

B.Sc., ZOOLOGY WITH BIOTECHNOLOGY (2017 – 2018)

S. No.	SEM	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks for Pass			Hours Week	Credits
					CIA	E.E	Total	CIA	E.E.	Total		
1.	I	Part I	17U1ZOTI/H1	Tamil –I / Hindi-I	25	75	100	10	30	40	6	3
2.		Part II	17U1ZOE1	English - I	25	75	100	10	30	40	6	3
3.		Core	17U1ZOC1	Invertebrata	25	75	100	10	30	40	7	6
4.		Core	17U1ZOCP1	Practical-I (Invertebrata)	40	60	100	16	24	40	3	4
5.		Allied	17U1ZOBOA1	Allied Botany – I	25	75	100	10	30	40	5	4
		Allied PL	17U2ZOBOAPL	Allied Botany Practical (NS)	---	---	---	---	---	---	3	---
6.		ES	17U1ZOES	Environmental Study	---	100	100	---	40	40	---	1
7.	II	Part I	17U2ZOT2/H2	Tamil – II/ Hindi –II	25	75	100	10	30	40	6	3
8.		Part II	17U2ZOE2	English – II	25	75	100	10	30	40	6	3
9.		Core	17U2ZOC2	Microbiology	25	75	100	10	30	40	6	6
10.		Core	17U2ZOCP2	Practical-II (Microbial Techniques)	40	60	100	16	24	40	3	4
11.		Allied	17U2ZOBOA2	Allied Botany – II	25	75	100	10	30	40	5	4
12.		Allied PL	17U2ZOBOAPL	Allied Botany Practical(N.S)	40	60	100	16	24	40	3	2
13.		VBE	17U2ZOVE	Value Based Education	25	75	100	10	30	40	---	---
14.		Skill Based Elective -I	17U2ZOS1	Clinical Analysis of Biological Samples	25	75	100	10	30	40	1	1
15.	III	Part I	17U3ZOT3/H3	Tamil – III / Hindi – III	25	75	100	10	30	40	6	3
16.		Part II	17U3ZOE3	English – III	25	75	100	10	30	40	6	3
17.		Core	17U3ZOC3	Chordata	25	75	100	10	30	40	6	6
18.		Core	17U3ZOCP3	Practical-III (Chordata)	40	60	100	16	24	40	3	4
19.		Allied	17U3ZOCHA1	Allied Chemistry-I	25	75	100	10	30	40	5	4
		Allied PL	17U4ZOCHAPL	Allied Chemistry Practical(N.S)	---	---	---	---	---	---	3	---
20.		GS	17U2ZOGS	Gender Studies	---	100	100	---	40	40	---	--

S. No.	SEM	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks for Pass			Hours Week	Credits
					CIA	E.E.	Total	CIA	E.E.	Total		
21	IV	Part I	17U4ZOT4/H4	Tamil – IV/ Hindi –IV	25	75	100	10	30	40	6	3
22		Part II	17U4ZOE4	English – IV	25	75	100	10	30	40	6	3
23		Core	17U4ZOC4	Biochemistry, Biophysics and Biostatistics	25	75	100	10	30	40	6	6
24		Core	17U4ZOCP4	Practical – IV (Biochemistry, Biophysics and Biostatistics)	40	60	100	16	24	40	3	4
25		Allied	17U4ZOCHA2	Allied Chemistry – II	25	75	100	10	30	40	5	4
26		Allied PL	17U4ZOCHAPL	Allied Chemistry Practical	40	60	100	16	24	40	3	2
27		Skill Based Elective -II	17U2ZOS2	Techniques in Clinical Lab (Practical)	25	75	100	10	30	40	1	1
28	V	Core	17U5ZOC5	Cell Biology & Genetics	25	75	100	10	30	40	6	5
29		Core	17U5ZOC6	Developmental Biology & Evolution	25	75	100	10	30	40	5	5
30		Core	17U5ZOC7	Immunology	25	75	100	10	30	40	4	4
31		Core	17U5ZOCP5	Practical – V (Cell Biology, Genetics, D.B. and Evolution & Immunology)	40	60	100	16	24	40	4	4
32		Major Elective I	17U5ZOEL1A 17U5ZOEL1B	Public Health and Hygiene Biosafety and IPR	25	75	100	10	30	40	4	4
33		Major Elective II	17U5ZOEL2A 17U5ZOEL2B	Aquaculture Vermiculture	25	75	100	10	30	40	4	3
34		NME	17U5ZONME	Non-Major Elective - Aquaculture	25	75	100	10	30	40	2	1
35		SSD	17U5ZOSSD	Soft Skill Development	---	100	100	---	40	40	1	---
36	VI	Core	17U6ZOC8	Comparative Animal Physiology & Environmental Biology	25	75	100	10	30	40	5	5
37		Core	17U6ZOC9	Molecular Biology & rDNA Technology	25	75	100	10	30	40	5	5
38		Core	17U6ZOC10	Applied Zoology	25	75	100	10	30	40	4	4
39.		Core	17U6ZOCP6	Practical-VI (Animal Physiology, E.B, Molecular Biology, rDNA Technology & Applied Zoology)	40	60	100	16	24	40	6	4
40		Major Elective III	17U6ZOEL3A 17U6ZOEL3B	Bioinformatics Bioinstrumentation	25	75	100	10	30	40	4	4
41		Major Elective IV	17U6ZOEL4A 17U6ZOEL4B	Animal & Environmental Biotechnology Poultry Science	25	75	100	10	30	40	4	3
42		GK	17U6ZOGK	General Knowledge	-	100	100	-	40	40	1	---
43		CN	17U6ZOCN	Comprehensive Test	-	100	100	-	40	40	1	1
				Extension Activities	---	---	---	---	---	---	---	1
				Total			4300				180	140

B.Sc. ZOOLOGY (2017 - 2018)

Paper Code	Total No. Of Papers	Total Marks	Total Credits	Classification
Part - I	04	400	12	√
Part - II	04	400	12	√
Part - III				
Core	16	1600	76	
Allied	06	600	20	√
Major Elective	04	400	14	
	26	2600	110	
Part - IV				
Environmental Studies	1	100	1	
Value based education	1	100	--	
Skill Based Elective	2	200	2	
Gender studies	1	100	--	
Non Major Elective	1	100	1	√
Soft skill development	1	100	--	
G.K	1	100	--	
Comprehensive Test	1	100	1	
	9	900	05	
Part - V	Extension Activity		1	X
Total	43	4300	140	√

**A.VEERIYA VANDAYAR MEMORIAL SRI PUSHPAM COLLEGE
(AUTONOMOUS),
POONDI, THANJAVUR DIST.**

**Question Pattern for UG and PG Programmes for students to
be admitted during 2017 – 2018 and afterwards**

Total Marks: 75

QUESTION PATTERN

**SECTION – A
(Question 1 to 10)**

10 x 2 = 20 Marks

1. Short Answer Questions
2. Two Questions from each units (All are answerable)

**SECTION – B
(Question 11 to 15)**

5 x 5 = 25 Marks

1. 5 Paragraph type questions with “either / or” type choice.
2. One question from each unit of the Syllabus.
3. Answer all the questions.

**SECTION – C
(Question 16 to 20)**

3 x 10 = 30 Marks

1. 5 Essay type questions – any three are answerable.
2. One questions from each unit of the Syllabus.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
I	17U1ZOT1	இக்கால இலக்கியம் (செய்யுள் , உரைநடை, சிறுகதை, புதினம், நாடகம்)	6	3

கூறு: 1 செய்யுள்

நேரம்: 18

1. இராமலிங்க அடிகளார் - திருவருட்பா - இறைத் திருக்காட்சி —1—10
2. பாரதியார் - தேசியகீதம் : பாரத தேசம் — எங்கள் நாடு,
3. பாரதிதாசன் - புதிய உலகம்: உலக ஒற்றுமை —பேரிகை, தளை அறு,
மானுட சக்தி
4. பட்டுக்கோட்டை கல்யாண சுந்தரம் -காடு வெளையட்டும் பெண்ணெ ,
5. நாமக்கல் கவிஞர் - என்றுமுளதென்றமிழ் ,
6. கவிமணி : ஒற்றுமையே ,உயர்வு நிலை—நாட்டுக்குழைப்போம்

கூறு: 2 உரைநடை

நேரம்: 18

1. கேட்டிவி - இராகபாவம் (1 முதல் 15 வரை)
2. கேட்டிவி - பயணங்கள் தொடரும்

கூறு: 3 சிறுகதை

நேரம்: 18

1. கேட்டிவி - குரல் கொடுக்கும் வானம்பாடி (1 முதல் 10 வரை)
2. கேட்டிவி - மனோரஞ்சிதம் முழுவதும்

கூறு: 4 புதினம்

நேரம்: 18

கு.வெ. பாலசுப்பிரமணியன் - காளவாய்

கூறு: 5 நாடகம் , இலக்கிய வரலாறு

நேரம்: 18

1. கலைவாணன் — கு.சா.கிருஷ்ணமூர்த்தி(NCBH வெளியீடு)
2. சிறுகதை, புதினம், நாடகம், கவிதை, உரைநடை

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
I	17U1ZOE1	PART – II ENGLISH PROSE, POETRY AND COMMUNICATION SKILLS	6	3

Objective

- To initiate the Students to understand English through Prose, Poetry and Basic Communicative Grammar.

