Rao Bhagwat and Smriti Razdan

Role of youth in peace –building and conflict resolution –Ozerdem.A., Podde

SEMESTER III
CORE PAPER: 3.1 - DEVELOPMENTAL ZOOLOGY

4 Hrs/Week **Credits 4**

OBJECTIVE:

To understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms.

OUTCOME:

To know the developmental processes of animals particularly in man

UNIT I

Definition and Scope of Developmental Zoology – Gametogenesis – Spermatogenesis – Oogenesis – Vitellogenesis – Structure of Sperm and Egg in Chick. Fertilization: Pre and Post fertilization events – Significance; Parthenogenesis.

(12L)

UNIT II

Cleavage in chick – Fate map of Chick – Gastrulation in Chick – Chick Embryo 48, 72 Hrs. Manipulations of reproduction in Human: Infertility (male and female) – IUI - Invitro fertilization –Artificial insemination - Test tube babies – Amniocentesis.

(12L)

UNIT III

Organogenesis : Development of brain and heart in chick.
Organizer: Primary and secondary organizers.
Morphogenetic fields and gradient hypothesis.

(12L)

UNIT IV

Hormonal control of Amphibian metamorphosis.

Extra-embryonic membranes in chick – Development, Types and Physiology.
Placenta in Mammals – Types and Physiology.

(12L)

UNIT V

Nuclear Transplantation in Acetabularia - Regeneration – Types – Regeneration in Amphibians – Regeneration in Planaria. Birth control : Contraceptive devices: Surgical methods – Hormonal methods – Physical barriers – IUCD.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS: Developmental Zoology

1. Arora, M.P. Embryology. Himalayan Publishing House, Ramdoot, Dr. Bhalero Marg (Kelewadi) Girgaon, Mumbai – 400004.
2. Arumugam, N.Developmental Biology. Saras Publications, 114/35G, A.R.P camp Road, Nagercoil.
3. Balinsky, B.J.Introduction to Embryology, W.B.Saunders, Philadelphia,USA.
4. Berry,A.K. An Introduction to Embryology,EMKAYPublications,Post Box No.9410, B – 19 East Krishna Nagar,SwamiPayanandMarg,Delhi – 110 051.
5. Beryl, N.J. Developmental Biology,Tata McGraw Hill Publishing Company Limited, 444/1 Sri EkambaraNaicker Industrial Estate, Alapakkam, Porur, Chennai -600 116.
6. Developmental Biology: R.M.Twyman.Bios scientific publishers, Ltd. New Delhi (2001).
7. Diwan, A.P. Mammalian Embryology, Anmol Publications Private Limited,4374/4B Ansari Road ,Daryaganj, New Delhi-110 002.
8. Diwan,A.P.Avian Embryology, Anmol Publications Private Limited,4374/4B Ansari Road , Daryaganj, New Delhi-110 002.
9. Gilbert,DevelopmentalBiology,ANE Books India, Avantika Niwas, 19,Doraiswamy Road,T.nager,Chennai-600 017.
10. Goel,S.C.Principles of Animal Developmental Biology,Himalaya Publishing House,Ramdoot,Dr.Bhalerao Marg (Kelewadi)Girgaon,Mumbai – 400 004.
11. Jain,P.C. Elements of Developmental Biology (Chordate Embryology).vishal Publishing Company,BooksMarket,Old Railway Road,Jalandhar – 144 008.
12. Jangir, O.P.Developmental Biology – A Manual.Agrobios (India),Behind NasraniCinema,ChopasaniRoad,Jodhpur – 342 002.
13. Nelson, E.Comparative Embryology of Vertebrates.Tata McGraw Hill Publishing Company Limited,No. 444/1 Sri EkambaraNaicker Industrial Estate, Alapakkam,Porur, Chennai – 600 116.
14. Ramesh Mathurand Meenakshi Metha. Embryology.Anmol Publications Private
    Limited,4374/4B,ansari road,Daryaganj,New Delhi – 110 002.
15. Rao, K.V. Developmental Biology. A Modern Synthesis.Oxford& IBH Publishing company Private Limited, S-155 Panchshila Park, New Delhi 110017.
16. Sastry.K.V. and VineetaShukal, Developmental Biology Rastogi Publications Gangotri, Shivaji Road, Meerut-250 002.
17. Slack,Essential Developmental biology. ANE Books India. Avantika Niwas, 19,Doraiswamy Road,T.Nager,Chennai-600 017.
18. Subramomam, T.Developmental Biology. Narosa Publishing House Private Limited, 35 – 36 Grams Road, Thousand Lights, Chennai – 600 006.
19. Verma.P.S. and V.K. Agarwal. Chordate Embryology (Edition).S. Chand & Company Ltd.7361 Ram Nagar,QutabRoad,New Delhi – 110055.

SEMESTER III
PRACTICAL III: DEVELOPMENTAL ZOOLOGY

2Hrs / Week **Credits 1**

1. Mounting and Observation of live sperms of a vertebrate
2. Mounting and Observation of egg of a frog
3. Temporary mounting and Observation of chick embryo: 24, 48, 72 & 96 Hrs.
4. Museum specimens, Slides, Models and Charts

   Sperm of a vertebrate, chick egg
   Blastula and Gastrula of a vertebrate
   Chick embryo – 24, 48, 72 & 96 Hrs
   IUCD: Condom, Mala – D, Copper T.
   Placenta in mammals: Discoidal, Cotyledonary, Zonary and Diffuse placenta.

SEMESTER III
(SKILL BASED CORE SUBJECT)- Any One
PART III - CORE PAPER: 3.2A- HOME AQUARIUM

4 Hrs / Week **Credits-4**

OBJECTIVES:

To understand the construction and maintenance of aquarium, selection, culture and breeding techniques**.**

OUTCOME:

To gain knowledge about the culture practices of aquarium fishes**.**

UNIT I

Construction of Home Aquarium.

Materials needed – Wooden and metal frames – Frameless tanks – Sealants and Gums. Design and Construction of Public Freshwater and Marine Aquaria.

Aerators and Filters – Hand net and other equipment.

Water quality requirements – Temperature control and Lighting.

(13L)

UNIT II

Setting up aquarium – gravel/pebbles – Plants – Ornamental objects and fishes – Selection. of species – Introducing fishes to the aquarium. Nutritional requirements of aquarium fishes.

Different kinds of feeds. Culture of food organisms. Preparation of dry feeds. Feeding methods

(11L)

UNIT III

Species of ornamental fishes – Taxonomy and biology of Gold fish, Guppies, Swordtails, Marine fishes – Angels and Butterfly fishes.

Fresh water species – live bearers and egg layers, one example each – Common Community fishes – Freshwater and marine, any two examples each.

(12L)

UNIT IV

Reproductive biology of gold fish and angel fish – Maturation, Secondary sexual characters, Breeding habits, Spawning, Parental care, Fertilization and Development of eggs. Common diseases of freshwater and marine aquarium fishes – Parasitic, Fungal, Bacterial- Symptoms – Treatment – Prevention and control.

(13L)

UNIT V

Fresh water plants – their taxonomy and morphology, any three of aquarium plants – provision of nutrient and optimum environmental condition for their growth.

Other Ornamental organisms – Anemones, Lobsters, Shrimps, Octopus, Star fishetc.,

(11L)

(TOTAL: 60L)

REFERENCE BOOKS: Home Aquarium

1. Guide to tropical fish keeping, 1967, Braymer, J.H.P.ILiffe.
2. Tropical Marine aquaria, 1974. Cox, J.F.Hamlyn.
3. Tropical Fish: Setting up and maintaining fresh water and Marine aquaria,1972. Dussa Octopus BookLtd.
4. Aquarium systems, 1981. Hawkins, A.S.(Ed.) Academicpress.
5. Living Aquarium, 1981. Hunnam, P. WardLock.
6. Aquarium Fishes and Plants, 1971, Rataj, K. and R. Zukal –Hamlyn.
7. Ornamental Fish for Garden and Home Aquariums, 1956, R and C.P Home Aquariums.
8. Sea Water Aquariums, 1979.Spotte, S. JohnWiley.
9. Collins Guide to Aquarium Fishes and Plants, 1969.Schiotz, A.Collins.
10. Complete Aquarium, 1963.Vogt,D. and H. WermuthThames.

SEMESTER III

(SKILL BASED CORE SUBJECT)- Any one

PART III - CORE PAPER: 3.2B -NUTRITION AND DIETETICS

4Hrs/Week **Credits-4**

OBJECTIVES:

To understand the importance of the various food stuffs on one side and to study malnutrition, Nutrition related diseases and special diets for persons suffering from diseases on the other side.

OUTCOME:

To understand the food we have to take and balanced diets to maintenance of health practices.

UNIT I

Macronutrients and their function – Carbohydrates – Fats – Proteins -Water.

Micronutrients and their function - Vitamins and Minerals.

Nutritive value of the foodstuff – Cereals – Pulses – Vegetables – Fruits – Milk – Egg – Meat – Fish.

(11L)

UNIT II

Parboiling of rice – process of parboiling and uses of parboiled rice.

Germination of cereals – process of germination and uses of sprouts & its nutritive value.

Metabolism of foodstuffs – protein, carbohydrate and lipid.

Food choice and preparation methods.

Effect of cooking on protein, carbohydrate and fat content.

Menu planning and meal pattern – vegetarian and non – vegetarian.

(13L)

UNIT III

Role of fibres innutrition.

Determination of energy contents of food – Bomb calorimeter.

BMR – Determination of BMR – using direct calorimeter and Benedict Methods, Roth basal metabolic apparatus – Factors affecting BMR.

(11L)

UNIT IV

Balanced diet – Nutritional requirements of different age groups – Pre schoolers- schoolers – Adolescents – Pregnant, lactating women and aged people.

Nutritional diseases – causes and prevention and dietary management of malnutrition, under nutrition and obesity.

Common nutritional deficiency diseases in India – Kwashiorkor – Marasmas –Anaemia-Goitre.

(15L)

UNIT V

Therapeutic diet and its importance, diet planning.

Symptoms, causes, prevention and dietary management for diabetes mellitus, ulcer, renal diseases, hepatitis, hypertension, atherosclerosis, gastro-intestinal disorders, constipation.

(10L)

(TOTAL: 60L)

REFERENCE BOOKS: Nutrition and Dietetics

1.Ann Louise Gittleman. The Fat Flush Plan. Tata Mc Graw Hill Publishing Company Limited,444/1,Sri EmbaraNaicker Industrial Estate, Alapakkam, Porur,Chennai

2 .Hellen Kowtaluk. Food for Today, Tata Mc Graw Hill Publishing Company Limited, 444/1,Sri EmbaraNaicker Industrial Estate, Alapakkam, Porur,Chennai

3. Shubhangini A. Joshi, Nutrition and Dietetics.T Tata Mc Graw Hill Publishing Company Limited, 444/1,Sri EmbaraNaicker Industrial Estate, Alapakkam, Porur,Chennai.

4. Swaminathan, M. Food Science, Chemistry andExperiment.

Swaminathan, M. Principles of Nutrition and Dietetics.

You and Your food and its utilization, Manuscript.IGNOU.

5. Rajalakshmi, R. Applied Nutrition.

6. Sumathi, R. Mudambi and M.V. Rajagopal. Fundamentals of Food andNutrition. Stanley Davidson, Passmore, R. Nutrition and Dietetics Poggy, S., Stanfield. Nutrition and Diet therapy. Fergos Clydesdate, M. Food Nutrition And Health.

SEMESTER III
PART IV- PAPER: 3.3A- BEE KEEPING
(NON- MAJOR ELECTIVE) - Any One

2 Hrs/Week **Credits-2**

OBJECTIVE:
To know the knowledge of rearing of honey bees and extraction of honey.
OUTCOME:
To encourage the students to develop self employment and keep apiary.

UNIT I
Comparative study of Rock bee, Indian bee, Little bee and Dammer bee – Life history of *Apis indica*. Queen, Drones and Workers – Identification, Salient features and Functions.
(6L)

UNIT II
Food of the bees – honey and pollen. Relationship of plants and bees. Arranging an apiary position – space – direction.
(6L)

UNIT III
Acquiring bees – Care of newly captured colonies. Architecture of bee comb- Different kinds of cells. Swarming - Dividing the colony- Applications- protection of colony from enemies.
(6L)

UNIT IV
Primitive hives – Different types. Advantages and disadvantages of primitive hives. Newton's bee hive and its architecture. Appliances used in Apiaries.
(6L)

UNIT V
Honey – Collection and Extraction of honey, preservation, storage, Physical properties, chemical composition, Nutritive value, medicinal values, Honey as Daily Food.
(6L)

(TOTAL: 30L)

REFERENCES: Bee Keeping

1. Bee Keeping in India – Sardar Singh- KAR,Delhi.
2. Bee keeping in South India – Cherian M.C. & Ramachandran, Govt.Press,Chennai.
3. Handbook of bee keeping – Sharma P.L. & Singh S.,Chandigarh.
4. Apiculture – J. Johnson and Jeyachandra, Marthandam, TamilNadu.