Unit – I

Shakespeare - Shall I compare thee to a Summer's Day?
John Milton – On His Blindness.
William Wordsworth – The Solitary Reaper
P.B.Shelley – Song to the Men of England.
Robert Frost – The Road not Taken
Nissim Ezekiel - Night of the Scorpion

Unit – II

- 1) The Running Rivulets of Man, 2) Parliament is Marking Time,
3) The Lady in Silver Coat, 4) Mr. Applebaum at Play.

Unit – III

- 1) The Feigning Brawl of an Imposter, 2) Thy Life Is My Lesson,
3) Solve The Gamble, 4) The Stoic Penalty.

Unit – IV

- 1) Nobility In Reasoning, 2) Malu the Frivolous Freak,
3) Bharath! Gird Up Your Loins! 4) Honesty is the Cream of Chastity

Unit – V

Parts of Speech, Nouns, Pronouns, Conjunctions, Adjectives, Articles, Verbs, Adverbs, Interjection – sentence.

References Book:

- A Melodious Harmony – Sri.KTV, Rajendra Publishing House, Poondi, 2017.
Flying Colours – Prof. K.Natarajan, New Century Book House (P) LTD., 2017.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	17U1ZOC1	INVERTEBRATA	7	6

Objectives:

1. To know the nomenclature, systematic position, classification of Invertebrates with suitable examples.
2. To study the economic importance of protozoans, insects and molluscs.
3. To study the parasitic adaptation of invertebrates.

Unit I

Hrs 18

Principles of Taxonomy. General Characters and detailed classification of Phylum Protozoa upto classes with suitable examples of biological interest.

Detailed study – Paramecium

General topic-1. Protozoan diseases in human–Malaria, Amoebiasis and Sleeping Sickness. 2. Protozoans Parasites of Man – Plasmodium, Entamoeba, Trypanosoma, Giardia and Leishmania, mode of infection and its control

Unit II

Hrs 18

General characters and detailed classification of phylum Porifera and Coelenterata up to classes with suitable examples.

Detailed study – Ascon Sponge, Obelia.

General topics: 1. Canal system in sponges.

2. Coral and coral reefs.

Unit III

Hrs 18

General characters and detailed classification of phylum Platyhelminthes and Nematelminthes upto classes with suitable examples.

Detailed study – *Taenia solium*, *Ascaris lumbricoides*

General topics: 1. Parasitic adaptation of platyhelminthes.

2. Nematodes parasites in Man.

Unit IV

Hrs 18

General characters and detailed classification of Phylum Annelida and Arthropoda upto classes with suitable examples.

Detailed study – Earthworm, Prawn

General topics : 1. Peripatus and its affinities.

2. Mouth parts of Insects

Unit V

Hrs 18

General characters and detailed classification of Phylum Mollusca and Echinodermata upto classes with suitable examples.

Detailed study – *Lamellidens marginalis*, *Asterias rubens*.

General topics: 1. Economic importance of Mollusca.

2. Larval forms of Echinoderms.

References

1. Ekambaranatha Iyyer E.K– A Manual of Zoology (Vol.I).
2. Kotpal, R.L. 1996. Modern Text Book of Zoology Invertebrates. Rastogi Publications, New Delhi.
3. Agarwal, V.K. 2003. Invertebrate Zoology. S.Chand & Company Ltd. New Delhi.
4. Nair, N.C., Leelavathy, L.Soundara Pandian, N.Murugan, T and Arumugam, N. 2009. A Text Book of Invertebrates. Saras Publications, Nagercoil.
5. Rastogi, V.B. 1984. Invertebrate Zoology, Kedar Nath Ram Nath Publicationos, Meerut.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	17U1ZOC1	Practical – I INVERTEBRATA	3	4

Objectives:

1. To know the evolutionary trend in the digestive, nervous systems of Earth worm, Cockroach, Pila and Freshwater mussel.
2. To understand the mode of feeding in the insects observing the mouthparts.

Dissections

- Earthworm : Digestive and nervous Systems.
Prawn : Nervous system.
Cockroach : Digestive, nervous and reproductive systems
Pila : Alimentary Canal and nervous system
F.W. Mussel : Digestive system

Mountings

- Earthworm : Body setae and penial setae
Prawn : Appendages
Cockroach : Mouthparts
Honeybee : Mouthparts
Housefly : Mouthparts
Pila : Radula
Freshwater mussel : Pedal ganglion

LIST OF SPOTTERS

- Protozoa : Entamoeba, Trypanosoma. Paramecium – Binary fission and Conjugation, Plasmodium
Porifera : Sponge - Gemmules, spicules,
Coelenterata : Obelia – entire, medusa; Physalia, Aurelia, Sea anemone and Corals
Platyhelminthes : Fasciola hepatica entire, T.S. Redia, Cercaria, Taenia solium – entire, T.S. and Scolex.
Nematoda : Ascaris male and female, T.S. of male and female, Dracunculus, Ancylostoma and Wuchereria
Annelida : Neries entire, Parapodium, Heteroneries, Earthworm entire, Leech entire , T.S. of Leech, nephridium, Trochophore larva, Peripatus.
Arthropoda : Daphnia, Cyclops, Sacculina, Limulus. Nauplius, Zoea, Mysis, Megalopa, Phyllososma, Alima, Honey bee, *Bombyx mori*.
Mollusca : Chiton, Dentalium, Sepia, Nautilus, Mytilus, Loligo Glochidium Larva.
Echinodermata : Starfish, Sea urchin, Sea-Cucumber. Bipinnaria larva, Auricularia Larva, Pluteus Larva, Pedicellaria, Aristotle's Lantern.

A record of lab work and report on field trip should be maintained and submitted at the time of practical examination for valuation.

B.Sc., Zoology with Biotechnology

Mark Details:

Methodology	=	20
Execution	=	30
Record	=	10
Total	=	60

Reference:

1. G.S. Sandhu – Advanced Practical Invertebrate Zoology,
 2. Gurdarshan Singh – Manual of Laboratory specimens – Invertebrates.
 3. H.S. Bharmah – Practical Zoology : Invertebrates.
 4. K.R. Aneja – Experiments in Microbiology.
 5. Gunasekaran P. – Lab manual in microbiology.
-

Candidates will be required to identify and comment upon specimen of Zoological interest Microscopic preparations, pertaining to types and examples studied under classification. A record of laboratory work and a report on local field trip should be maintained and submitted at the time of practical examination for valuation.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching /Weeks	No. of Credits
I	17U1ZOB0A1	Allied Botany – I	5	4

Objectives:

- ❖ To make the students more competent in plant science and acquire skills to engage themselves in self-employment especially in different fields like Horticulture and Mushroom culture. To expose avenues of opportunities in the field of Plant Biotechnology which is growing phenomenally.

Unit I

Hrs 15

Elementary knowledge of bacteria, Classification. Ultrastructure of *E.coli*. Economic importance of bacteria. General account of plant viruses (TMV).

Unit II

Hrs 15

Classification of cryptogams. Study of *Nostoc*, *Chlorella*, *Ectocarpus*, *Polysiphonia*, *Albugo*.

Unit III

Hrs 15

Penicillium, Polyporus, Polytrichum, Lycopodium, Cycas (excluding developmental studies).

Unit IV

Hrs 15

Types of tissues, Primary structure of dicot stem, root and leaf. Secondary thickening in dicot stem. Structure of mature anther and ovule, fertilization, structure of dicot embryo.

Unit V

Hrs 15

Absorption of water, photosynthesis: Light reaction, dark reaction (Calvin cycle); Respiration: Glycolysis, Krebs' cycle.

Books for Reference:

1. Ganguly, A.K., (1971). General Botany, Vol. II, The New Book Stall, Calcutta.
2. Rao, K.N., Krishnamurthy, K.V. and Rao, G., (1979). Ancillary Botany, Viswanathan Private Ltd.
3. Dutta, A.C., College Botany, Vol. I & II.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching /Weeks	No. of Credits
I & II	17U2ZOBOAPL	Allied Botany – Practical (NS)	3	-

Objectives:

- ❖ To identify the families from locally available plants.
- ❖ To know the various forms of algae, fungi, bryophytes, pteridophytes and gymnosperms
- ❖ To study the various aspects of internal structures of root, stem and leaves.
- ❖ To make the students to understand the various principles of physiological experiments.
- ❖ To understand the techniques of horticulture and mushroom cultivation.