SEMESTER III

(NON-MAJOR ELECTIVE)- Any one

PART IV- PAPER: 3. 3B- CLINICALBIOLOGY

2Hrs/Week **Credits-2**

OBJECTIVE:

To understand the methodology of collection, analysis and preservation of samples related to various diseases.

OUTCOME:

To understand various preventive measures

UNIT I

Introduction- Normal and Abnormal conditions of body – Symptoms – Samples to be collected for analysis – diagnosis – Instruments used in the analysis - Sterilization .

(6L)

UNIT-II

Urine Analysis –Collection and preservation of sample and chemical estimation. Protein, Urea, Glycemia, sediments and casts, impaired renal function and clearance test..

(6L)

UNIT-III

Estimation of Gastro intestinal contents –Saliva constituents, Collection and estimation of Gastric juice, Secretion of liver, Duodenal contents and Pancreatic function tests.

(6L)

UNIT-IV

Clinical Haematology – Ways of obtaining blood, Haemoglobin estimation. Cell counting

(DC/ TC), Estimation of Erythrocyte sedimentation test (ESR) ,pathological ,physiological and hereditary disorders, Blood banking, Blood grouping ,and typing ,Glucose Tolerance Test (GTT), Impaired Glucose Tolerance Test , Elisa test.

(7L)

UNIT-V

Fertility test-semen analysis and pregnancy test, RIA test- Agglutination test- Morphological variations – Types- Count and Abnormalities.

(5L)

(TOTAL: 30L)

REFERENCE BOOKS: Clinical Biology

1. Medical laboratory techniques-R.Sood
2. Text book of preventive medicine-J.E Park, Benansidar Bhalot
3. Introduction of medical laboratory technology-Baker, F.J.Silverton
4. Medical laboratory technology-Lynch.

SEMESTER IV

CORE PAPER: 4.1 -CELL AND MOLECULAR BIOLOGY

4 Hrs /Week **Credits-4**

OBJEVTIVES:

To understand the ultrastructure and functions of various cell organelles..

OUTCOME:

To inculcates the techniques of Cell and Molecular Biology.

UNIT I

Cell types – Prokaryotic & Eukaryotic, Microscopy – detailed study of Compound microscope, Phase Contrast & Electron microscopes, Cytological techniques – Fixation & Fixatives – Types of stains.

(13L)

UNIT II

Ultrastructure & functions of the following cell organelles: Plasma membrane, Mitochondria. Golgi Apparatus, Endoplasmic Reticulum, Ribosomes, Lysosomes, Centriole. **(12L)**

UNIT III

Nuclear components: Ultra structure & functions of Nucleus, Nuclear membrane, Nucleolus, Chromosomes & their types Lampbrush chromosome and Polytene Chromosome.

Cancer cells & Carcinogenesis: Definition, types, causes, properties, treatment, Oncogenesis. Cell Signaling.

(14L)

UNIT IV

Nucleic acids – DNA: Components of DNA, DNA structure & Replication, Hybridization, DNA finger print, DNA as genetic material. Transcription- RNA - Types, Protein Synthesis.

(11L)

UNIT V

Cell Division – Mitosis, Meiosis, & Synaptonemal complex, functional unit of gene, Genetic code – codon, anticodon -Control of gene expression- Lac operon- Tryp operon.

(10L)

(TOTAL: 60L)

REFERENCE BOOKS:

Cell and Molecular Biology

1. Ambrose, E.J & Dorothy, M.E: Cell Biology (ELBS CAMLOTPRESS)
2. De Robertis& De Robertis: Cell & Molecular Biology. (W.B. Saunders &co, Philadelphia).
3. De Robertis, E.D.P, Nowinski, W.N &Saez, F.A : Cell Biology (W.B. Saunders &co, Philadelphia).
4. Dupraw, EJ : Cell & Molecular Biology (Academic Press, NewYork)
5. Dyson, R.D :Essentials of Cell Biology (Allyn &BaconInc. Boston). Giese.A.C: Cell Physiology (W.B. Saunders &co,Philadelphia).
6. Gupta P.K. – Cell and Molecular Biology, RastogiPublication,Meerut.
7. Norman.S. Cohn : Elements of Cytology (Freeman Book co, KamiaNager, NewDelhi). Swanson, C.P & Webster. B : The Cell (Prentice Hall Inc., Engle Wook Cliffs, New Jersey) Verma, P.S. and Agarwal, V.K. Cytology eighth edition S. Chand andCo.

SEMESTER IV
PRACTICAL IV: CELL AND MOLECULAR BIOLOGY

2 Hrs/ Week **Credits 1**

1. Mitosis in Onion root tip cells./ Garlic root cells.
2. Meiosis in Grasshopper testis – Demonstration only.
3. Giant chromosome in Chironomous larva.
4. Preparation of a smear of Squamous epithelial cells
5. Preparation of human blood smear
6. Preparation of frog blood smear

Spotters: Models & Charts: DNA, t-RNA, Ribosomes, Nucleus, Mitochondria, Golgi Apparatus, Endoplasmic Reticulum, Protein synthesis.

SEMESTER IV

PART III -CORE PAPER : 4.2A -

BIOPHYSICS AND BIOINSTRUMENTATION

SKILL BASED CORE SUBJECTS (Any One)

4Hrs / Week **Credits 4**

OBJECTIVES :

To know the methods of various instrumentations related to biological systems and functions.

OUTCOME:

To gain knowledge about the establishment of clinical laboratory and also useful for research purposes.

UNIT I

Biophysics – Scope and Method – Atoms – Molecules – Molecular Interactions – Chemical bonds – Primary chemical bonds – Secondary chemical bonds. Principles of Thermodynamics – Laws of Thermodynamics – Enthalpy – Entropy – Living systems and energy changes.

(12L)

UNIT II

Bioenergetics – Energy and Work – Energy Transformation – ATP – Bioenergetics – Structure of ATP – Formation of ATP – NADP – Structure – NADP / NADPH Redox couple – Mitochondrial bioenergetics – Chloroplast bioenergetics. Membrane Conductivity – Diffusion – Active transport – Osmosis – Electric conductivity.

(12L)

UNIT III

Photobiology – Nature of light and its properties – Absorption and Emission Spectra – action spectrum, Refractive index – Huyge's Principle – Polarized light – Solar radiation – UV – Infrared – De- excitation- Bioluminescence – Fluorescence – Phosphorescence.

(11L)

UNIT IV

Instrumentation – Microscopy – Principle and application of Electron Microscope. Basic Instruments – Principle and applications of pH meter and Colorimeter- Centrifugation – Principle and Types – Chromatography – Principle – Types – Paper, Ion exchange, HPLC and applications **(11L)**

UNIT V

Labelling Techniques: Isotopes, Radioactivity, Radioactive decay, half – life, autoradiography, biological use of radioactivity, Radioactivity Counter – Principle – Types – Geiger Muller – Scintillation Counter.

Electrophoresis – Principle – Types – Agarose Gel electrophoresis, Polyacrylamide gel – Sodium

Dodecyl Sulphate Polyacrylamide gel – Applications
PCR Technology: Working mechanism of PCR
Gel Doc. – Principle – Working mechanism – Lyophiliser – Pinciple – Working mechanism – applications.
(14L)
(TOTAL: 60L)

REFERENCE BOOKS:
Biophysics and Bioinstrumentation

1. Saleel Bose: Elements of Biophysics.
2. Casey: Biophysics – Concepts & Mechanism.
3. Vasanthapattabhi N. Gautham: (Narosa publishing House) – Biophysics.
4. Jeyaraman, K. : Laboratoy Manual in Biochemistry. New Age International publishers.
5. Kalaichelvan, P.T: A Laboratory Manual, MJP Publishers,47, Nallathambi Street, Triplicane,Chennai 600 005.
6. Gurumani, N: Research Methodology for Biological Sciences.MJP 47, Nallathambi Street, Triplicane, Chennai 600 005.
7. Palanivelu, P.Analytical Biochemistry and Separation Techniques.A Laboratory Manual for B.SC and M.SC Students.Department of Molecular Biology,M.K.University, Madurai-625 021.
8. L.Veerakumari,Bioinstrumentation MJP Publishers,47, Nallathambi Street, Triplicane,Chennai 600 005

SEMESTER IV
PART III
CORE PAPER: 4.2B-VERMITECHNOLOGY
SKILL BASED CORE SUBJECT-Any one

4Hrs / Week **Credits-4**

OBJECTIVE:

To get a thorough knowledge of producing vermicompost and vermiculture

OUTCOME:

To encourage the self employment practices and save the human being and environment by the way of minimizing the use of chemical fertilizers.

UNIT I

Earthworm taxonomy – Morphological and anatomical – Classification of earthworms – Food habits – Digestive system – Excretion – Reproduction and Life cycle – Earthworm as farmer's friend.

(11L)

UNIT II

Types of earthworm – Exotic and native species – South Indian and North Indian species used in Vermicomposting – Collection and Preservation of earthworms for vermicomposting – Culture techniques of earthworms.

(11L)

UNIT III

Vermicompost production – Requirements – Different methods of Vermicomposting – Heap method – Pot method and Tray method – changes during Vemicomposting.

(11L)

UNIT IV

Role of Earthworms in soil fertility – Use of Vermicompost for crop production – Use of earthworms in land improvement and land reclamation – Economics of Vermicompost and Vermiwash production. Earthworms are asanimal feed – Medicinal value of earthworm meal – Roles of Earthworms in Solid Waste, Sewage and faecal waste management and Vermifilters. Earthworm as a bioreactor.

(15L)

UNIT V

Interactions of earthworms with other organisms – Influence of chemical inputs on earthworm activities – Large scale manufacture of Vermicompost, packaging of vermicompost and its marketing – Financial supporting – Government and NGOs for vermiculture work.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS:
Vermitechnology

1. Invertebrate Zoology – EkambaranathaAyyar.
2. Earthworm in Agriculture – S.C. Talashikar and Dosani, Agrobios Publications, Near Nasarani Cinema, Jodhpur, 342 002.
3. Vermicompost for sustainable Agriculture – P.K. Gupta Agrobios 2nd Edition.
4. Organic Farming for sustainable Agriculture – A.K.Dahama,Agrobios. 5.A Hand book of Organic farming – A.K.Sharma.Agrobios publication.
6. Earthworm ecology – Clive A. Edwards St. Lucie press – CRC Press Washington DC.
7. Biology of Earthworm - Edward and Lofti – Chapman and Hall Publication.
8. Vermicology – Sultan A. Ismail – Orient Longman Press.
9. Vermiculture Biotechnology – U.S. Bhawalkar BERI, PUNE

SEMESTER IV

PART IV

PAPER: 4.3A - PUBLIC HEALTH AND HYGIENE

NON -MAJOR ELECTIVE- (ANY ONE)

2 Hrs / Week **Credits 2**

OBJECTIVES

To understand the physical, mental and social health and also know the safer disposal of various wastes.

OUTCOME

To gain the knowledge about the preventive measures.

UNIT I

Physical, Mental,Social – Positive health – Quality of life Index. Nutrition and Health – Food hygiene – Food toxicants. Population explosion in India – Birth control measures.

(6L)

UNIT II

Environment and health – Water – Sources of water – Uses of water. Water borne diseases – Cholera – Ascariasis. Standards of Housing – Ventilation.

(6L)

UNIT III

Excreta disposal – Importance – Methods of excreta disposal. Sanitary health measures during fares and festivals. First aid with reference to accident.

(6L)

UNIT IV

Communicable disease – Viral diseases – AIDS, Rabies. Bacterial diseases – Tuberculosis, Typhoid. Protozoan diseases – Amoebiasis. Helminth diseases – Filariasis.

(6L)

UNIT V

Health situation in India – Health problems – Primary health care in India – PHC – National Programmes – National AIDS control – National Malaria Eradication Programme – National Tuberculosis.

(6L)

(TOTAL: 30L)

REFERENCE BOOKS:

Public Health and Hygiene

1. Anderson R.Cliford. Your Guide toHealth.
2. Basu, S.C. Preventive and SocialMedicine.
3. Goel, S.O.L. Public HealthAdministration.
4. Harold Shoryock and Hubert O. Swartout. You and Your Health illustratedDealing with Diseases.
5. Park, K.Park‟s Text Book of Preventive and Social Medicine.BanarsidasBhanot Publishers,1167 PremNager,Jabalpur – 482001.
6. Ramarao, V.First Aid in accidents. Sri Krishna brothers, ThambuChettyStreet,Chennai.
7. Sanitarians Hand Book. Theory and Administrative Practice.PearlesPublications, New Orleans, USA.

SEMESTER IV

PART IV

PAPER:4.3B – COMMUNITY AND SOCIAL PREVENTIVEMEDICINE (NON- MAJOR ELECTIVE) –ANY ONE

2Hrs/Week **Credits 2**

OBJECTIVES:

To understand the knowledge of epidemic and endemic diseases

OUTCOME:

To gain the knowledge about the maintenance of hygienic conditions, various diseases and their preventive measures

UNIT-I

Community and Health

Meaning and concept- Biomedical, Ecological, Psychological, Social and Holistic. Determinants of health& Indicators of health. Concept of community health, Role of primary health centers. **(6L)**

UNIT-II

Drug Addiction:

In India today –incidence among college students-common drugs in vogue-their side effects, control and management of drug addiction.