A study of the vegetative and reproductive structures of the following genera – *Nostoc*, *Chlorella*, *Ectocarpus*, *Polysiphonia*, *Albugo*, *Penicillium*, *Polyporus*, *Polytrichum*, *Lycopodium*, *Cycas*.

A study of the simple and complex permanent tissues. – Internal structures of stem, root, leaf (both dicot and monocot).

To Critically comment on simple experimental setup in physiology.

Observe the morphological characters of the following families - Annonaceae, Rutaceae, Rubiaceae, Apocynaceae, Euphorbiaceae and Poaceae.

Acquire elementary practical knowledge on Biotechnology, Horticulture and Mushroom cultivation (photos/diagrams/techniques/implements/tools).

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
II	17U2ZOT2	இடைக்கால இலக்கியம் - பயன்முறைத் தமிழ் -இலக்கண வரலாறு	6	3

கூறு: 1

நேரம்: 18

1. திருஞானசம்பந்தர் - தேவாரம் - கோளறு திருப்பதிகம்
2. திருநாவுக்கரசர் -தேவாரம் -தனித்திருக் குறுந்தொகை - மாசில்வீணையும் - 1—10 பதிகம்
3. சுந்தரர் -தேவாரம் - திருநொடித்தான்மலைப் பதிகம் —தானெனை முன்படைத்தான்
4. மாணிக்கவாசகர் - திருவாசகம் - திருப்பொன்னூசல்

கூறு: 2

நேரம்: 18

1. குலசேகராழ்வார்: திருவித்துவக்கோட்டம்மான் : 1—10 பாடல்கள்
2. நம்மாழ்வார் - திருவாய் மொழி -இரண்டாம்பத்து —1—10 பாடல்கள்
3. ஆண்டாள் - நாச்சியார் திருமொழி —வாரணமாயிரம் 1—10 பாடல்கள்
4. திருமங்கையாழ்வார் - சிறிய திருமொழி —1—10 பாடல்கள்

கூறு: 3

நேரம்: 18

1. திருமூலர் - திருமந்திரம் - அட்டாங்க யோகம் —1—10 பாடல்கள்
2. குமரகுருபரர் - மீனாட்சியம்மை பிள்ளைத் தமிழ்: வருகைபருவம்
3. திரிகூடராசப்பக் கவிராயர் - குற்றாலக் குறவஞ்சி - நாட்டு வளம்
4. வீரமாமுனிவர் - திருக்காவலூர்க் கலம்பகம் — முதல் 5 பாடல்கள்
5. குணங்குடி மஸ்தான் சாகிபு - ஆனந்தக் களிப்பு —முழுதும்

கூறு: 4 பயன்முறைத் தமிழ்

நேரம்: 18

வாக்கிய அமைப்பு - புணர்ச்சி வகைகள் - வலிமிகும், வலி மிகா இடங்கள் - எழுத்துப்பிழை நீக்கம் லகர, ளகர, ழகர வேறுபாடுகள் - சொற்களைப் பிரித்துப் பொருள் காணும் முறை - நிறுத்தற் குறியீடுகள் - சரியான தமிழ் வடிவம் அறிதல்.

சொல்லியல் - சொல் வகை - இலக்கண வகை - இலக்கிய வகை - பெயர்ச்சொல் - இடுகுறி - காரணம் - அறுபொருட் பெயர் (பொருள், இடம், காலம், சினை, குணம், தொழில்) - வினைச்சொல் - இடைச் சொல் - உரிச்சொல் - முற்று - எச்சம் - விசுதிகள் - இடைநிலை - தன்வினை - பிறவினை - தெரிநிலை வினை - குறிப்பு வினை-வழுவமைதி.

கூறு: 5 இலக்கண வரலாறு

நேரம்: 18

இலக்கண வரலாறு - தமிழ்த் துறை வெளியீடு.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
II	17U2ZOE2	PART – II ENGLISH EXTENSIVE READERS AND COMMUNICATIVE SKILLS	6	3

Objective

- To impart language and communicative skills through short stories, one act plays and communicative grammar

Unit – I

Shakespeare – The Seven Stages of Man

Long Fellow – A Psalm of Life

Nissim Ezakiel - Enterprise

William Wordsworth – The world is too much with us

Unit – II

Anton Chekov – The Proposal

J.B.Priestly - Mother's Day

Unit - III

William Faulkner - A Rose for Emily

P. Lankesh - Bread

Katherine Mansfield - The Doll's House

Unit – IV

Tense, Question Tag, Dialogue Writing, Paragraph Writing, Adjectives, Adverb

Unit – V

Voices, Degrees of Comparison, Direct and Indirect

Book Prescribed:

Unit I , II, III , Voices of vision in English (Vol. I & II), Board of Editors, Pavai Printers (P) Ltd., Chennai, 2016.

Unit IV & V – Communicative grammar by the Department of English, Poondi, 2017.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	17U2ZOC2	MICROBIOLOGY	6	6

Objectives:

1. To study about the Microscope – structure and function of various microscopes.
2. To study the classification of microorganisms and their structure.
3. To study about the preparation of bacterial culture medium and Gram's staining techniques.
4. To study the pathology of various microbes.
5. To study the role of microbes in agriculture, food and dairy industries.

Unit I

Hrs 18

Classification: Prokaryotic and eukaryotic microorganisms – viruses, bacteria, algae, fungi, protozoans. Scope of Microbiology – Microscopy – optical, TEM and SEM.

Unit II

Hrs 18

Sterilization methods – dry heat, moist heat, radiation, chemical, filtration; significance of Pasteur's experiment. Nutritional classifications of microorganisms. Basic structure – Virus, Bacteria and yeast

Unit III

Hrs 18

Bacterial culture technology– Bacterial culture medium – composition and preparation. Types of Media. Bacteria - Isolation and pure cultures - Serial dilution technique, Streak plate method and Pour plate method - Gram staining technique – Preservation and maintenance of bacterial culture.

Unit IV

Hrs 18

Human diseases caused by microbes.
Viral diseases: Influenza, Mumps, Viral Hepatitis, Poliomyelitis, AIDS, and Chicken pox.
Bacterial diseases: Pneumonia, whooping cough; Typhoid, Cholera, Diphtheria, Tuberculosis and Leprosy.
Fungal Diseases : Mycetes, Aspergillosis;
Vaccines.

Unit V

Hrs 18

Agricultural microbiology - Azospirillum, Azolla, Acetobacter and BGA- Mass production. Phosphate biofertilizer and VAM fungi.

References:

1. Ross, F.C. – Introductory Microbiology (Bell and Howell Co, London).
2. Pelzer, M.J.Reid, R.D and Chan, E.C.S – Microbiology (Mc Graw Hill).
3. Purohit S.S. Microbiology – Fundamentals and Applications, (Agro Bios).
4. Dubey, R.C. & Maheshwari, D.K. A Text Book of Microbiology. (S.Chand & Co.)
5. Sharma, P.D. – Microbiology (Rastogi Publication).
6. Powar, C.B and Dagainawala, H.E – General Microbiology (Himalaya Publishing House Meerut).
7. Anita Rozar – Practical methods for Environmental Microbiology and Biochemistry.
8. Bisen – Handbook of Microbiology (CBS Publishers, New Delhi).
9. Michael, J. Waites – Industrial Microbiology – and Introduction (Blackwell Sciences, New York)
10. Patel, A.H. – Industrial Microbiology (Tata Mc Graw Hill Publishers).
11. Power, C.B. and Dagina Wala – Industrial Microbiology (Tata Mc Graw Hill).

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	17U2ZOC2	Practical – II MICROBIAL TECHNIQUES	3	4

Objectives:

1. To study about the Microscope – structure and function of various microscopes.
2. To study the classification of microorganisms and their structure.
3. To study about the preparation of bacterial culture medium and Gram's staining techniques.
4. To study the pathology of various microbes.
5. To study the role of microbes in agriculture, food and dairy industries.

PRACTICALS

1. Cleaning and preparation of glasswares.
2. Sterilization of glasswares and media.
3. Preparation of fungal culture media – PDA and Rose Bengal Agar medium.
4. Preparation of Bacterial culture media – NA and Nutrient broth medium.
5. Identification of microorganisms in water and soil samples.
6. Pure culture technique – Serial dilution, Streak plate and pour plate technique.
7. Staining techniques – Gram's staining and Lactophenol cotton blue staining.
8. Biochemical test – Fermentation of Carbohydrate and Amylase test.

SPOTTERS

Hot air oven, Autoclave, Pressure cooker, Agar plate, Inoculation needle, Petri plates, Laminar air flow, Colony counter, Haemocytometer.