Alcoholism:

Its effect on various organs like heart, lungs, liver, pancreas, brain and intestine-chronic alcoholism – alcoholic withdrawal syndrome - its control and treatment.

(6L)

UNIT-III

Sexually transmitted diseases:

Gonorrhoea- Syphilils – AIDS - Causative agent, causes - symptoms-diagnosis - treatment and control measures.

(6L)

UNIT-IV

Child abuse:

Definition-causes-effects- protection and Legal measures for eradication – remedial measures.

(6L)

UNIT-V

Problems of old age:

Concept of ageing. H**o**using and health care of the aged. Problems – Cardiovascular - alimentary –Locomotion and joints-welfare service provided to the aged by the Government.

(6L)

(TOTAL: 30L)

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REFERENCE BOOKS:

Community and Social Preventive Medicine

1. Social Problems in India – Ram Akuja.
2. Social Preventive Medicine – Park& Park.
3. Ageing and Aged – Paul Chowthry.
4. Indian Social Problem –G.R. Madan

SEMESTER V

CORE PAPER: 5.1- ECOLOGY & TOXICOLOGY

5 Hrs / Week **Credits 4**

OBJECTIVE:

To study the interaction and interdependence among environmental factors and living organisms – To enumerate the ill-effects and the health hazards of toxic agents released to the environment – To discern the evolutionary significance of animals, theories origin of species and significance.

OUTCOME:

To understand the dynamics of various ecosystems such as marine, freshwater and terrestrial.

UNIT I

Abiotic factors : Biological effect of temperature and light.

Biotic factors: Producer, Consumers and Decomposers.

Ecosystem: Pond &Forest

(15L)

UNIT II

Food chain, Food web, Trophic levels, Energy flow, Ecological Pyramids

Animal Relationships: Symbiosis- Mutualism, Commensalism. Antagonism - Antibiosis, Parasitism, Predation and Competition.

(15L)

UNIT III

Population Ecology: Definition – Density – Natality – Mortality – Age distribution – Age pyramids –Population growth – Population fluctuations – Regulation of Population density - Animal Dispersion.

Community Ecology: Definition - Community stratification-Periodicity – Community interdependence – Ecotone - Edge effect- Ecological niche –Ecological Succession.

Adaptation:

- Desert Adaptation
- Cave Adaptation

(15L)

UNIT IV

Wild life Conservation: Definition- Endangered Species – Causes for Depletion, Necessity for conservation – Methods of conservation – Sanctuaries – National Parks.

Remote sensing: Its application in Agriculture, Fisheries, Forest management and Flood Management.

Urbanization: Reasons for urbanization, Urban problems, Methods to control urban growth.

(15L)

UNIT V

Introduction to Toxicology, Definition, Outline classification of Toxicants..

Toxic agents and mode of action of Pesticides, metals, solvents, carcinogens, poisons Environmental toxicology and public health.

(15L)

(TOTAL: 75L)

REFERENCE BOOKS: Ecology and Toxicology

ECOLOGY

1. Agarwal, A.K. Ecology and Environmental Biology. Student Edition, Agrobios (India) Behind NasraniConema, Chopasani Road, Jodhpur -342 002.
2. Arora, M.P. Ecology. Himalaya Publishing House, Ramdoot, Dr.Bhalerao Marg, Girgaon, Mumbai- 400 004.
3. Clarke, G.L. Elements of Ecology, John Wiley & sons Inc. New York.
4. Junega, Kavita. Ecology. Anmol Publications Private Limited, 4371/4B Ansari Road, Daryagani, New Delhi – 110002.
5. Kotpal, R.L and N.P. Bali. Concepts of Ecology Vishal Publishing Company,Books Market, Old railway road, Jalandhar – 144 008.
6. Madhab, C.Dash. Fundamentals of Ecology. Tata McGraw Hill Publishing Company Limited,No.444/1.Sri EkambaraNaicker Industrial Estate, Alapakkam, Porur, Chennai – 600 116.
7. Odum , E.P. Fundamentals of Ecology. International Student Edition, W.B. Saunders Company, Philadelphia, USA.
8. Purohit, S.S. A Text book of Environmental Science, Student Edition, Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodhpur – 342 002.
9. Singh, H.R. and Neeraj Kumar. Ecology and Environmental Science, Vishal Publishing Company, Books Market, Old Railway Road,Jalandhar – 140 008.
10. Singh, S.P.Animal Ecology,6th Edition, Rastogi Publications, Gangotri, Shivaji Road, Meerut – 250 002.
11. Verma, P.S. and Agawal 1986, Environmental Biology, S. Chand & Co Ltd.,

TOXICOLOGY

1. Omkar. Concepts of Toxicology, Vishal Publishing Company, Books market, Old Railway Road,Jalandhur-144 008
2. Sharma, P.D.Toxicology .Rastogi Publications, Shivaji Road,Meerut-250 002.
3. Subramanian, M.A.Toxicology, Principles and Methods.MJP Publishers, Tamil Nadu Book House,47 Nallathambi Street,Triplicane,Chennai-600005.
4. Shukla, J.P. and S.P.Trivedi, Fundamentals of Toxicology, New Central Book Agency(P)Limited, 8/1 Chintamoni Das Lane,Kolkata-700 009.

SEMESTER V
CORE PAPER: 5.2 – GENETICS

5 Hrs /Week **Credits-4**

OBJECTIVE :

To understand the inheritance of parental characters and hereditary diseases

OUTCOME :

To gain knowledge of Mendelian traits of human traits and transmission of characters.

UNIT I

Introduction to Genetics. Mendel- Reason for Mendel's experiment- Alleles- Backcross&Testcross-Mendellian laws of heredity. Monohybrid cross and Dihybrid cross.

Interaction of genes – Complementary, Supplementary, Duplicate genes, Lethal genes in man, Epistasis, Complete and Incomplete dominance, Co-dominance.

Multiple alleles – A,B,Oblood groups- Rh factors in man. Problems related to blood groups– Erythroblastosis foetalis. Multiple genes (Polygenic inheritance) -Skin colour in man.

(15L)

UNIT II

Linkage – complete, incomplete, Crossing over – coupling and repulsion – Mechanism of Meiotic crossing over – Chromosomes map; Sex determination in Man & Drosophila. Genic Balance Theory; Sex linked Inheritance in man – Haemophilia, Colour Blindness, Holandric genes - Hypertrichosis- Sex limited genes. Non disjunction inman.

Extra chromosomal inheritance in Paramecium- Maternal predetermination in coiling of shell. Animal breeding: – Inbreeding and Out breeding- Heterosis.

(15L)

UNIT III

Mutation – types of mutation- gene mutation – genome mutation – mutagens – mode of action of chemical mutagens and ionizing mutagens – detection of mutation by CLB method.

Chromosomal abnormalities – autosomal and sex chromosomes – Down's syndrome.

Klinefelter's syndrome and Turner's syndrome.

(15L)

UNIT IV

Human genetics & Twins. Human chromosome, karyotypes, ideogram- Simple Mendelian traits in man- Inborn errors of metabolism – Phenylketonuria, Alkaptonuria, Albinism, Sickle – Cell anaemia. Improvement of human race – Eugenics, Euthenics, Pedigree Analysis. Genetics Prognosis – Genetic counselling – family history – Preventive measures.

(15L)

UNIT V

Bacterial Genetics – Structure of *E.coli*- Bacterial recombination – transformation-conjugation, transduction and sexduction. Genetic applications of Bacteria- Structure and life history of T_4Phage. Genetic applications of Virus.

(15L)

(TOTAL: 75L)

REFERENCE BOOKS: Genetics

1. Strickberger : Genetics(MacMillan).
2. Farnsworth : Genetics (Harper andRow).
3. P.K.Gupta: Genetics (RastogiPublications)
4. P.S. Verma and Agarwal: Genetics (S.Chand&Co.Ltd.)
5. Altonburg,E: Genetics (Oxford & IBH publishing company)
6. Burns G.W.: The Science of Genetics (MacMillan)
7. A.C.Pai: Foundations of Genetics (Mc Gaw –Hill)
8. J.A.Serra: Modern Genetics (3 volumes)
9. Sinnot,Dunn and Dobzhansky: Principles of Genetics (McGrawHill)
10. Gardener: Principles of Genetics.

SEMESTER V

PRACTICAL V- ECOLOGY AND TOXICOLOGY AND GENETICS

3 Hrs/ Week **Credits 2**

ECOLOGY

Plankton mounting: Any two fresh water/marine plankton
Museum specimens, slides, models and charts
Secchi disc,

Mutualism -Hermit crab and Sea anemone; Commensalism- Echeneis and Shark; Parasitism- Sacculina on Crab; Predation - Snake and Rat.

Cyclomolphosis –Daphnia. Effect of light Protective Colouration(Leaf insect) Effect of light Colour changes (Chamaeleon)

Pond Ecosystem (Chart). Food Chain –.Forest Ecosystem- Food Web – Grass land.

A report on campus fauna.

GENETICS

Breeding Experiment: Chi Square test to be illustrated with beads

a) Monohybrid Cross b) Dihybrid Cross.

- Observation of Simple Mendelian traits in man – to be recorded.
- Observation and study of Polygenic inheritance of quantitative traits to be interpreted in graphs:-a) height of student b) weight of students / length of shells / length of pods.
- Blood group to be analyzed in a population with a minimum of 30 students.
- Spotters: Models of genetic significance to be studied *E.coli*, T_4 Phage. Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Sex -linked inheritance (Colour Blindness, Haemophila, Hypertrichosis, and Webbed toes).
- Culture and Observation of Drosophila life cycle.

SEMESTER V

CORE PAPER: 5.3 – ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

5 Hrs /Week

Credits-4

OBJECTIVES:

Carving an integrated approach to chemistry related to the functional significance of the various organs and organ systems of animals.

OUTCOME:

Students learned about various physiological systems and their activities.

UNITI

- Introduction – Animal Physiology and Biochemistry
- Carbohydrates – Classification – Structure and functions of glucose, fructose, sucrose and glycogen
- Proteins – Classification – Structure and function of albumin and glycoproteins.
- General structure of amino acids – essential &non essential aminoacids.
- Lipids – classification – structure and functions of lecithin, cephalin and cholesterol

(16L)

UNIT II

- Enzymes – Classification – Nomenclature and properties – Mechanism of enzymeaction.
- Digestion – Role of enzymes in Carbohydrate, Protein and Fat digestion in man- Absorption of digested food materials in man.
- Metabolism – Carbohydrates – Glycogenesis, Glycogenolysis, Glycolysis – Krebs's cycle.
- Proteins – Deamination – Transamination –Lipids –β-Oxidation.

(15L)

UNIT III

- Respiration – Respiratory pigments – distribution – composition – properties – functions. Transport and exchange of Oxygen and Carbon-di-oxide - Anaerobiosis - Respiratory Quotient.
- Circulation – Origin and conduction of heat beat – cardiac cycle – ECG – Blood pressure -Heart diseases – Artherosclerosis- Angiogram.
- Excretion – Kinds of excretory products – Structure of kidney – Nephron – Mechanism of urine formation in man – Composition of urine – Nephritis – Dialysis.

(16L)

UNIT IV

- Muscle Physiology – types of muscles - Ultra structure of skeletal muscle – properties – mechanism of muscle contraction.
- Nerve Physiology – Structure, types and functions of neuron.
- Nerve impulse – Definition – Conduction of nerve impulse through nerve – Synapse – Synaptic transmission of impulses – Neurotransmitters – Neuromuscular junction.

(15L)

UNIT V

- Endocrine system – Structure and functions of Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langerhans, Testis and Ovary.
- Reproductive Physiology – Ovary- Graafian follicles. The role of hormones- menstrual cycle- pregnancy -lactation- menopause -.

(13L)

(TOTAL: 75L)

REFERENCE BOOKS:
Animal Physiology and Biochemistry

1. Agarwal, R.A, A.K. Srivastava and Kaushal Kumar. Animal Physiologyand Biochemistry (third edition).S.Chand& Company Limited, NewDelhi.
2. Arora, M.P. Animal Physiology (sixth edition) Himalaya Publishing house, Ramdoot,Dr. Bhalerao Marg, Girgaon,Mumbai.
3. Berry, A.K. A Text Book of Animal Physiology with related Biochemistry(6th
4. Edition). EMKAY Publications, Post box No.9410. B – 19 East Krishna Nayar, Swami Dayanad Marg, Delhi.
5. Das, A.K. Medical Physiology, Vol. I and Vol. II Books and allied (P) Limited, No.1 E/2 Shubam Plaza (1st Floor), 83/1 Beliaghata Main Road,Kolkata.
6. Goyal, K.A and K.V. Sastry, Animal Physiology,6thRevised Edition, Rastogi Publication, Gangotri, ShivajiRoad,Meerut.
7. Guyton, A.C. (1981).Text Book of Medical Physiology, W.B. Saunders co.
8. Hill. Animal Physiology, ANE Books India, Anantika Niwas,19 Doraiswamy Road, T- Nagar,Chennai.
9. Hoar, W.S.(1975). Text Book Of Medical Physiology, W.B.SaundersCo.
10. Juneja, Kavita, Animal physiology. Anmol Publications Pvt. Ltd, 4374/4B AnsariRoad, Daryaganj. NewDelhi

11. Nagabhushanam, R.M.S. Kodarkar and R. Sarogini. Text Book of Animal Physiology2nd Edition. Oxford & IBH Publishing Company Private Limited, S – 155, Panchshila Park, New Delhi.
12. Nigam, H.C. Animal Physiology. Vishal Publishing Company, Books Market Old Railway Road,Jalandhaar.
13. Prosser, L. and A. Brown Comparative Animal Physiology. Saunders &Co.Philadelphia.
14. Prosser,C.L.(1978). Comparative Animal Physiology. W.B. Saundersco.
15. William, S. Hoar, General and Comparative Physiology. Prentice – Hall of India,M-97 Connaught Circus, NewDelhi.