HIV, Bacteriophage, Yeast, E.coli, Pseudomonas, Bacillus subtilis, Streptococci, Vibrio cholera, Aspergillus niger, A.flavous, Pencillium janthinelum, P.citrinum and Fusarium sp.,

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching /Weeks	No. of Credits
II	17U2ZBOA2	Allied Botany – II	5	4

Objectives:

- ❖ To enable the students to get a fair knowledge of morphology and taxonomy of angiosperms.
- ❖ To learn the applied aspects of biotechnology, horticulture and mushroom cultivation.

Unit I

Hrs 15

Morphology – leaf and its modifications, inflorescence, flower & fruits. General outline of Bentham and Hooker’s system of classification.

Unit II

Hrs 15

Study of the range of characters and economic importance of Annonaceae, Rutaceae, Apocynaceae, Euphorbiaceae, Poaceae.

Unit III

Hrs 15

Biotechnology– definition, principles of genetic engineering, rDNA technology.

Unit IV

Hrs 15

Horticulture, scope and importance; Propagation methods (Cuttage, Layerage and Air layering). Gardening and Landscaping, Lawns, Indoor plants, Bonsai techniques.

Unit V

Hrs 15

Mushroom cultivation–Introduction, Nutritive value and importance of mushrooms. Cultivation of Oyster mushroom, spawn preparation, preservation of mushrooms, Recipes made from mushrooms (Mushroom soup and omelette).

Books for Reference:

1. Ganguly, A.K., (1971). General Botany, Vol. II, The New Book Stall, Calcutta.
2. Rao, K.N., Krishnamurthy, K.V. and Rao, G., (1979). Ancillary Botany, Viswanathan Private Ltd.
3. Dutta, A.C., College Botany, Vol. I & II.
4. Gupta, P.K., Elements of Biotechnology Rastogi and Company.
5. Suman, B.S. and Sharma, V.P., Mushroom Cultivation and used Agrobios (India), Jodhpur.
6. Kumar, N., (1999). Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching /Weeks	No. of Credits
I & II	17U2ZOBOAPL	Allied Botany – Practical (NS)	3	2

Objectives:

- ❖ To identify the families from locally available plants.
- ❖ To know the various forms of algae, fungi, bryophytes, pteridophytes and gymnosperms
- ❖ To study the various aspects of internal structures of root, stem and leaves.
- ❖ To make the students to understand the various principles of physiological experiments.
- ❖ To understand the techniques of horticulture and mushroom cultivation.

A study of the vegetative and reproductive structures of the following genera – *Nostoc*, *Chlorella*, *Ectocarpus*, *Polysiphonia*, *Albugo*, *Penicillium*, *Polyporus*, *Polytrichum*, *Lycopodium*, *Cycas*.

A study of the simple and complex permanent tissues. – Internal structures of stem, root, leaf (both dicot and monocot).

To Critically comment on simple experimental setup in physiology.

Observe the morphological characters of the following families - Annonaceae, Rutaceae, Rubiaceae, Apocynaceae, Euphorbiaceae and Poaceae.

Acquire elementary practical knowledge on Biotechnology, Horticulture and Mushroom cultivation (photos/diagrams/techniques/implements/tools).

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
II	17U2ZOS1	SKILL BASED EDUCATION –I CLINICAL ANALYSIS OF BIOLOGICAL SAMPLES	1	1

Objectives:

1. To study the Safety regulation and first aid.
2. To know the Clinical tests of Blood, Urine, Sputum, Stool, Semen.

UNIT - I

Scope for study of clinical laboratory technology. Functional Components of Clinical Labs. Needs of Clinical Labs. Safety regulation and first aid. Analysis of Semen, Sputum, Stool- EGC, EEG.

UNIT – II

Blood cell counting - Erythrocyte sedimentation rate (ESR), Determination of packed cell volume. (PCV) Determination of Haemoglobin, Determination of Blood sugars (glucose), Cholesterol, Urea, Albumin, Hypoglycaemia and Hyperglycemia.

Reference:

1. Biological chemistry – Lehinger
 2. Human physiology by peark.
 3. Medical Laboratory Technology – A procedure manual for routine diagnostic Tests – Vol – I – III By Kanai L. Mukherjff.
-

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
III	17U3ZOT3	காப்டியங்கள், கட்டுரைகள், இலக்கிய வரலாறு	6	3

கூறு: 1 காப்டியங்கள் 1

நேரம்: 18

1. சிலப்பதிகாரம் - புகார்க் காண்டம்—மனையறம்படுத்த காதை
2. மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
3. சீவக சிந்தாமணி - மண்மகள் இலம்பகம்
4. கம்பராமாயணம் - மிதிலைக் காட்சிப் படலம்

கூறு: 2 காப்டியங்கள் 2

நேரம்: 18

1. பெரிய புராணம் -மெய்ப்பொருள் நாயனார் புராணம் —முழுதும்
2. அரிசந்திரபுராணம் —மயான காண்டம்
3. தேம்பாவணி - திருமணப் படலம்—1—10 பாடல்கள்
4. சீறாப்புராணம் -நபி அவதாரப் படலம் —1—10 பாடல்கள்

கூறு: 3 கட்டுரைத் தொகுப்பு

நேரம்: 18

கட்டுரைத் தொகுப்பு - தமிழ்த்துறை வெளியீடு

கூறு: 4 பொதுக்கட்டுரை, மொழிபெயர்ப்புப் பயிற்சி

நேரம்: 18

பயிற்சிக் கட்டுரைகளும் கடிதங்களும் -பாவை வெளியீடு
கட்டுரைப் பயிற்சி - 10 மதிப்பெண்
மொழிபெயர்ப்புப் பயிற்சி - 5 மதிப்பெண்
கலைச்சொல்லாக்கம்

கூறு: 5

நேரம்: 18

அ. இலக்கிய வரலாறு

பக்தி இலக்கியங்கள் - காப்பிய இலக்கியங்கள் - சிற்றிலக்கியங்கள்

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
III	17U3ZOE3	PART – II ENGLISH SHAKESPEARE, EXTENSIVE READERS AND COMMUNICATIVE SKILLS	6	3

Objective

- To introduce the language of the world renowned dramatist and novelist to enhance the vocabulary and communicative skills of the learners.

Unit – I

Funeral Oration – Julius Caesar

Trial for a Pound of Flesh – The Merchant of Venice

Unit – II

He Kills Sleep – Macbeth

The gulling scene of malvalio – Twelfth Night

Unit – III

Romeo and Juliet

In Love is a “Midsummer Madness” – Tempest

Unit – IV

R.L. Stevenson – Treasure Island

Unit – V

Note making, Hints Developing, Expansion of Ideas and Proverbs, Clauses and sentence, Structure simple, Compound and Complex.

Book Prescribed:

Unit – I, II & III: Selected scenes from Shakespeare, Prof.K.Natarajan, Pavai Printers (p) Ltd., 2017.

Unit IV: Treasure Island Abridged by E.F. Dodd

Unit V: Communicative Grammar by Department of English, Poondi, 2017.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	17U3ZOC3	CHORDATA	7	6

Objectives:

1. To study about the chordate animals upto orders with suitable examples.
2. To study about the accessory respiratory organs and migration of fishes.
3. To study the parental care in Amphibia, poisonous and non-poisonous snakes of South India.
4. To study the flight adaptation and migration of birds.
5. To study prototheria, metatheria and dentition in mammals.
6. To study the detailed information about Amphioxus, Scoliodon, Frog, Pigeon and Rat.

Unit I

Hrs 18

General characters of Chordata and its outline classification – Origin of Chordates – General characters of Prochordates and its classification.
Detailed study – Amphioxus
External features of Balanoglossus and Ascidian.
Retgressive metamorphosis in Ascidian.

Unit II

Hrs 18

Pisces – General characters and classification upto orders with suitable examples. External characters of petromyzon.
Detailed study – Scoliodon (Shark)
General topics: 1. Accessory respiratory organs of fishes
2. Migration of fishes.

Unit III

Hrs 18

Amphibia and Replitia–General characters and classification upto orders with examples. Frog – Morphology and life history
Detailed study – Calotes.
General topics: 1. Parental care in Amphibia
2. Identification of Poisonous and non-poisonous snakes in South India.

Unit IV

Hrs 18

Aves – General characters and classification upto orders with examples.
Detailed study – Pigeon
General topics : 1. Flight Adaptation
2. Flightless birds.
3. Migration of birds.

Unit V

Hrs 18

Mammalia – General characters and classification upto orders with examples.
Detailed study: Rat
General topics: 1. Prototheria and Metatheria–Salient features and examples.
2. Dentition in Mammals.
3. Adaptations of Aquatic Mammals.