SEMESTER V

PRACTICAL VI– ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

3 Hrs/ Week **Credits 1**

- Rate of Oxygen consumption in a fish.
- Effect of temperature on the Opercular movement of a fish – Calculation of Q_{10}.
- Action of Salivary amylase in relation to enzyme concentration.
- Qualitative test for carbohydrate (glucose), protein and lipid.
- Demonstration of blood pressure using Sphygmomanometer.
- Estimation of Haemoglobin – demonstration only.
- Counting of different kinds of blood cells using Haemocytometer – demonstration only.
- Qualitative test for Ammonia, Urea and Uric acid.

Slides, Models and Charts – Glucose, Fructose, Glycogen, Amino acid, Cholesterol, Intestinal villi, Haemoglobin, Myoglobin, ECG, Sphygmomanometer, Haemometer, Haemocytometer, Kymograph, Cardiac muscle, Striated muscle and Non – Striated muscle, Simple muscle twitch. Ovary- T.S.

SEMESTER V

CORE PAPER: 5.4-IMMUNOLOGY AND MICROBIOLOGY

5 Hrs/ Week **Credits-4**

OBJECTIVES:

To study the types of immunity and immune system and their function and basic awareness about the microorganisms.

OUTCOME:

To know the role of immune system and life cycle of microbes and Pathogenesity and their control measures.

UNIT I

History and Scope of Immunology.

Immunity-Types of Immunity - Innate & Acquired, Passive & Active.

Lymphoid organs –Primary & Secondary (Thymus, Bone marrow, Bursa of Fabricius , Spleen, Tonsil, Lymph node, Peyer‟s patches) – Structure and Functions.

(15L)

UNIT II

Immunoglobulin-Structure, Function, Biological Properties of Ig classes. Interaction of Antigen and Antibody. Salient features of antigen- antibody reaction. Types of antigen-antibody reaction – Agglutination, Precipitation, Opsonization and Cytolysis.

(15L)

UNIT III

Immune response-Lymphocyte as unit of immune system, stem cells - Structure and lineage, T-cells, B- cells & Macrophages.

Humoral immune response - primary & secondary responses - B cell activation. Cell - Mediated immune response - Type of T cells & functions.

Tumour immunology.

(15L)

UNIT IV

Introduction : History & Scope of Microbiology. General structure of microbes (Bacteria & Virus). Bacterial growth -Culture media & selective media- Continuous & Batch culture techniques- Growth curve.

(14L)

UNIT V

Food Microbiology :Food poisoning ; Food spoilage & preservation.

Industrial Microbiology : Production of Antibiotic Penicillin.

Soil Microbiology : Role of soil microbes in N2 fixation.

Medical Microbiology : Diseases caused by bacteria in different systems of man as given below**:** Dermal; Streptococcal inflammation -Tuberculosis; Gastro-intestinal-dysentery; Reproductive – Gonorrhea.

Viral diseases with reference to causative organisms, symptoms, impact on the host & control measures-AIDS , Rabies, Chicken pox, Measles, Influenza & Polio.
(16L)

(TOTAL: 75L)

REFERENCE BOOKS: Immunology and Microbiology

IMMUNOLOGY

Roitt, I. : Essential Immunology(ELBS).
Kuby : Immunology (W.H.Freeman)

MICROBIOLOGY

Pelczar, Reid &Chan: Microbiology.
Philip, L. Carpenter : Microbiology.
Powar : General Microbiology.
Salle,A.J: Fundamental Principles of Bacteriology.
Alexander, M : Introduction to Soil Microbiology.
Frazier, A.C. & Westhoff, D.C: Food Microbiology.
Burrows : Text Book of Microbiology.
Lakshmanan,M : Laboratory manual in Microbiology.
Moat &Foster : Microbial Physiology.
Rangaswami,G : Diseases of crop plants in India.
Patel,A.H.:Industrial Microbiology (MC . Millan India).

SEMESTER V

PRACTICAL VII- IMMUNOLGY AND MICROBIOLOGY

2Hrs/ Week **Credits 1**

IMMUNOLOGY

ABO blood grouping and Rh blood grouping.

. Lymphoid organs in Rat (Demonstration only)

Charts, Slides and Photos: Stem cells, Phagocytes, Thymus, Bone marrow, Spleen, Lymph node, Immunoglobulin- Ig G.

MICROBIOLOGY

Simple staining of bacteria.

Gram-Staining of bacteria.

Serial dilution technique.

Microscopic examination of living bacteria - Hanging drop method.

Microscopic counting of microbes using Haemocytometer (Demonstration only)

Measurement of microbes using Ocular & Stage micrometers (Demonstrationonly)

Preparation of culture media for microbes.

Distribution of microorganisms in nature- soil, water & air.

Aseptic transfer of microbes & pure culture of bacteria and cultural characteristics of Micro-organisms.

Charts, Slides, Equipments and Photos: Autoclave, Hot air oven, Agar plate, Agar stab, Agar slant, Inoculation needle.

SEMESTER V
COMMON SKILL BASED (Any One)
COMMON PAPER: 5. 5A EFFECTIVE COMMUNICATION
2 Hrs/ Week **Credits 2**

GENERAL OBJECTIVE :

The paper aims to fulfill the long felt need to help the undergraduate students, who share a common dream of achieving career success to improve their communicative competence in English both in speaking and writing, by providing them with down-to –earth sensible and stimulating guidance .

SPECIFIC OBJECTIVES :

The course will enable the students to

1. Cary on conversation in different communication contexts such as face to face communication, telephonic communication viva voce interview etc.,
2. Participate actively in group discussions and exchange ideas or attempt to reach a decision on shared problems.
3. Improve their ability to read fast with better understanding.
4. Express themselves clearly and concisely using right words inright places, as they will be enabled to add new words to their present vocabulary. (words, phrases and idioms).
5. Prepare well-organized curriculum vitae(resume/bio-data) Project report, long essay, and term paper6.Write effective formal and informal, letters applications, memos, Emails and faxes.

II. The Structure of the paper. The paper consists of the following five units:Unit One : Listening. Unit Two : Speaking Unit Three:Reading. Unit Four :Writing. Unit Five:Vocabulary Building.

III. Methods :All four skills –listening, peaking , reading, writing –are developed through a wide –ranging tasks.

UNIT I: LISTENING

Listening in to audio and videotapes of conversations and speeches, announcements, instructions and making notes.

UNIT II : SPEAKING

Using correct expressions in given situations / Contexts. Role-play narration of jokes, commentary on (important) events, festivals and matches, conducting quizzes, introducing VIPs

and welcoming an audience, proposing vote of thanks, compeering college functions r youth festivals, sports events, miming radio/TV announcements making simple advertisements, conducting interviews presenting reports, group discussion.

UNIT III : READING

Providing exercises to test the students ability to read and comprehend. Tasks or passages to improve the students average reading speed. Extensive readers may be included. Passages of different types – narrative, descriptive and explorative, may be used as class room materials to train students in different types of reading.

UNITIV: **WRITING**

Tasks, assignments, exercises on various current topics may be provided. Report, Writing, Freparing agenda and writing minutes for meetings effective use of SMS, Applying for job, Resume and effective profiling. Emergency communication through print & Electronic media.

UNIT V: Vocabulary Traditional and innovative tasks may be devised.

MATERIALS:

The following texts may be used by teachers.

- Leo Jone's New International Business Entlish(Cambridge University Press)
- B.Jean Naterop and Rod Revell's Telephoning in English(Cambridge)
- Reader's Digest How to Write and Speak Better
- Robert Barras's Students Must Write (Routledge)
- Norman Lewis's Word Power Made Easy
- Owen Webster's Read Well and Remember (ELBS)
- Dr. Francis soundararaj's Teaching spoken English and Communication Skills (T.R. Publications).

A course book may be prepared by experts in the University area.

V. Testing and Evaluation Scheme of Examination.

The testing may be both internal and external. The distribution of marks 40: 60. Internal for written : 20, for oral :20. External : 60. Total : 100. Internal -40 Marks. Oral Test–20 Marks. One test at the end of the Semester.

Note: Special focus on Units I & II. Unit I –10 marks; Unit –II –10 marks; Written Test:20 Marks (2 tests per semester). Test I –Units III & IV. Test II –Units IV & V.

Summative Examination

- Section A –Multiple Choice10 X 1 = 10 marks
- Section B –Answer in 100 words 4 X 5 = 20 Marks(with internal choice)
- Section C –30 Marks1.Comprehension2.All sub units in UnitIV.

SEMESTER V
COMMON SKILL BASED (Any One)
COMMON PAPER: 5. 5B PERSONALITY DEVELOPMENT
2 Hrs/ Week **Credits 2**

UNIT: I - PERSONALITY

Definition –Determinants –Personality Traits –Theories of Personality –Importance of Personality Development. SELF AWARENESS–Meaning –Benefits of Self –Awareness –Developing Self –Awareness. SWOT–Meaning –Importance-Application –Components. GOAL SETTING-Meaning-Importance –Effective goal setting –Principles of goal setting –Goal setting at the Right level.

UNIT :II- SELF MONITORING

Meaning –High self –monitor versus low self monitor –Advantages and Disadvantages self monitor-Self –monitoring and job performance. PERCEPTION-Definition-Factor influencing perception-Perception process –Errors in perception –Avoiding perceptual errors. ATTITUDE–Meaning-Formation of attitude –Types of attitude -Measurementof Attitudes –Barriers to attitude change –Methods to attitude change.
ASSERTIVENESS-Meaning –Assertiveness in Communication –Assertiveness Techniques –Benefits of being Assertive –Improving Assertiveness.

UNIT : III - TEAM BUILDING

Meaning –Types of teams –Importance of Team building-Creating Effective Team. LEADERSHIP–Definition –Leadership style-Theories of leadership –Qualities of an Effect leader. NEGOTIATION SKILLS–Meaning –Principles of Negotiation –Types of Negotiation –The NegotiationProcess –Common mistakes in Negotiation process. CONFLICT MANAGEMENT–Definition-Types of Conflict-Levels of Conflict –Conflict Resolution –Conflict management .

UNIT :IV - COMMUNICATION
Definition –Importance of communication –Process of communication -Communication Symbols –Communication network –Barriers in communication –Overcoming Communication Barriers. TRANSACTIONAL ANALYSIS–Meaning –EGO States –Types of Transactions –Johari Window-Life Positions. EMOTIONAL INTELLIGENCE-Meaning –Components of Emotional Intelligence-Significance of managing Emotional intelligence –How to develop Emotional Quotient. STRESS MANAGEMENT–Meaning –Sources of Stress –Symptoms of Stress –Consequences of Stress –Managing Stress.

UNIT :V - SOCIAL GRACES

Meaning–Social Grace at Work –Acquiring Social Graces. TABLE MANNERS–Meaning –Table Etiquettes in Multicultural Environment-Do's and Don'ts of Table Etiquettes. DRESS CODE–Meaning-Dress Code for selected Occasions –Dress Code for an Interview. GROUP DISCUSSION–Meaning –Personality traits required for Group Discussion-Process of Group Discussion-Group Discusson Topics. INTERVIEW–Definition-Types of skills –Employer Expectations –Planning for the Interview –Interview Questions-Critical Interview Questions.

REFERENCES:

1. Dr.S. Narayana Rajan, Dr. B. Rajasekaran, G. Venkadasalapthi, V. Vijuresh Nayaham and Herald M.Dhas, Personality Development, Publication Division, Manonmaniam Sundaranar University, Tirunelveli
2. Stephan P.Robbins, Organisational Behaviour, Tenth Edition, Prentice Hall of India Private Limited, New Delhi,2008.
3. Jit S. Chandan, Oragnisational Behaviour, Third Edition, Vikas Publishing House Private Limited, 2008.
4. Dr.K.K. Ramachandran and Dr.K.K. Karthick, From Campus to Corporate, Macmillan Publishers India Limited, New Delhi,2015.

SEMESTER V

COMMON SKILL BASED (Any One)

COMMON PAPER: 5. 5C YOUTH LEADERSHIP

2 Hrs/ Week **Credits 2**

OBJECTIVE

This course is offered with an objective to improve the personality of the undergraduate students by making them understand the importance of the youth in nation development and ways and means to enhance the contribution of youth and the schemes thereof.