References

1. Ekambaranatha Iyyer E.K– A Manual of Zoology (Vol.II) (Chordata).
2. Kotpal,R.L.1996. Modern Text Book of Zoology Vertebrates. Rastogi Publications, New Delhi.
3. Alexander – The Chordates.
4. Goodrich – Structure and Development of Vertebrata (Vol.I and II)
5. Jothie, M.–Chordate Morphology.
6. Dhami,P.S. and Dhami, J.K.1982. Chordate Zoology, R.Chand & Co. Publishers, New Delhi.
7. Waterman, A.J. 1971. Chordate structure and function. Macmillan Company, New Delhi.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	17U3ZOC3	Practical – III CHORDATA	3	4

Objectives:

1. To know the various systems of Calotes and Rat.
2. To study the important chordate animals as spotters.

DISSECTION

1. Fish : Digestive System, Arterial system and venous system
2. Rat : Digestive System, Arterial system and venous system

MOUNTING : Placoid scale of shark, Brain of Fish and Rat.

Candidates are required to identify and comment upon specimen of Zoological interest, microscopic preparations pertaining to types and examples studied under classifications and osteology of types.

LIST OF SPOTTERS – CHORDATES

Amphioxus, Balanoglossus, Tornaria larva, Ascidia, Petromyzon, Shark, Mullet, Eel, Arius, Exocoetus, Saccobranchus, Synapta, Echenies, Gambusia, Clarias, Anabas, Varanus, Draco, Calotes, Hemidactylus, Chaemeleon, Oligodon, Cobra, Viper, Python, Pit viper, Pigeon, Owl, Parrot, Kingfisher, Rat, Bat, Loris, Dentition – Rabbit.

Pectoral, girdle : Frog, Calotes, Pigeon and Rabbit

Pelvic Girdle : Frog, Calotes, Pigeon and Rabbit

Fore and Hind Limbs : Frog, Calotes, Pigeon and Rabbit

Skull : Frog, Calotes, Pigeon and Rabbit

Reference:

1. G.S. Sandhu – Advanced Practical Chordate Zoology
 2. Gurdarshan Singh – Manual of Laboratory specimens – Chordates
 3. H.S. Bharmah – Practical Zoology; Chordates.
-

Semester	Subject code	Title of the paper	Hours of Teaching/Week	No. of Credits
III	17U3ZOCHA1	Allied chemistry-I (For Biologists)	5	4

UNIT I Fundamental concepts

Bonding – nature of bonds – ionic, covalent, coordinate and hydrogen bonds - Cleavage of covalent bonds–homolytic and heterolytic fission–electrophiles, nucleophiles and free radicals. Types of organic reactions – substitution, addition, elimination, rearrangement–definition and examples. Hybridisation – states of hybridization of carbon in methane, ethane, ethylene, acetylene.

UNIT II Fuel gases, Plant nutrients and Fertilizers

Fuel gases – natural gas, water gas, semi water gas, carburetted water gas, producer gas, LPG and oil gas – composition, manufacture (elementary idea) and uses. Plant nutrients – major nutrients – role of nitrogen, phosphorus and potassium in plant life, micro nutrients. Fertilizers – definition, urea, ammonium sulphate, superphosphate of lime, triple superphosphate and potassium nitrate – preparation and uses.

UNIT III Industrial Organic Chemistry

Pesticides–DDT, BHC–preparation and uses. Refrigerant–freon12– preparation, properties and uses. Polymers – definition, classification– natural and synthetic, homo and copolymers, natural polymers – cotton, silk and wool, preparation and applications of the synthetic polymers – polythene, PVC, teflon and nylon. Synthetic dyes–classification, preparation and uses of methyl orange and indigo, food colours.

UNIT IV Colloidal State and Chromatography

Colloidal system – definition, types -Emulsions– definition, types – o/w and w/o emulsions–tests for identification, properties and applications. Gels–definition, classification, preparation and properties–syneresis, imbibition and thixotropy. Electrophoresis–applications. Chromatography–column and paper chromatography–experimental procedures only.

UNIT V Pharmaceutical chemistry

Antiseptic & disinfectants – phenolic compounds – Dettol, phenyle & Lysol – Definition – differences – medicinal uses and side effects. Anaesthetics– general anaesthetics and local anaesthetics – Definition, examples, uses and side effects. Analgesics–narcotic–morphine & pethidine, non-narcotic–salicylic acid & its derivatives–medicinal uses and side effects. Organic pharmaceutical aids– Preservatives, antioxidants, colouring, flavouring and sweetening agents–Definition, examples and uses.

Text Books:

1. Text Book of Ancillary Chemistry, **V.Veeraiyan** et al, revised edition, 1997.
2. Allied Chemistry, **R.Gopalan** and **S.Sundaram**, S.Chand & Sons, 2nd edition, 1993.

Reference Books:

1. Text Book of Organic Chemistry, **P.L. Soni** and **H.M. Chawla**, S.Chand & Sons, , 29th edition, 2014 (Unit III).
2. Principles of Inorganic Chemistry, **B.R. Puri**, **L.R. Sharma** and **K.C. Kalia** Vishal Publishing Co, Reprint 2016 (Unit I & II).
3. Principles of Physical Chemistry, **B.R.Puri**, **L.R. Sharma**, Vishal Publishing Company, Jalandhar, 44th edition 2009. (Unit IV)
4. A text book of pharmaceutical chemistry, **Jayashree Ghosh**, S.Chand and Company Ltd., New Delhi, 1st edition, 2004. (Unit V)
5. Pharmaceutical Chemistry, **S. Lakshmi**, S.Chand & Company Ltd., New Delhi, 3rd edition, 2004. (Unit V)

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III & IV	17U4ZOCHAPL	Allied chemistry practical (NS)	3+3	-

A. Volumetric Analysis

1. Estimation of HCl (or H₂SO₄) by NaOH using a standard oxalic acid solution
2. Estimation of NaOH by H₂SO₄ (or HCl) using a standard Na₂CO₃ solution
3. Estimation of oxalic acid by KmnO₄ using a standard Mohr's salt solution
4. Estimation of Ferrous sulphate by KmnO₄ using a standard oxalic acid solution.
5. Estimation of Mohr's salt by KmnO₄ using a standard oxalic acid solution.
6. Estimation of KMnO₄ by thio using a standard K₂Cr₂O₇ solution.
7. Estimation of K₂Cr₂O₇ by thio using a standard CuSO₄ solution
8. Estimation of CuSO₄ by thio using a standard K₂Cr₂O₇ solution

B. Organic qualitative analysis

Systematic analysis of an organic compound, Preliminary tests, detection of element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests for given organic compounds.

The following substance are prescribed:

Benzoic Acid , Cinnamic acid, Phenol , Cresol, Aniline , Toludine, Urea, Benzaldehyde, Glucose

Reference:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997)

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
IV	17U4ZOT4	சங்க இலக்கியம் - அறு இலக்கியம் - செம்மொழி - இலக்கிய வரலாறு	6	3

கூறு: 1

நேரம்: 18

குறுந்தொகை

1. குறிஞ்சி - (பா.எ.:3)
2. முல்லை - (பா.எ.94)
3. மருதம் - (பா.எ.45)
4. நெய்தல் - (பா.எ.:49)
5. பாலை - (பா.எ.:41)

நற்றிணை

1. குறிஞ்சி - (பா.எ. 32)
2. முல்லை - (பா.எ. 81)
3. மருதம் - (பா.எ. 210)
4. நெய்தல் - (பா.எ. 226)
5. பாலை - (பா.எ.229)

கலித்தொகை

1. பாலை - (பா.எ. 6)
2. குறிஞ்சி - (பா.எ. 38)

அகநானூறு

1. குறிஞ்சி : - (பா.எ. 68)
2. மருதம் - (பா.எ. 86)

கூறு: 2

நேரம்: 18

ஐங்குறுநூறு

குறிஞ்சி - தோழிக்கு உரைத்த பத்து: பாடல் எண்கள் —111—120

புறநானூறு

பாடல் எண்கள் 8,17,20,95,141,159,184,186,188,206

பதிற்றுப்பத்து

ஏழாம் பத்து —பாடல் எண். 1

பரிபாடல்

எட்டாம் பாடல் : செவ்வேள்

கூறு: 3

நேரம்: 18

நெடுநல்வாடை முழுவதும்

திருக்குறள் : வான்சிறப்பு, பெருமை, காதற் சிறப்புரைத்தல்

கூறு: 4

நேரம்: 18

செம்மொழி வரலாறு

மொழி - விளக்கம் - மொழிக்குடும்பங்கள் - உலகச் செம்மொழிகள் - இந்தியச் செம்மொழிகள் - செம்மொழித் தகுதிகள் - வரையறைகள் - வாழும் தமிழ்ச்செம்மொழி - தொன்மை - தமிழின் சிறப்புகள் - தமிழ்ச் செம்மொழி நூல்கள்.

கூறு: 5

நேரம்: 18

அ. இலக்கிய வரலாறு

சங்க இலக்கியங்கள், பதினெண்கீழ்க்கணக்கு நூல்கள்

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of The Paper	Hours of Teaching/Week	No. of Credits
IV	17U4ZOE4	PART – II ENGLISH ENGLISH FOR COMPETITIVE EXAMINATIONS	6	3

Objective

- To prepare the learners for competitive examinations and to know the fundamentals of practical communication.