.UNIT I: UNDERSTANDING YOUTH

Definition, Profile of youth, categories of youth –Issues, Challenges and Opportunities for youth – Youth as an agent of social change –Role of Youth Leadership –Meaning and types of leadership – Qualities and traits of good leaders –Importance of youth leadership.

UNIT II: HEALTH, HYGIENE & SANITATION

Definition, needs and scope of health education –Food and Nutrition –Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan) –National Health programme.

UNIT III: YOUTH HEALTHHEALTHY

Lifestyles –HIV AIDS, Drugs and Substance abuse –Home Nursing –First Aid –Reproductive health.

UNIT IV: YOUTH AND CRIME

Sociological and Psychological Factors influencing Youth Crime –Peer Mentoring in preventing crimes –Awareness about Anti –Ragging –Cyber Crimes and its prevention –Juvenile Justice –Youth Development Programmes in India –Nation Youth Policy –Youth Development Programmes at the National Level, State Level and Voluntary Section –Youth Focused and youth –led organizations.

UNIT V: INTRODUCTION AND BASIC CONCEPTS OF NSS

History, Philossophy, aims & objectives of NSS –Emblem, flag, motto, song, badge etc., - Organizational Structure, roles and responsibilities of various functionaries –Youth Programme / Schemes of GOI.

SEMESTER VI

CORE PAPER: 6.1 - EVOLUTION

5Hrs/Week **Credits-4**

OBJECTIVES :

To know how the life originated in our planet and related theories

OUTCOME: Students learned principle of evolution and factors responsible for Evolution..

UNIT I

Chemical origin of life – Biological experimental evidences. Evidences in favour of evolution :
-Homologous organs and Analogous structures.
Evidences: Embryological – Palaeontology - Geologicalscale – Biochemistry and Physiological..
(15L)

UNIT II

Lamarckism and Neo – Lamarckism Darwinism and Neo – Darwinism.
Mutation theory of De vries
Modern concept of Evolution : Natural Selection – types and mechanism.
(15L)

UNIT III :

Variations and Sources of Variability. Isolation and Isolating mechanisms. Population Genetics and evolution :Hardy – Weinberg law. Species concept and Speciation – types and mechanism.
(15L)

UNITIV:

Mimicry and Protective Colouration.
Adaptations : Cursorial, Fossorial, Arboreal, Volant, Aquatic, Desert and Cave.
(15L)

UNIT : V

Evolution of Horse.
Evolution of man- Ancestry of man-Salient features of Apes and Man- Trends in Human Evolution – Causes for Human Evolution- Evolution of man as seen in the fossil record.
Cultural Evolution of Man.
Animal distribution (Geographical) – Patterns of Distribution - Zoogeography of Palaearctic , Nearctic , Neotropical , Ethiopian , Oriental and Australian region.
(15L)
(TOTAL: 75L)

REFERENCE BOOKS

Organic Evolution- N. Arumugam
Evolution- M. P. Arora
Moody, Introduction To Evolution.
Dobzhansky, Th.: Genetics And The Origin Of Species 1951,Columbia Uty. Press.
Dodson, Evolution – Process and Product.

SEMESTER VI

CORE PAPER: 6.2- ANIMAL BIOTECHNOLOGY

5 Hrs/Week **Credits-4**

OBJECTIVES:

To introduce the various concepts, principles of b\Biotechnology.

To illustrate the concepts of isolation, cloning and insertion of various genes into a prokaryotes.

To describe the utilization of Biotechnology in various biological fields

OUTCOME:

Students learned about the advancement in Biotechnological techniques and their utilization in biological fields.

UNIT I

Biotechnology:.Definition- History-Scope and Importance.

Restriction enzymes as tools in Biotechnology.

Steps in Gene cloning – preparation of desired DNA and isolation of Plasmid vector- Insertionof , Introduction of recombinant DNA into host cells - Prokaryotic and Eukaryotic animal cells. (Transformation, Transfection, Microinjection Electroporation,). Screening and Selection of recombinants. (Insertional inactivation, blue-white selection, Direct selection), Hybridization techniques -Colony hybridization. Blotting techniques -Southern, Northern and Western.

(15L)

UNIT II

Genomic library, DNA probe, cloning vectors: Plasmids – types, characteristic features, properties of an ideal gene cloning vector. Plasmid vector ($_{p}$BR 322,, Ti plasmid), Bacteriophage vector (Lambda phage and M13), Cosmid, Animal Viral Vector (SV40); Yeast artificial chromosome, Transposons as vectors. Gene Amplification through PCR.

(15L)

UNIT III

Animal cell and Tissue culture: Requirements for animal cell culture laboratory, substrate, liquid media and gases; Maintenance of aseptic condition, Isolation of Explant, culture of Explant, disaggregation of Explants. Primary culture, secondary culture, subculture, prevention of contamination storage of animal cells (cryopreservation) Large scale culture – (Mono layer culture), Bioreactors – (CSTB and Air lift Bioreactor), Organ Culture: Techniques, advantages, applications Artificial Skin & Cartilage. Stem cell culture. Hybridoma technology / Monoclonal antibody production.

(16L)

UNIT IV

Transgenic animal technology – Introduction, Methods of trans genesis (Any 3 methods)- Dolly.

Gene therapy – Definition, Classification, . Enzyme technology: Definition, Production of βGalactosidase enzyme, Enzyme immobilization and their application.

Bioethics: Intellectual property right, patenting of Biotech products. Bio safety.

(14L)

UNIT V

Applied Biotechnology

Biotechnological methods of Sewage Water treatment – primary, secondary and tertiary treatment.
Bioremediation: Definition, types, Role of genetically engineered organisms in bioremediation (Super bug) Biofuel: - Ethanol.
Aqua culture technology: - DOT-ELISA
Human Genome Project- DNA finger printing techniques and its application in forensic medicine.
Microarrays- Biochip- Bioweapons.

(15L)

(TOTAL: 75L)

REFERENCE BOOKS: Animal Biotechnology

Prof.V. Kumaresan,"Animal Biotechnology", Saras Publication, A.R.P. Camp Road, Periavilai, Kottar P.O., Nagercoil, K.K.Dist., - 629002.

Kumar H.D." A text book of Biotechnology, Affiliated East – West Press(P) Ltd., NewDelhi.

Animal Biotechnology,2006,R .Sasidhara, MJP Publishers, Chennai.

Dubey R.C "A text book of Biotechnology" S.Chand& Co., Ltd., NewDelhi

PRACTICALVIII- EVOLUTION AND ANIMAL BIOTECHNOLOGY

2Hrs/ Week **Credits 2**

EVOLUTION

Gene Frequency : Hardy -Weinberg law- Probability Experiment.
Museum Specimens, Slides, Models and Charts.
Animals of evolutionary significance: Peripatus, Archeopteryx, Limulus.
Colouration and Mimicry- Lycodon and Krait; Stick insect, Leaf insect.
Mutation-Peppered Moth, Ancon Sheep
Variations : Variation in finger prints

ANIMAL BIOTECHNOLOGY

Isolation of genomic DNA –Demonstration.
Isolation of plasmid –Demonstration
Protoplast preparation and fusion –Demonstration
Estimation of Co_2in any three effluent / sewage water samples –(Individual)
Isolation of Protein by PAGE –Demonstration.

Models / Charts / Photos: PBR 322, PUC 8, Ti plasmid, Lambda Phage, SV40, , Restriction enzyme, recombinant DNA, Gene cloning, Electroporation, Microinjection, , Southern blotting, Monoclonal antibody, Stem cells, Dolly- Trans genesis,- Animal cloning- Organ culture,-Anaerobic Digester,Fermentor.

SEMESTER VI

CORE PAPER: 6.3

BIOSTATISTICS, COMPUTER APPLICATIONS AND BIOINFORMATICS

5 Hrs / Week **Credits-4**

OBJECTIVES:

To study the descriptive and non- descriptive methods of Mathematics and their applications in biology incorporating computer system.

OUTCOME:

To understand the Mathematical principles of Biological systems and Bioinformatics

UNIT I

Definition and Scope- Data: Types & Collection; Sampling methods – Variables – Discrete and continuous; Presentation of Data - Classification and Tabulation- Parts of the table. Diagrams and Graphs: Line diagram, Bar Diagram, Pie Diagram, Histogram, Frequency Polygon, Frequency Poly Curve. Measures of Central Tendency: Calculation of Mean, Mode and Median (Grouped and Ungrouped Data)

(15L)

UNIT II

Measures of Dispersion: Variance - Range -Standard Deviation and Standard Error, Co-efficient of variation. Chi – Square test – Calculation and application, Students' t- test.
Correlation: Introduction , Types , Perfect positive and negative, Linear and Non-Linear methods Scatter diagram, Karl Pearson's Correlation Co-efficient ; Interpretation of the Correlation-Co-efficient.

(14L)

UNIT III

Introduction to Computer, Generation of Computer – Components of Computer, Input devices and Output devices – CPU – Primary and Secondary Memory operating system. Introduction to M.S- Office software, covering, word processing, spread sheet and presentation software. MS Word basics : Creating word document – File, edit, Format, Save menus, adding bullets, numbering and symbols – printing. MS Excel – entering and editing cell entries – adjusting row and column height – Pie, bar and line chart preparation. Uses of Internet – Email, Internet Browsing, World Wide Web(WWW), MS Power point.

(16L)

UNIT IV

Bioinformatics : Introduction – Definition of Bioinformatics – History – Importance of Bioinformatics – Scope and application of Bioinformatics – Components of Bioinformatics - Bioinformatics in life science. Biological sequence analysis – Sequence alignment – Pair wise sequence comparison – multiple sequence alignment.

(15L)

UNIT V

Major Data bases in Bioinformatics – Nucleic acid sequence databases – EMBL – Genbank – Protein sequence database – SWISS – PROT .

Databases similarity search Tools: BLAST- FASTA – Application of Bioinformatics tools. Database Retrieval Tools: ENTREZ – Locus link – Pub Med (Publishers on Medicine) SRS . Protein structure visualizing tools – RasMol, Swiss- PDB viewer.

(15L)

(TOTAL: 75L)

REFERENCE BOOKS:

BIO STATISTICS

1. Arora and Mathan. Bio Statistics (5th Edition). Himalaya Publishing House, Ramdoot, Dr.BhaleraoMarg,Girgaon,Mumbai – 400004.
2. Daha, T.K. Biostatitics in Theory and Practics. EMKAY Publications, Post Box No.9410, B-19, East Akrishna Nagar, Swami Dayanand Marg, Delhi-110051.
3. Gurumani. N, An Introduction to Biostatistics (computer Application included) 2nd Edition M.J.P. Publishers, Tamilnadu Book House, 47 Nallathambistreet,Triplicane- 600 005.
4. Jasra, P.K. and Gurdeef Raj. Biostatistics, Krishna Prakashan Media(P) Limited, 11, Shivahi Road, Meerut – 250001
5. Parihar and Parihar. Biostatistics and biometry, Student Edition, Agrobios(India) Behind NasraniCinema,Chopasani Road,Hodhpur-342002.
6. Pranab Kumar Banergee. Introduction to Biostatistics (2nd Edition). S. chand& Company Limited, 7361, Ram nager,New Delhi-110055
7. Prasad, S. Elementa of Biostatistics. Rastogi Publications, Gangotri, ShivajiRoad, Meerut 250002.
8. Satguru Prasad – Fundamentals of Biostatistics (Biometry). EMKAY Publication,Post Box No.9410 B-19, East Akrishna Nagar, Swami Dayanand Marg, Delhi-110051.
9. Pagano, M. and K. Gauvreau. Principles of Biostatistics. Thomas Learning,Alps Building,1st floor,56,Janpath,NewDelhi.
10. Satgurau Prasad, Elements of Biostatistics, Rastogi Publications Gangotri,Shivaji Road, Meerut 250002.

COMPUTER APPLICATIONS:

- Krishnamoorthy, R. Computer Programming andapplications.
- Rajaram, V. Fundamentals of computers.

BIOINFORMATICS:

1. Bal, H.P. Bioinformatics principles and Applications, Tata Mc Graw Hill Publishing company Limited, No. 444/1 Sri EkambaraNaicker Industrial Estate, Alkapakkam, Porur, Chennai – 600116
2. Dan, E. Krane and Michael L. Raymer.Fundamental concepts of Bioinformatics. Pearson Education (Singapore) PTE Limited, Indian Branch, 482 FIE Patparganj,Delhi-110 092.
3. Ignacimuthu, S. Basic Bioinformatics. Narosa Publishing House Private Limited,35- 36 Greams Road, Thousand Lights, Chennai-600006
4. Ranga, M.M. Bioinformatics, Agrobios (India) Behind Nasranicinema,Chopasani Road, Hodhpur – 342002.
5. C.S.V. Murthy Bioinformatics-

PRACTICAL IX
BIOSTATISTICS, COMPUTER APPLICATIONS AND BIOINFORMATICS

2Hrs/ Week **Credits1**

1. Find out Mean, Median, Mode, Standard deviation, Standard error and Co-efficient of variance using Neem leaf.
2. Calculation of correlation.
3. Bar diagram, Histogram, Pie diagram and Frequency curve.
4. Models, Chart and Photos: Computer Mouse, CPU, Keyboard, Monitor.
5. Visit to a Computer centre to learn internet browsing and email sending – Compulsory for each student.
6. Take printout from NCBI, EMBL and PubMed and keep it for spot tests..
7. Write some of the file commands and keep for spot tests.

SEMESTER VI

MAJOR ELECTIVE
(Any One)
ELECTIVE PAPER: 6.4A -SERICULTURE

5Hrs/Week **Credits-4**

OBJECTIVES:

To explore the scope for students adopting Sericulture as a vocation after their graduation as it is rural based and welfare oriented agro based industry.

OUTCOME:

Students learned how to rear, maintain the silk wormsscientifically and know the reeling of silk.

UNIT I

Importance of Sericulture: Sericulture industry in India- Sericulture as cottage industry, role of Central Silk Board, Moriculture: Morphology of Mulberry plant- High yielding varieties – methods of propagation- irrigation. Manuring: Biofertilizers – Green manuring – Triacontanol for increased mulberry productivity – Seriboost. Pruning- Harvesting and storing of mulberry leaves- Package of practices for mulberry cultivation. **(15L)**

UNIT II

Diseases of mulberry: Fungal diseases – fungal root diseases, fungal shoot diseases; Bacterial diseases – leaf blight disease, rot disease; Viral diseases – mulberry leaf mosaic disease, dawn disease; Neamatode diseases: root knot disease; Deficiency diseases: nitrogen deficiency, phosphorus deficiency, potassium deficiency, magnesium deficiency and calcium deficiency diseases; Pests of mulberry – leaf eating insect pests and borer pests one example each.
(15L)

UNIT III

Silkworm: Classification of Mulberry silkworm- habit and habitats; Voltinism- races of silkworms; Life cycle- Structure of egg- larva- pupa and adult- Sexual dimorphism. Digestive system- circulatory system- excretory system- respiratory system, nervous system and reproductive system, endocrine glands - other glands of Silkworm.
(15L)

UNIT IV

Rearing of Silkworm: Rearing house – Rearing appliances. Rearing operation: Disinfection – Brushing – Maintenance of optimum conditions, Feeding – Bed cleaning – Spacing. Methods of Rearing; Young age worms – Chawki rearing - Rearing of late age larva-Types;Shelf rearing. Floor rearing, Shoot rearing- Application of Sampoorna. Mounting: Mountages- Methods – Precautions. Cocoon marketing: Characteristics of cocoon – defective cocoons – methods of harvesting.
(15L)

UNIT V

Diseases of silkworms; Protozoan diseaes – Pebrine; Viral diseases – Flacherie, Gattine, Grasserie; Bacterial diseases – Flacherie, Septicemia, Sotto, Court, Fungal diseases – Muscardine. Pests: Uzy fly, Dermestid beetle of silkworm. Silk reeling: Cocoon stifling – types- storage of stifled cocoons- sorting- cocoon boiling and deflossing – brushing, Process of reeling: Different methods- silk waste and byproducts of silk reeling- Raw silk and marketing.

(15L)

(TOTAL: 75L)

REFERENCE BOOKS:

1. Ganga, G. and I. Sulochana Chetty, An introduction to Sericulture. Oxford & IBH Publishing Company Private Limited, S -155,Panchshila Park, New Delhi.
2. Ganga,G. Comprehensive Sericulture, Volume – 2 Silkworm Rearing and Silk Realing. Oxford & IBH Publishing Company Private Limited, S -155, Panchshila Park,New Delhi.
3. Dandin, S.B, Jayant Jayaswal and K. Giridhas, Hand Book of Sericultural Technologies, Central Silk Board, Madivala, Bangalore –68.
4. Kamile Afifa. S and Masoodi M. Amin, Principles of Temperate Sericulture,Kalyani Publishers, B – 1/1292,Rajinder Nagar, Ludhians.

   Kesary, M and M.Johnson, Sericulture, Department of Zoology, N.M.. Christian College, Marthandam

PRACTICALS:

1. Dissection of silk glands, digestive and nervous systems.
2. Dissection of male and female reproductive system.
3. Selection of mulberry leaves according to different stages.
4. Life history – egg, larva, pupa and adult.
5. Sexual dimorphism in larva, pupa and adult.
6. Mulberry varieties such as MR2, S30, S36,V2.
7. Chandrika.
8. Rearing tray and rearing stand.
9. Raw silk.
10. Report on field visit to Sericulture farm/ unit.

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SEMESTER VI
MAJOR ELECTIVE
ELECTIVE PAPER: 6.4B -ECONOMIC ENTOMOLOGY
5Hrs/Week **Credits-4**

OBJECTIVES:

To understand the role of insects in the ecosystem and their beneficial and harmful impacts on the society and plants.

OUTCOME

Students learned about the beneficial and harmful insects.

UNIT I

Structure and salient features

Brief account of external morphology of head, thorax and abdomen; Classification and development (metamorphosis) of insects; Salient features (up to order) and economic important of Thysanura, Orthoptera, Odonata, Thysanoptera, Isoptera, Coleoptera, Lepidoptera, Hemiptera, Diptera, Hymenoptera, Dermaptera

(15L)

UNIT II

Productive insects

Sericulture- Types of Silkworm, Life cycle and rearing of mulberry silkworm, *Bombyxmori*; Economic importance of silkworms

Apiculture – Types of honey bees, Life cycle and culture methods, bee product and its economic importance

Lac culture – Lac insect, *Lacciferlacca*- Life cycle, Lac processing, Lac products and Economic importance.

(15L)

UNIT III

Beneficial insects

Biological control agents – Characters and different between parasitoids and predators (common Indian insects); General characters and beneficial role of scavengers, pollinators, weed killers; Medicinal and Aesthetic value of insects; Insect as human food (general account only)..

(15L)

UNIT IV

Insects of medical importance

General account on Personal Pests(Lice, Fleas, Bedbugs, Ticks, Scabies mites), Housefly, Cockroach, Biting insects(Mosquitoes, Biting Midges, Sand flies, Black flies, Horse flies, Stable flies).Major insect-born disease and their management; Recent development in Forensic entomology..

(15L)

UNIT V

Pest management

Components of Pest control – physical, mechanical, cultural, chemical and biological control; Pesticide applicators; Pesticide poisoning and first aids; Banned pesticides; General Principles, advantages and disadvantages of Integrated Pest Management; Recent advances in pest control – sterilization techniques, liquid vaporizers, pheromones, RNA interferences, kairomones.

(15L)

(TOTAL: 75L)

REFERENCES BOOKS

1. Abhishek Shkula, 2009. A Handbook on Economic Entomology, Daya Publishing House, India
2. Ganga, G. &SulochanaChetty, J. 1997. An introduction to Sericulture. Oxford & IBH Publ. Co. pvt. Ltd., India.
3. David,B.V.& Ramamurthy, V.V. 2016. Elements of Economic Entomology, 8th Edition, Brillion Publishing, India.

PRACTICALS:

1. Head sclerites, thoracic segments, abdominal segments of cockroach
2. Types of antennae. Filiform, Moniliform, Aristate, Capitate, Clavate, Clubbed, Plumose, Pilose, Pectinate, Bipectinate, Setaceous and Geniculate, Lamellate, Serrate. (Any two mountings and rest for study with photo/permanent slides) (Preferablypests)
3. Halter and wings of housefly
4. Types of legs- Typical, Cursorial, Fossorial, Saltatory, Natatorial and Scansorial (Mountings of any two and rest for study with photo/permanentslides).
5. Abdominal appendages- styles, cerci of cockroach.
6. Mouthparts of Cockroach.
7. Malpighian tubules (Cockroach).
8. Collection, preservationanddisplayof5insecttypes (collection and preservation of insects other than pests be discouraged).
9. Common Insecticide formulations (display of samples).
10. Field visit / Assignment / Play and ponder. Give actual handling of bees/ silk moth / lac insect or visit to any one of these units.

SEMESTER VI
MAJOR ELECTIVE
ELECTIVE PAPER: 6.4 C- DAIRY FARMING

5 Hrs/Week **Credits-4**

OBJECTIVES:

To introduce various breeds of Indian cows

To describe construction, maintenance of sheds and also introduce the growing and maintenance of dairy animals

To describe how to prevent and manage various diseases of airy animals

OUTCOME :

Students learned about selection, growing and maintenance of dairy animals

UNIT I

Importance of the study: Live stock in India – Live stock reproduction – Organs – Fertilization – Artificial Insemination – Inheritance – Hybrids – Hybrid Vigor – Grading – Pure breeds – Inbreeding. **(15L)**

UNIT II

Nutrition – Nutritive values of common feeds – Commercial and mixed feeds – Balance ration.

(15L)

UNIT III

Dairy animals – Cattle – Cow – Buffaloes – Goat – Their economic importance – Productivity.

(15L)

UNIT IV

Live stock diseases – Common parasites in India – Treatment.

(15L)

UNIT V

Marketing the dairy products – Milk and other dairy products – Nutritive values of fresh and preserved products – Combating spoilage of milk – Souring – Gassy Curdling – Robiness – Sweet curdling – Pasteurization.

(15L)

(TOTAL:75L)

REFERENCE BOOKS:

1. Principles of Dairy Chemistry. Janness, Robert and Sturte Patton; WielyEastern.
2. Artificial Insemination in Farm animals: Perry Enos (Eds.) Oxford &IBH.
3. Breeding and Improvement of Farm animals: Rice, Victor, Arthur; Tata MCGraw Hill.
4. Livestock and Poultry Production: Singh, Herbans and Earl Moore; Prentice Hallin India.

PRACTICALS:

1. Visit to Pasteurization plant and reporting.
2. On the spot tests of pure milk – Specific gravity, total solids and adulteration of milk.
3. Demonstration of Dairy products – Cream, Butter, Ghee, Khoa, and Ice cream.
4. Identification of cattle diseases – Prevention and Cure-Method of taking temperature in cows.
5. Preparation of Cattle Feed-Balanced food – Identification of different feed plants.
6. Artificial Insemination – Common Surgical Instruments and their uses.
7. Periodical visit to a Good Dairy Farm and Reporting.

SEMESTER VI

MAJOR ELECTIVE (GROUP B)
(ANY ONE)
ELECTIVE PAPER: 6.5A -APICULTURE

4 Hrs. / Week **Credits-4**

OBJECTIVES:

To examine the scope for self employment opportunities after their graduation account of the rural based and welfare oriented nature of this vocation.

OUTCOME:

Students learned about selection, rearing and maintenance of apiary.

UNIT I

Definition, Scope, Classification of bees, Rock bee, Indian bee, Little bee and Dammer bee- their identification and habits, choice of species in Apiculture.

Bee colony-Distinctive features, Identification and Functions of queen, drones and workers, Structure and functions of Legs, mouth parts and sting of worker bee.

Development of Honey bee-egg, larva and pupa- time taken for the development of queen, drone and worker. Food of the bee- honey and pollen-royal jelly.

Artificial feeding. Behaviour of bees-dances.

(12L)

UNIT II

Principles of Apiculture: Arranging an Apiary- position-space- direction- acquiring bees-care of newly captured colonies-handling the bees.

Bee keeping: Primitive methods and their advantages and disadvantages.

Different types of Modern hives – Architecture - Parts of artificial hive and its advantages – other appliances used in apiaries.

The bee comb and its architecture-Different kinds of cells-Burr comb.

(12L)

UNIT III

Honey bee products:

Honey- Collection and Extraction, Preservation and storage –Physical properties, Chemical composition, nutritive value, medicinal values-honey as daily food.

Bee wax- Production - method of extraction-characteristics and uses.

Bee venom-method of collection - composition of venom- its uses.

(12L)

UNIT IV

Enemies of bees-Greater wax moth, lesser wax moth, ants, wasps, lice, beetles, birds and their management.

Diseases of bees-adult and brood diseases- Bacterial, Fungal, Viral & Protozoan- Prevention and Control measures.

(12L)

UNIT V

Swarming-Prevention and control.

Robbing and Fighting-Prevention and control. Uniting stocks-Different methods. Queen rearing.

Supersedure.

Foraging, inter-relationships of plants and bees.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS:

1. Mishra,R.C. and R. Garg. Perspectives in Indian Apiculture. Agrobios (India)behind Nasrani Cinema, Chopasani Road, Jodhpur-342002.
2. Abrol,D.P. Bee Keeping in India. Kalyani Publishers, B-1/1292, Rajinder Nagar,Ludhiana-141 008.
3. Cherian, M.C. and Ramachandran. Bee Keeping in SouthIndia.
4. Philips, E.F. Bee Keeping,Agrobios (India) behind NasraniCinema,Chopasani Road,Jodhpur-342 002.
5. Sadar Singh, Bee Keeping in India KarDelhi.
6. Sharma P.L and Singh, S.(controller) Hand Book of bee Keeping, printingandStationery,Chandigarh.
7. Webb,A. Bee Keeping for profit and Pleasure, Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodhpur-342002

PRACTICALS

1. Mountings of Legs, mouth parts and sting.
2. Specimen, Model, Slide and Appliances
   Queen, worker, Drone, Artificial hive, Queen excluder, smoker, honey extractor, honey, Bee comb and Comb foundation sheet.
3. Report on field visit to Apiary farm/ unit.