Unit – I

Grammar – Number, Subject, Verb, Agreement, Articles, Sequence of Tenses, Common Errors.

Unit – II

Word Power - Idioms & Phrases, one word substitutes, Synonyms, Antonyms, Words we often confuse, foreign words & phrases, spelling.

Unit – III

Reading & Reasoning – Comprehension, Jumbled Sentences.

Unit - IV

Writing Skills – Paragraph, Precis Writing, Expansion of an idea, Report Writing, Essay, Letters, Reviews (Film & Book)

Unit – V

Speaking- Public speaking, Group Discussion, Interview, Spoken English.

Prescribed Text:

English for Competitive Examinations, by Ayothi, Trichy, 2017.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	17U4ZOC4	BIO-CHEMISTRY, BIO-PHYSICS AND BIO-STATISTICS	6	6

Objectives:

1. To study the classification, structure and biological importance of carbohydrates, protein, lipid .
2. To study the basic structure of nucleic acids.
3. To study the classification, kinetics of enzymes and it's role in food industries and also to know the significance of ELISA test in immuno technology
4. To study the principles of colorimetry and Spectroscopy and its working mechanisms and also to known about ECG, EEG and NMR Scanning.
5. To study the basics of biostatistics.

BIOCHEMISTRY

Unit I

Hrs 18

Carbohydrates and Lipids: Classification of carbohydrates – Monosaccharide, Disaccharides and Polysaccharides. Basic molecular structure, Peptidoglycans. Lipids – Triglycerides – Fatty acids and glycerol – steroids and cholesterol.

Unit II

Hrs 18

Proteins : Basic structure and classification. Classification of aminoacids with examples – simple, acidic, basic, hydroxylic, sulphated and aromatic aminoacids. Nucleic acids - Basic molecular structure of DNA, RNA and their types.

Unit III

Hrs 18

Enzymes : Classification of enzymes and mode of Action – enzyme Kinetics. Enzymes in the production of new compounds. Enzymes in food industry and food processing.

BIOPHYSICS

Hrs 18

Unit IV

Colloids: Types and its Properties - Tyndall effect, Surface tension, Brownian movement, filtration, osmosis and dialysis – Principles of Colorimeter and Spectrophotometer and their applications - Beer's and Lambert's law. Radiology – Applications of UV, fluorescence, atomic absorption, infrared.

BIOSTATISTICS

Hrs 18

Unit V

Biostatistics –Types of data, Collection of data; Measures of central tendency: Mean, median and mode – Standard deviation.

Graphical and diagrammatic representation – bar types, pie diagram and histogram.

Reference:

1. Biochemistry – J.L.Jain
2. Biological chemistry – Conn and Stump; Tata McGraw Hill Publishers
3. Biochemistry – Power and Chatwall; Himalaya Publishing House, New Delhi
4. The Text Book of Biochemistry – A.V.S.S. RamaRao
5. An Introduction to Practical Biochemistry – David T.Plummer
Principles of Biochemistry – Albert L.Lehninger, Damodaran, M.Vasudevan – Macmillan Publishers.
Biochemistry–Jeremy M.Berg, John, L. Tymoczko, Lubert serger – WH Freeman & Co.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	17U4Z0CP4	Practical – IV BIOCHEMISTRY, BIOPHYSICS AND BIO-STATISTICS	3	4

Objectives:

1. To understand the level of sugar, proteins, and lipids in biological samples by qualitative and quantitative estimation.

A. Bio-Chemistry

1. Qualitative test for Carbohydrate.
2. Qualitative test for Protein.
3. Qualitative test for Lipid.
4. Quantitative estimation of sugar in biological samples (Anthrone Method).
5. Quantitative estimation of proteins in biological samples (Folin-Phenol/Biuret method).
6. Separation of amino acids by circular paper chromatography.
7. Extraction and separation of lipids (TLC).
8. Measurement of pH of the given sample.

B. Biostatistics

1. Determination of mean, median and mode.
2. Determination of standard deviation.

C. Biophysics

1. Verification of Beer's and Lambert's law.
2. Estimation of soluble sugar in the given sample – Colorimetric method (Phenol Sulphuric acid method).

Spotters

Colorimeter, Spectrophotometer, NMR, ECG, EEG, pH meter, TLC, Homogenizer, Centrifuge, SDS-PAGE, ELISA – kit, Micro pipette.

Mark Details:

Practical	= 50
Record	= 10
Total	= 60

B.Sc., Zoology with Biotechnology

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No. of Credits
IV	17U4ZCHA2	Allied chemistry-II (For Biologists)	5	4

UNIT I Acids, Bases and Catalysis

Acids and bases–Arrhenius and Lewis theories of acids and bases, pH scale, buffer solutions – definition – examples of acidic and basic buffer solutions, importance of pH and buffer in living systems. Hardness of water – types and determination of hardness by EDTA titration. Catalysis–types of catalysis, characteristics of catalysts, promoters and catalytic poison, biocatalysts – enzyme catalysis, industrial applications of catalysts.

UNIT II Carbohydrates, Vitamins and Cosmetics

Carbohydrates–classification, glucose and fructose–sources, manufacturing method, reactions of glucose, derivatives of starch and cellulose–applications. Vitamins–classification, sources and deficiency diseases of vitamins A, D, E, K, C, B₁, B₂, B₅, B₆, and B₁₂.

UNIT III Amino acids, Proteins and Nucleic acids

α -Amino acids – essential and non essential amino acids, α -amino acid-preparation by Gabriel-phthalimide reaction and Strecker’s method, isoelectric point, zwitter ion formation, action of heat, ninhydrin test. Peptides – definition only, proteins – classification, characteristics and biological functions, elementary treatment of primary and secondary structure. Nucleic acids–DNA & RNA–composition and structure (elementary treatment), differences between DNA & RNA.

UNIT IV Biochemistry

Metabolism–anabolism and catabolism. Digestion and absorption of carbohydrates, glycolysis, TCA cycle, glycogenesis, glyconeogenesis, maintenance of blood sugar level. Digestion and absorption of proteins, urea biosynthesis. Digestion and absorption of lipids - β -oxidation of fatty acids.

UNIT V Food Chemistry

Food additives–sweeteners, preservatives, emulsifying and stabilizing agents, flavouring agents, antioxidants and colouring agents. Food adulteration–definition and types of adulterations–adulterants in soft drinks, milk and milk products, edible oils and fats. Packaging hazards–prevention and control. Simple tests for common adulterants in coffee powder, tea leaves, cane sugar, honey, turmeric, common salt, dhals, and ice creams.

Text Books

1. Text Book of Organic Chemistry, **P.L.Soni and H.M. Chawla**, S.Chand & Sons, 27th edition, 1997.
2. Principles of Physical Chemistry, **B.R.Puri, L.R. Sharma**, Vishal Publishing Company, Jalandhar, 44th edition 2009. (Unit IV)

Reference Books:

1. Elements of Physical Chemistry, **B.R. Puri, L.R. Sharma, M.S. Pathania**, Vishal Publishing Co. 43rd edition, 2008-09. (Unit I)
2. TextBook of Biochemistry, **O.P. Agarwal and G.R. Agarwal**, , Goel Publishing House, 7th edition, 1993. (Unit III & IV)
3. Chemistry for Changing Times, **John W.Hill**, St. edition, subject Publishing House, 1986 (Unit II)
4. Food Science, **B.Srilakshmi**, New Age International (P) Ltd., Publishers, 3rd edition ,2003 (Unit V).
5. Food Additives – Characteristics, Detection and Estimation, **S.N. Mahindru** Tata McGraw Hill Publishing Company Limited. (Unit V).

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III & IV	17U4ZOCHAPL	Allied chemistry practical (NS)	3+3	2

A. Volumetric Analysis

1. Estimation of HCl (or H₂SO₄) by NaOH using a standard oxalic acid solution
2. Estimation of NaOH by H₂SO₄ (or HCl) using a standard Na₂CO₃ solution
3. Estimation of oxalic acid by KmnO₄ using a standard Mohr's salt solution
4. Estimation of Ferrous sulphate by KmnO₄ using a standard oxalic acid solution.
5. Estimation of Mohr's salt by KmnO₄ using a standard oxalic acid solution.
6. Estimation of KMnO₄ by thio using a standard K₂Cr₂O₇ solution.
7. Estimation of K₂Cr₂O₇ by thio using a standard CuSO₄ solution
8. Estimation of CuSO₄ by thio using a standard K₂Cr₂O₇ solution

B. Organic qualitative analysis

Systematic analysis of an organic compound, Preliminary tests, detection of element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests for given organic compounds.

The following substance are prescribed:

Benzoic Acid, Cinnamic acid, Phenol, Cresol, Aniline, Toludine, Urea, Benzaldehyde, Glucose

Reference:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997)

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	17U4ZOS2	Skill based education – II – TECHNIQUES IN CLINICAL LAB (PRACTICAL)	1	1

Objectives:

1. The main objective of introducing this paper is to learn the basic techniques in Clinical Lab technology.

1. Sample collection and storage techniques.
2. Blood grouping
3. RBC counting
4. WBC counting
5. Sterilization techniques
6. Preparation of fungal and bacterial media
7. Urine analysis – Sugar, urea, creatinine
8. Diagnosing Equipments – ECG, EEG, Sphygmomanometer, Haemocytometer.

Reference

1. Medical Laboratory Technology – K.M. Samuel.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5ZOC5	CELL BIOLOGY AND GENETICS	6	5

Objectives:

1. To study the structure and functions of plasmambrane and cytoplasmic organelles.
2. To study the ultra structure and functions of nuclear components and importance of cell division.
3. To know the Mendelian principles, crossing over, linkage, chromosomal mapping, mutations, sex linked inheritance, non disjunction of chromosome, and sex determination.
4. To study the fine structure of gene, Operon concept, and Inborn error metabolism in man.

CELL BIOLOGY

Hrs 18

Unit I

Cell fractionation techniques: Centrifugation – Principles and Types - Differential and Density gradient. Cytoplasm – Organization of Cytoplasmic matrix and functions. Ultra structure and functions of plasma membrane.

Unit II

Hrs 18

Structure and functions of Cytoplasmic organelles – Mitochondria, Golgi complex, Endoplasmic reticulum, Centrosome, Ribosomes, Lysosomes.

Unit III

Hrs 18

Nucleus: Organization and Functions. Nucleolus, Chromosomes and their role, Giant Chromosomes – Polytene and lamp brush, Cell Divisions – Mitosis and Meiosis.

GENETICS

Hrs 18

Unit IV

Mendelian Principles – Monohybrid and Dihybrid cross. Linkage and crossing over. Chromosomal mapping. Multiple alleles – ABO & Rh Blood grouping Sex-Linked inheritance – Colour blindness and Hemophilia in man – Non-disjunction of Chromosomes. Sex determination in Drosophila and Man.

Unit V

Hrs 18

Fine structure of Genes – Cistron, Recon, Muton – operon model. Gene mutation. Chromosomal aberration – Population Genetics – Hardy Weinberg law – Inborn error metabolism in man – Phenylketonuria, Alkaptonuria and Albinism – Genetic Counseling.

Reference:

1. Loewy, A.g. and P.Seikovitz–Cell structure and function (Half Rinchart and Winstion) 1969.
2. Ambrose, E.J, and Easty, D.M–Cell Biology (ELBS).
3. Derobertis–Cell Biology.
4. Swanson, C.F. and P.L. waster–The cell (4th Edn), Prentice Hall of India, 1978.
5. Langley–Cell function.
6. Stern and Nancy–The Biology of the cells.
7. Livine, R.P.–Genetics (Hort R.W.N.Y 1969).
8. Swanson, C.P.T.Marg.–Cytogenetics.
9. Waddington, C.H–The strategy of Genes.
10. Garber, Ed. – Cyto – Genetics – An introduction (McGraw Hill).
11. Stent, G.S. – Molecular Genetics.
12. Witeheusel, H.L.K. – Towards on understanding of the mechanism of Hereditary.
13. Watson, J.O. – Molecular Biology of the genes (3rd Edn).

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5ZOC6	DEVELOPMENTAL BIOLOGY AND EVOLUTION	5	5

Objectives:

1. To study the various theories of developmental biology and gametogenesis.
2. To study parthenogenesis, types of eggs, cleavage, blastulation, and gastrulation in amphioxus, Frog, Chick, and Mammals.
3. To study the organogenesis of chick and placenta in mammals.
4. To study about the origin of life and evidences of evolution.
5. To study the speciation and isolation, mimicry and colouration and evolution of Horse and Man.

DEVELOPMENTAL BIOLOGY

Hrs 18

Unit I

Scope of Embryology. Theories on development – Epigenesis, Beer’s Law, Germplasm Theory, Mosaic theory, Regulative theory, Gradient theory and Spemann and Mangold’s Theory of organizers. Spermatogenesis, Oogenesis. Fertilization – Physico-chemical changes during fertilization – Parthenogenesis.

Unit II

Hrs 18

Types of eggs in chordates, cleavage – Patterns of cleavage Blastulation in Amphioxus, Frog and chick. Gastrulation in Amphioxus, Frog and Chick. Fate map.

Unit III

Hrs 18

Organogenesis : Development of Heart, Brain, eye and ear of Frog, Extra embryonic membranes in Chick. Placenta in mammals.

EVOLUTION

Hrs 18

Unit IV

Origin of Life–Evidences of evolution-Palaentological, Anatomical, Embryological, Physiological and Biochemical evidences. Theories of evolution-Lamarkism, Darwinism and Devries.

Unit V

Hrs 18

Speciation – isolatic mechanism - Mimicry and colouration. Evolution of Horse. Evolution of Man – Cultural evolution of Man.

Reference:

1. Balinsky – An introduction to embryology V Edn, Saunders Co, Philadelphia, 1981.
2. Rayam, C.P.–An outline of developmental Physiology, I Edn, Bergman, London, 1961.
3. Weber, R.–The biochemistry of animal Development, Vol. I and III, academic Press.
4. Ebert, J.C. Interacting systems in Development, Holt Rainbart and Winston, New York, 1965.
5. Berril, N.J. – Deelopmental Biology, TMH Edn., New Delhi 1961.
6. Bodemes, C.W. – Modern Embryology, Holt Rinebert Winston, New York, 1968.
7. Rough, R– Experimental Embryology, Burgress, Minneopolis, 1945.
8. Needham, J – A History of embryology, Burgress, Minneopolis, 1945.
9. Savage – Evolution (Modern Biology Series, 1969).
10. Stabbins – Process of Organic Evolution (Prentice Hall).
11. Dowdeswell, W.H. – The mechanism of Evolution (Hermann, London, 1956).
12. Shappart, P.M. – Natural Selection and Heredity (Hutchinson).
13. Ehrlich / Holin / Pauell – The process of evolution (McGraw Hill).
14. Mayr, El, Animal Species and Evolution (Harvard Uni, Harvad Uni, Press, 1963.
15. Simpson, G.G. – The major adaptation (CUP).
16. Huxley, J – Evolution, The modern synthesis (Harpers N.Y), 1942.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5ZOC7	IMMUNOLOGY	4	4

Objectives:

1. To study about different immunities and Lymphoidal organs.
2. To study about the Biosynthesis of Immunglobulins with functions and Theories of antibody formation.
3. To study the structure and functions of Antigens and Antibodies.
4. To study about the antigen-antibody reactions.
5. To study about the Vaccines for infectious disease, blood grouping, and transplantation.

Unit I

Hrs12

Immunity: Kinds of immunity – Natural and acquired. Primary lymphoidal organs – Thymus, Bursa of Fabricius, Bone marrow. Secondary Lymphoidal organs – Spleen, Lymphnodes, Payer's Patches.

Unit II

Hrs 12

Antigens and Antibodies: Antigens and Haptens, Size, Solubility and Chemical nature of immunoglobulins. IgG, IgA, IgM, IgD & IgE - Basic structure of antibody (IgG).

Unit III

Hrs12

Biosynthesis and functions of immunoglobulins. Theories of antibody formation. Immune response. Humoral and cell mediated immune response; Phagocytosis and Pinocytosis.

Unit IV

Hrs12

Antigen – Antibody reactions: Precipitation, Agglutination, Cytolysis, Complement fixation, Flocculation, Opsonization, Immunofluorescence – MHC of Man – Hypersensitivity-Type I and Type II.

Unit V:

Hrs12

Autoimmune diseases – Thrombocytopenia, Thyrotoxicosis, Rheumatoid arthritis and Haemolytic anaemia, Application of Immunology in blood grouping, Rh factor Immunotechniques – RIA and ELISA

References:

1. Jean Francis Bach – Immunology, 6th Ed. Wiley Medical Publication, New York, 1982.
2. Jean Fracis Bach – Immunology, 6th Ed. Wiley Medical Publication, New York, 1982.
3. Glynn, L. and Steward, M.W, - Structure and functions of Antibodies, John Wiley Sons, NY.
4. Hildermann, W.H. – Essentials of Immunology, Elsevier publications, Oxford.
5. Joshi, K.R – Immunology, Agrobios Publication jodhpur, 2002.
6. K.R. Joshi and N.O. Osama – Immunology, Agrobios, India.
7. Rastogi, S.C. – Elements of Immunology.
8. Jean Francis Bach – Immunology, 6th Ed. Wiley Medical Publication, New York, 1982.
9. Joshi, K.R – Immunology, Agrobios Publication, Jodhpur, 2002.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5Z0CP5	CORE – PL – CELL BIOLOGY, GENETICS, DEVELOPMENTAL BIOLOGY, EVOLUTION & IMMUNOLOGY	4	4

Objectives:

1. To learn the handling of microscope and to observe the cell divisions.
2. To identify the blood groups and Mendelian characters of Man
3. To observe the various hours of chick embryo.
4. To know the evolutionary significance with suitable examples.
5. To identify the primary and secondary lymphoid organs in Rat.