SEMESTER VI
MAJOR ELECTIVE
ELECTIVE PAPER: 6.5B - FOOD AND FOOD PROCESSINGTECHNOLOGY
4Hrs/ week **Credits-4**

OBJECTIVES:

To understand the physical and chemical properties of food stuff, the methods of preparation of palatable diets and the techniques employed to increase their shelf – life.

OUTCOME

Understood various value added food products and their marketing strategies

UNIT I: FOOD CHEMISTRY

Food chemistry: Definition and importance, water in food, water activity and shelf life of food. Carbohydrates: Chemical reactions, functional properties of sugars and polysaccharides in foods. Lipids: Classification and use of lipids in foods, physical and chemical properties, effects of processing on functional properties and nutritive value. Protein and amino acids: physical and chemical properties, distribution, amount and functions of proteins in foods, functional properties. Effects of processing- Losses of vitamins and minerals due to processing. Pigments in food, food flavours, browning reaction in foods. Enzymes in foods and food industry, Bio-deterioration of foods, food contaminants, additives and toxicants.

(12L)

UNIT II: PRINCIPLES OF FOODPROCESSING

Scope and importance food processing – National and International perspectives.

Principles and methods of food preservation – freezing, heating, dehydration, canning, additives, fermentation, irradiation, extrusion cooking, hydrostatic pressure-cooking, dielectric heating, microwave processing, aseptic processing, hurdle technology.

Storage of food, modified atmosphere packaging. Refrigeration , freezing and drying of food, Minimal processing, Radiation processing.

(12L)

UNIT III: MILK PROCESSING TECHNOLOGY

Definition of milk, composition, physical and chemical properties of milk Constituents and nutritive value of milk, Factors affecting composition of milk, Types of milk.Fluid Milk Processing. Receiving, Filtration Clarification, Straining, Standardization, Homogenization and its Effects, Pasteurization and various systems of pasteurization ; LTLT, HTST , UHT methods, Pasteurizes(Heating and Cooling systems ,Flow controller regenerator,Flow division valve) sterilization, packaging of fluid milk. Coagulated Milk Products.

Channa, Paneer, Classification and manufacturing process of cheese, butter and ghee and its storage.

Condensed Milk - Types and factors affecting the quality of Condensed Milk , Storage of condensed milk - Methods of drying milk.(Drum and Spray drying) factors affecting the quality of dry milk. Introduction to instant non-fat dry milk, packaging of dry milk products.

(12L)

UNIT IV: FRUITS AND VEGETABLESTECHNOLOGY

Cleaning, sorting, grading, peeling, and blanching methods and their Equipments, Ingredients and Processes for the manufactures of jam, jellies, marmalade, preserves, pickles and chutneys. Defects and factors affecting the quality of above. Thermal Processing of Fruits and Vegetables: History, definition, various techniques of thermal processing and their effects on the quality of fruits and vegetable products, thermal process time, introduction to concept of thermal process calculations, types of containers and their selection, spoilage of canned food. Dehydration of fruits and vegetables, equipment and process for dehydration of plums, apricot, apple, fig, grapes, peach, cauliflower, potato, mushroom, tomato. Freezing process of selected fruits and vegetables: Peas, beans, cauliflower, apricot and mushroom.

(12L)

UNIT V : TECHNOLOGY OF MEAT,FISH AND POULTRY PRODUCTS

Slaughter of meat animals, different cuts of lamb and their uses, post-mortem inspection – post mortem changes- Loss of homeostasis, post-mortem glycolysis and pH decline, Rigor mortis. Preparatory operations of meats and meat products: Abattior- definition and construction, Basic preparatory procedures (commintion, emulsification, preblending). Cured and smoked meats, sausage products- classifications, processing steps and canned meat, meat pickles.

Handling and Dressing of poultry: Inspection of poultry birds, dressing and preparation of ready to cook poultry, factors affecting the quality- Egg and Egg products- structure, chemical composition and nutritive value, spoilage of eggs and preservation of whole eggs and egg products, preparation of egg powder. Fish and fish products: Types of fish, composition and nutritive value, judging and freshness of fish, fish grading and cooking of fish, smoking, pickling, salting and dehydration , preservation of fish and processed fish products. Frozen storage of fresh and processed meat, fish and poultry. Byproducts of fresh and processed meat, fish, poultry and egg industry.

(12 L)

(TOTAL: 60L)

REFERENCE BOOKS:

1. Food processing and nutrition – Bender A.E. – 1978 Academic Press, London.
2. Food processing technology: Principles and Practices. Fellows, P. and Ellis, A.1990,New York.
3. Introduction to food processing – Jelen,P.-1985.Prentice Hall, Reston Virginia, USA.
4. Food Chemistry – Awrand. W andWoods, A.E.1973.AVI,Westport.
5. Food Chemistry – Meyer, L.H.-1973.East West Press Pvt. Ltd, New Delhi.
6. Outlines of Dietary technology –Woarnes.
7. Preservation of fruits and Vegetables – Vijayakhaderkalyani.
8. Preservation of fruits and Vegetables Srivastava, IBD Co. Lucknow.
9. Fish Preservation – S.K. Kulsherestha.
10. Fish Processing and Preservation –C.L.Cutting.
11. Processed Meat- Pearson and Glite – CBS publishes.
12. Poultry, Meat and Egg Products – Parkursht and Mountney.CBS Publishers

PRACTICALS:

1. Determination of Protein, Starch, Sugar, Amino acids, Crude fibers, Total minerals, Crude fat in food stuff.
2. Estimation of Vitamins – Ascorbic acid, Thiamine.
3. Browning reaction in food, Analysis of lipid-saponification value, acid value & Iodine Value.
4. Determination of Tannins-chemical residues and Aflatoxins, Estimation of Preservative and Antioxidants.
5. Platform test of Milk.
6. Determination of SNF, Specific gravity and total solids of milk.
7. Determination of moisture and fat content of milk powder.
8. Determination of adulterants in milk like Water, Urea, Neutralizes, Preservatives and Starch.
9. Preparation of Channa and Paneer.
10. Preparation of different types of milk products and their evaluations.
11. Preparation of fish, Meat, Egg and Vegetable pickles –Demonstration.
12. Estimation of iron sulphide formation in cooked egg.
13. Visit to a Dairy Unit, Different fruit and vegetables processing unit, Slaughter house and observation of different types of cuts made and demonstration of slaughtering, fish processing unit and submit are port.
14. Equipmentsand appliances used in various food processing industries-observation.

SEMESTER VI
MAJOR ELECTIVE
ELECTIVE PAPER: 6.5C – POULTRYSCIENCE

4Hrs/Week **Credits 4**

OBJECTIVES:

To introduce various breeds of chicks, layers and broilers

To describe construction, maintenance of poultry keeping and also introduce the rearing and maintenance of poultry

To describe how to prevent and manage various diseases of poultry

OUTCOME :

Students can get self employed after their graduation. To know about poultry farming and to get deep knowledge about poultry manure, nutrition and various diseases

UNIT I

Poultry industry in India – a brief introduction.

Choosing a commercial laying stock –sexing in one day old chicks. Poultry housing – General principles of building poultry house.

Deep litter system – Droppings pit – Feeders , Waters – Nest boxes. Laying cages – Californian cages – Management of cage birds.

(12L)

UNIT II

Poultry manure – Volume, Composition and values.

Nutritional content of eggs.

Management of Chicks, Growers, Layers and Broilers.

Lighting for Chicks, Growers, Layers and Broilers.

Summer and winter management.

Debeaking.

Forced moulting.

(12L)

UNIT III

Poultry nutrition : Protein and Amino acid requirements for chicks , growers ,layers and broilers – Symptoms of excessive dietary levels and deficiency.

Carbohydrates and Fat requirements for Chicks, Growers, Layers and Broilers– Symptoms of excessive dietary levels and deficiency.

Fibre requirement for poultry feeds.

Requirements of vitamins and inorganic minerals for Chicks, Growers and Layers – Deficiency Symptoms.

(12L)

UNIT IV

Importance of feed additives in a poultry feed.

Preparation of supplementary feed for poultry- South Indian feed ingredients in relation to M.E level, Protein level, Amino acid, Minerals (Ca & P) and Fiber content.

(12L)

UNIT V

Poltry diseases – Causes, Symptoms, Transmission, Treatment, Prevention and Control of the following diseases : Viral diseases - Ranikhit disease, Fowl pox,. Bronchitis and Gumboro disease.Infection and control; Bacterial diseases – Fowl typhoid, Paratyphoid, Pullorum, Fowlcholera, Coryza and Mycoplasmosis; Fungal diseases – Aspergillosis and Aflatoxicosis; Parasitic disease- Coccidiosis. Nematode infections- Tape worm infections; External parasites of chicks – ticks, mites and lice.

(12L)

(TOTAL: 60L)

REFERENCES :

- Poultry keeping – M.R. Gnanamani
- The Rearing of pullets – Bulletin No. 54, Her majesty‟s stationary office, London
- Intensive Poultry management for egg production. Bulleting No. 152. Her majesty „s stationary office ,London.
- Nutrition of Chicken - M.L Scott et al.,
  Disease of Poultry – Biester Oxford &IBH , Himalaya Publishing House

PRACTICALS :

1. Identification of Ectoparasites of poultry studied in the theory.
2. Identification of Endoparasites.
3. Feeders – Different types.
4. Waterers – Different types.
5. Cage house –Model
6. New Castle disease, Fowl pox, Coryza, Coccidiosis - Diagrams or models
7. Debeaking
8. Visit to a Poultry farm and reporting.

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ALLIED ZOOLOGY
&
INDUSTRIAL FISH AND FISHERIES- ALLIED: 2020 -2021 ONWARDS

ALLIED SUBJECTS FOR I/ II YEAR B.SC SCIENCE MAJOR OTHER THAN ZOOLOGY STUDENTS

SYLLABUS FOR ALLIED ZOOLOGY

Under Choice Based Credit system (CBCS)

(For the candidates admitted to the course in the academic year 2020 – 2021 onwards)

SEMESTER – I / III

PAPER 1: CELL BIOLOGY, GENETICS AND BIOTECHNOLOGY

4Hrs/Week **Credits – 3**

OBJECTIVES:

To elucidate the structure and functions of the cell organelles; to exemplify the concept of genetics, the principles of inheritance and the role of genes in determining characters; to understand the application of the innovative technology to manipulate living organisms or parts of organisms to make products useful to human.

CELL BIOLOGY

UNIT I

Ultra structure and functions of (a) Plasma membrane (b) Mitochondria (c) Nucleus. Chromosomes – Structure, types and functions; Giant Chromosomes (Polytene and Lampbrush Chromosomes)

(12L)

UNIT II

DNA: Structure (Watson and Crick Model)- Replication.

RNA: Different types – r RNA – mRNA – tRNA; Protein synthesis.

Cancer cells and Carcinogenesis – Definition, Types, Causes, Properties, Diagnosis and Treatment.

(12L)

GENETICS

UNIT III

Simple Mendelian traits in man; Multiple alleles – ABO blood groups in man – problems. Rh-factor in human – Erythroblastosis foetalis. Multiple gene inheritance.

(12L)

UNIT IV

Sex determination in man; Sex linked inheritance in man – Haemophilia, Colour blindness and Hypertrichosis.

Non disjunction and Syndromes in man – Klinefelter's syndrome, Turner's syndrome and Down's syndrome.

Inborn Errors of Metabolism in man – Phenylketonuria, Alkaptanuria and Albinism.

(12L)

BIOTECHNOLOGY

UNIT V

Definition, scope and importance of Biotechnology, Basic concepts of genetic engineering. Restriction and modification system – Cloning vectors – (Plasmids, pBR 322, Lambda phage) Introduction of cloned genes into host cells – Transgenesis – Transgenic animals and its application.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS:

CELL BIOLOGY

1. Ambrose, E.J & Dorothy, M.E: Cell Biology (ELBS CAMLOTPRESS)
2. De Robertis& De Robertis: Cell & Molecular Biology. (W.B. Saunders &co, Philadelphia).
3. De Robertis, E.D.P, Nowinski, W.N &Saez, F.A : Cell Biology (W.B. Saunders &co, Philadelphia).
4. Dupraw, EJ : Cell & Molecular Biology (Academic Press, NewYork)
5. Dyson, R.D :Essentials of Cell Biology (Allyn &BaconInc. Boston). Giese.A.C: Cell Physiology (W.B. Saunders &co,Philadelphia).

GENETICS

1. Strickberger : Genetics(MacMillan).
2. Farnsworth : Genetics (harper andRow).
3. P.K.Gupta: Genetics (RastogiPublications)
4. P.S. Verma and Agarwal: Genetics (S.Chand&Co.Ltd.)
5. Altonburg,E: Genetics (Oxford & IBH publishing company)
6. Burns G.W.: The Science of Genetics (MacMillan)
7. A.C.Pai: Foundations of Genetics (Mc Gaw –Hill)

BIOTECHNOLOGY

1. Prof.V. Kumaresan,"Animal Biotechnology", Saras Publication, A.R.P. Camp Road, Periavilai, Kottar P.O.,Nagercoil, K.K.Dist., - 629002.
2. Kumar H.D." A text book of Biotechnology,Affiliated East – West Press(P) Ltd., NewDelhi.
3. Animal Biotechnology,2006,R.Sasidhara,MJPPublishers,Chennai.
4. Dubey R.C "A text book of Biotechnology"S.Chand& Co.,Ltd.,NewDelhi.

SEMESTER - I/ III
(ALLIED ZOOLOGY PRACTICALS)
PRACTICAL I
CELL BIOLOGY, GENETICS AND BIOTECHNOLOGY

2Hrs/week **Credits 1**

- Mounting of Giant Chromosome in Chironomous larva (or)Squash preparation of mitotic stages in onion root tip cells.
- Observation of Simple Mendelian Triats among the students.
- **Study of the following through Charts, Slides and Figures:**
  Mitochondria, Interphase Nucleus, DNA, tRNA, ABO Blood group.
  Colour Blindness, Haemophilia, Klinefelter's syndrome, Down's syndrome.
  pBR 322, Lambda Phage, Recombinant DNA.

SEMESTER- II/ IV
ALLIED ZOOLOGY
PAPER II
DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY AND EVOLUTION

4Hrs/Week **Credits-3**

OBJECTIVES:
To understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms. To study the interaction and the interdependence among environmental factors and living organisms; To understand the functional significance of various organs and organ systems of animals. To discern the evolutionary significance of the animals, origin of species, effects of mutation.

UNIT I

Early development in Man: Structure of sperm and ovum; Fertilization – Cleavage, Morula, Blastocyst, Implantation and Gastrulation – Fate map. Placenta in mammals – types and functions. Test tube babies – Twins – Amniocentesis.
Nuclear Transplantation in Acetabularia.
(13L)

UNIT II

Abiotic factors: Biological effects of Temperature and Light; Biotic factors: Symbiosis, Commensalism, Mutualism, Parasitism, Prey- Predator Relationship; Adaptations: Desert adaptations; Community: Ecosystem – Structure and dynamics of a pond.
(13L)

UNIT III

Nutrition: Food constituents – Carbohydrates, Proteins and Fats. Digestion: Role of enzymes in carbohydrate, protein and fat digestion. Absorption: Absorption of digested food.
Metabolism: Carbohydrate metabolism: Glycogenesis, Glycogenolysis, Glycolysis. Respiration: Transport and exchange of Oxygen and Carbon-di-oxide.Haemoglobin.
(13L)

UNIT IV

Excretion: Structure of Nephron – Urine formation – Dialysis; Nervous Co-ordination: Structure and types of neurons – Nerve impulse, conduction of nerve impulse through neuron and synapse; Reproduction: Structure of human testis and ovary, Graafian follicle, Menstrual cycle and its hormonal control.
(13L)

UNIT V

Theories of Evolution: Darwinism, Mutation theory of De Vries. Adaptive radiation in birds. Mimicry and Colouration.
(8L)

(TOTAL: 60L)

REFERENCE BOOK:

Developmental Zoology

1. Arora, M.P. Embryology. Himalaya Publishing House,Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai- 400 004.
2. Arumugom, N. Developmental Biology, Saras Publication, 114/35G,A.R.P camp Road, Nagercoil.

Ecology:

1. Agrawal. A.k. Ecology and environmental biology, student edition agrobios (india), behind nasrani cinema. Chopasani road. Jodhpur-342 002
2. Odum, E.P. Fundementals of Ecology International Student Edition W.B. Sounders Company, Philadelphia, London.

Animal Physiology:

1. Agarwal, R.A., A.K. Srivastava and Kaushal Kumar. Animal Physiology and Biochemistry (3rd Edition). S. Chand & Company Limited, 7361 Ram Nagar, New Delhi-110 055.
2. Arora,M.P Animal Physiology (6th Edition). Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai 400 004.

Evolution:

1. Arora, M.P. Evolutionary Biology. Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai 400 004.
2. Tomar, B.S. and S.P. Singh. Evolutionary Biology. Rastogi Publications, Gangotri, Shivaji Road, Meerut-250 002.

SEMESTER -II/ IV

ALLIED ZOOLOGY PRACTICALS
PRACTICAL II
DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY AND EVOLUTION.

2Hrs/Week **Credits 1**

1. Mounting and observation of live sperms of a vertebrate.
2. Estimation of dissolved oxygen in two water sample and discuss the result
3. Qualitative test for glucose, protein and lipid.
4. Effect of temperature on the opercular movement of fish; Calculation of Q_{10}.
5. Museum specimens, slides, models and charts:

Developmental Zoology: Human sperm, Human ovum, Cleavage, Diffuse Placenta, Zonary Placenta, Discoidal placenta,Cotyledonary Placenta (any two).

Ecology: Identification of any two planktons- either Fresh water (or) marine samples.
Echeneis and Shark, Hermit crab and Sea anemone, Sacculina, Secchi disc.

Animal Physiology: Intestinal villi, Nephron, Heart of mammal.
Evolution: Ancon sheep.

Allied Practical Examination at the end of each Semester

ALLIED SUBJECT FOR I YEAR B.SC ZOOLOGY MAJOR STUDENTS FROM THE YEAR 2020 – 2021 ONWARDS

INDUSTRIAL FISH AND FISHERIES – ALLIED

SEMESTER I /III

PAPER 1: BIOLOGY OF FISH

4 Hrs/Week **Credits-3**

OBJECTIVES:

To help the students taking Industrial Fish and Fisheries as a subject to have a thorough knowledge of the various aspects of the Biology of Fish

OUTCOME:

To understand the marketing of fishes and fishery products.

UNIT I

Introduction: Fish Biology – Definition and basic concepts of biosystematics. Importance of classification – Theories of biological classification. Variations in structure, Form, Skin, Coloration, Scales, Mouth, Jaws, Teeth, Fins, Spines and other structures used in taxonomic studies. Induced breeding techniques – Hatching methods – Seed and Brood transport.

(12L)

UNIT II

Study of external morphology and internal organization of a typical Elasmobranch and Teleost.

Alimentary Canal and Associated Structures – Gills – Swim Bladder – Accessory Respiratory organs – Lateral line system – Sound and Light producing organs. Morphological and anatomical characters of Prawn, Crab, Lobster, Bivalve, Gastropod and Cephalopod (one example each)

(12L)

UNIT III

Natural food of fishes – Feeding habits in various groups of fresh water and marine fishes, Prawns, Crabs, Lobsters and Cephalopods. Qualitative and Quantitative estimation of food consumption based on experimental studies and stomach content analysis – Seasonal changes in food availability and food preference – Food and Feeding in relation to age – Food selectively – Feeding intensity. Nutrition of fishes and utilization of food, Feeding strategies and energies. Artificial feeding – Nutritional requirement.

(12L)

UNIT IV

Growth of fish – Absolute, Relative, Isometric and Allometric growth. The Cube Law – Methods for determination of growth – Length frequency analysis – Analysis of growth checks on hard parts like Scales, Otolith and Vertebrae – Estimation of growth by direct methods – Marking and tagging of fish for growth studies – Aging of fish and shell-fish based on length data and growth checks – Length weight relationships, Ponderal index, Relative condition factor and Gonado – Stomach index.

(12L)

UNIT V

Types of reproduction, Sex differences – Sexual maturity, Classification of maturity stages, Size at first maturity. Estimation of fecundity – Ova diameter frequency – Fecundity in relation to length, Weight, Age and food supply. Spawning habits – Factors affecting Spawning, Spawning seasons and frequency. Embryonic and early development – Types of egg and Larvae –

Metamorphosis of larva – Larval life and feeding habits. Reproductive behaviour and parental care – Social behaviour – Aggregation and Shoaling. Migrations – Anadromous and Catadromous.

(12L)

(TOTAL: 60L)

INDUSTRIAL FISH AND FISHERIES – ALLIED
SEMESTER I/III
PRACTICAL I- BIOLOGY OF FISH

2 Hrs/ Week **Credits 1**

PRACTICALS

1. Methods for Collection, Handling, Identification and Preservation of fish for taxonomic purposes.
2. Study of external morphology of fish. Specific identification of important fresh water and marine fishes, prawns, crabs, Bivalves and Cephalopods of India.
3. Identification of scales of fishes – Placoid, Cycloid and Ctenoid scales.
4. Study of food and feeding habits of fishes – Plankton feeder, Herbivore feeder, Carnivore feeder, Omnivore feeder, Detritus feeder. Study of Structural Adaptations for Diet.
5. Qualitative and Quantitative methods for Stomach content analysis.
6. Estimation of Oxygen, Carbon dioxide, Salinity content in water samples.
7. Plankton analysis in the water samples – any two.
8. Identification of Anadromous and Catadromous fishes.

REFERENCES

1. The Biology of Fishes, Kyle, H. M., T.F.H. Publication, Hong kong 366 P.
2. The Life of Fishes, Marshell,N.B.1965,Weidenfeld& Nicolson, London 402 P.
3. The Marine and Freshwater Fishes of Ceylon,Munro I.S.R,1982.Soni Reprints Agency, New Delhi 351 P.
4. Inland Fishes of India and Adjacent Countries., Vol I & Vol II,Talwar, P.K. and A.G.Jhingran,1991,Oxford & IBH Publishing Co PvtLtd.,New Delhi 1958 P.
5. Fisheries Ecology, Pitcher, T.J. & P.J.E. Hart,1992,Room Helm,London 414 P.
6. Introduction to the Practice of Fisheries Science.Royce,W.F.1984,Academic Press 438 P.
7. Fisheries Science its methods and application,1993,Rounsfell,G.A. and W.H.Everheart, John William & Sons New York,444

ALLIED SUBJECTS FOR I YEAR B.SC ZOOLOGY MAJOR STUDENTS FROM THE YEAR 2020 - 2021 ONWARDS

INDUSTRIAL FISH AND FISHERIES – ALLIED

SEMESTER - II/IV

PAPER: 2 CAPTURE FISHERIES

4 Hrs/Week **Credits-3**

OBJECTIVES:

To highlight the recent trends and types of capture fisheries to students studying industrial fish and fisheries.

OUTCOME:

To understand the knowledge of techniques about fish capture and culture.

UNIT I

Capture Fisheries – Inland Capture Fisheries – Scope and importance of Capture Fisheries in India and World. Present yield and Estimates of Potential. Inland capture fishery resources of

Indian Fisheries of major and minor carps. Cat fishes and other groups. Problems and management.

(12L)

UNIT II

Cold water fishery resources – Fisheries of trout, Mahaseer and other Cold water Species. Lacustrine fisheries – Species, Catch, Fishing gears, Potential and Problems of Development and management. Estuarine fisheries. Fisheries of Brackish water lakes and back waters – Problems and Management.

(12L)

UNIT III

Salient features of cultivable species of fishes and shell fishes.Marine fishery resources of India – Fisheries of Sardine, Lesser Sardine, Anchovies, Other Clupeoids, Mackerel, Ribbon fishes, Tunnies, Carangids and Cephalopods.

(12L)

UNIT IV

Mid water and Demersal fisheries – Fisheries of Elasmobranches, Bombay duck, Cat fishes, Silver Bellies, Sciaenids, Pomfrets,Threadfins,Thread fin breams and Perches,Flatfishes,Prawnslobsters,Crabs,Mussels Oysters and Clams,Culture of edible Oyster.

(12L)

UNIT V

Biological aspect of fishery managements,Principles of Conservation,Development and Management Concept and practice.Population dynamics – Concept of recruitment and yield,problems of over fishing, MSY, MEY and OSY **(12L)**

(TOTAL: 60L)

REFERENCE BOOKS

1. Fish and Fisheries of India Jhingran V.G. 1982 Hindustan Publishing Corporation India Delhi Rev.Ed.
2. Prawns and Prawn fisheries of India Kurian C.V and V.C Sebastian 1982.Hindustan Publishing corporation (India) Delhi Rev.Ed.
3. Marine Fisheries.Bal D.V and K.V Rao 1990.Narendra Publishing House Delhi Rev.Ed.
4. Cold water fisheriesofIndia.Jhingran V.G and K.L Sehgal 1979.Barrackpore Inland fisheries soceity of India.
5. Fisheries Development in India.Srivastava U.K and Dharma Reddy 1983.Concept publishing co.,New Delhi.
6. Introduction to the practice of fishery science,Royce 1984 Academic press,London.
7. Fishery Science its methods and Applications,Rounsefell,G.A and W.H Everhart 1953 John.Wiley, New York.

INDUSTRIAL FISH AND FISHERIES – ALLIED
SEMESTER - II/IV
PRACTICAL II- CAPTURE FISHERIES

2Hrs/Week **Credits 1**

1. Identification of commercial fresh water and marine prawns.
2. Visit to a Prawn farm.
3. Visit to a fish processing industry.
4. Visit to a Landing centers.
5. Raceway culture system.
6. Field visit to observe fishing and to collect field data regarding species composition, Craft, Gear and Field problems regarding riverine, estuarine, reservoir and cold water fisheries.
7. Study of fishery development programmes.
8. Study of fishery management problem – Laws,Acts and Field problems.