1. Cell Biology

1. Mitosis - Squash preparation of onion root tip.
2. Meiosis - Squash preparation of grasshopper testis.
3. Giant chromosome - Squash preparation of salivary gland of Chironomous larva.

2.Genetics

1. Blood grouping.
2. Drosophila – sex differences – identification of different mutant.
3. Mendelian traits – tasters and non – tasters, tongue rollers and non-rollers and other common human traits.

3. Developmental Biology

3. Observation of various stages of chick embryo.
4. Observation of early developmental stages of Frog (Metamorphosis).
5. Temporary mounting of the invertebrate larvae (From Plankton Collection).

4. Evolution

Comments on animals of Evolutionary significance (Palaentological evidences).

5.Immunology

Dissection of Lymphoid organs in Rat.

Reference:

1. Taylor, R.G.W – Practical Cytology, Academic Press, London.
2. Michael, A. Tribe, Michael, R. Erant and Roger, K. Snook – Electron Microscopy and cell Structure: Basic Biology course, Cambridge University Press, London.
3. Benjamin, H. Willies and Sane, M. Oppenheimer, - Foundations of Experimental Embryolog, Eastern Economy Edn.
Sinha,J, Chatterjee. A.K. P.Chattopadhyay – Advanced Practical Zoology.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5ZOEL1A	Major Elective – I PUBLIC HEALTH AND HYGIENE	4	4

Objectives:

1. To study about the awareness on public health and hygiene.
2. To create knowledge on health education.

UNIT :I

Public Health – Definition – Physical, Mental, Social and Positive Health – Health problems in India – Population explosion and Birth control in India.

UNIT – II

Environmental and Health – Water borne diseases – Food hygiene and food intoxicants – Health service agencies – National Health programme.

UNIT – III

Methods of Excreta disposal – Sanitary Health measure – during festival – First Aid with reference to accidents – Blood transfusion – Blood Grouping.

UNIT – IV

Communicable diseases (Hepatitis B, AIDS, Rabies, Tuberculosis, Typhoid, Amoebiasis, Filariasis).

UNIT – V

Health Situation in India – PHC – National AIDS control organization (NACO) – National Malaria eradication Programme – National Tuberculosis eradication programme.

Reference:

1. Br.THOS, D., TUTTLE, B.S., M.D., Principles of Public Health, 1950, World Book Company.
2. Verma, S. 1998; Medi and Zoology, Rastogi Public – Meerut – India.
3. Dubey R.C. and Maheswari, D.K. 2007; Text book of Bicrobiology – S.Chand & Co. Publication New Delhi – India.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5ZOEL1B	Major Elective – I BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS	4	4

Objectives:

1. To know about the safety measures in using micro organisms.
2. To learn the biosafety guidelines and regulations.
3. To know the importance of IPR and patents.

Unit I

Hrs12

Biosafety: Introduction: Biosafety issues in biotechnology – historical background: Introduction to biological safety cabinets: Primary containment for bio hazards: Biosafety levels: Biosafety levels of specific micro organisms: Recommended Biosafety levels for infections agents and infected animals.

Unit II

Hrs12

Biosafety Guidelines: Biosafety guidelines and regulations (National and international) – operation of biosafety guidelines and regulations of government of India: Definition of GMOs & LMOs: Roles of institutional Biosafety committee, RCGM, GEAC etc. For GMO applications in food and agriculture: Environmental release of GMOs: Risk Analysis: Risk Assessment: Risk management and communication: Overview of National Regulations and relevant International Agreements including Cartagena protocol.

Unit III

Hrs12

Introduction of Intellectual Property: Types IP patents, Trademarks, Copyright & Related rights. Industrial design, Traditional Knowledge. Geographical indications – Importance of IPR – Patentable and non-Patentable – Patenting life – legal protection of biotechnological inventions – world intellectual property rights organization (WIPO).

Unit V

Hrs12

Basics of patents and concept of Prior Art: Introduction to patents: Types of patent applications: Ordinary, PCT, Conventional, divisional and patent of Addition: Specifications. Provisional and complete: Forms and fees invention in context of "Prior art". Patent database searching. International databases. Country wise patent searches (USPTO, esp@ ce net CEPO), PATENT scope (WIPO), IPO.

Unit V

Hrs12

Agreements and Treaties: History of GATT & TRIPS Agreement: Madrid, Agreement : Hague Agreement : WIPO Treaties : Budapest Treaty : PCT Indian Patent Act 1970 and recent amendments.

Reference:

1. Biotechnology and Safety Assessment, Thomas (2003).
2. Environmental Health Hazards, Kumar (2004).
3. Progress in Bioethics, Jonathan *et al.*, 2010.
4. The Ethics of Protocells – Mark 2009.
5. Design and Destiny – Ronald and Turner, 2008.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5ZOEL2A	Major Elective –II AQUACULTURE	4	3

Objectives:

1. To study the water quality management
2. To study the culture Techniques of Important Fresh water fishes.
3. To study the culture Techniques of Ornamental fish culture
4. To study the disease management during aquaculture.

Unit I

Hrs12

Scope of Aquaculture – Aquaculture in India – Extensive – Intensive and Semi-intensive fish culture – Inland fisheries – Marine Fisheries – Ornamental fisheries.

Unit II

Hrs12

Selection of site – construction and preparation of pond – Fertilization of pond – Water quality management - Control of aquatic vegetation and predators.

Unit III

Hrs12

Monoculture, Monosex culture, Polyculture, Composite fish culture – Carp culture – Murrel culture – Integrated fish farming – Hypophysation techniques, Bacterial diseases of Fish (Haemorrhagic septicemia & Epitheliocystis)

Unit IV

Hrs12

Prawn culture: Types of prawn, (Prawn culture in fresh water and marine water) Techniques in Prawn culture - Food and feeding of prawns - Bacterial diseases of Prawn (Myxobacteriosis, Pseudomonas & Vibriosis)- Economic importance of Prawn culture.

Unit V

Hrs12

Post harvest technology - Processing and Preservation of fish and Prawns – By-products of fishes – Marketing Systems of fishes – Role of MPEDA,FFDA.

References

1. Fish and Fisheries–Kamleshwar Pandey and J.P. Shukla, Rastogi Publications.
2. Fishery Biology and Aquaculture – K. Shanmugam (Leo Padhippagam).

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5ZOEL2B	Major Elective - II VERMICULTURE	4	3

UNIT – I

Hrs12

Scope and importance of Vermitechnology. Classification of earthworm. Earthworm – external features, Digestive system, excretory system, reproductive system, Life cycle. Economic importance of Earthworm.

UNIT – II

Hrs12

Vermiculture: Methods of collection of earthworms. Steps involved in vermiculture. Factors influencing the culture of earthworms. Vermicomposting; steps of vermicomposting mechanism of vermicomposting, changes during vermicomposting.

UNIT – III

Hrs12

Methods of vermicomposting: Small scale or Indoor vermicomposting – pit method. Heap method. Large scale or outdoor vermicomposting – Bed method, Window method vermitech 200. Vermiwash – preparation, composition and application of vermiwash.

UNIT – IV

Hrs12

Vermicompost: Physical, chemical and biological characteristics of vermicompost. Nutritive value of vermicompost advantages and economic importance of vermicompost. Use of vermicompost for crop production. Use of vermicompost in Land improvement and Reclamation.

UNIT – V

Hrs12

Role of earthworm in waste management – Solid waste management, Sewage waste management (Vermifilter), Faecal waste management, Industrial waste management. Role of earthworm in soil fertility earthworm as Farmer's friend.

Reference

1. Clive A.Edwards, Norman Q. Aramon, Rhonda L.Sherman – Vermiculture Technology: Earthworms, Organic waste and Environmental Management.
2. Niir Board – The complete technology book on Vermiculture and vermicompost (Available Online).
3. Engineers India Research In A1 Books. Co.in. Rediff Books – Hand book of Biofertilizers and Vermiculture.
4. M.Seethalakshmi, Dr.R.Shanthi – Saras Publications – Vermitechnology.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	17U5ZONME	NON-Major Elective AQUACULTURE	2	1

Objectives:

5. To study the water quality management
6. To study the culture Techniques of Important Fresh water fishes.
7. To study the culture Techniques of Ornamental fish culture
8. To study the disease management during aquaculture.

Unit I

Hrs 15

Scope of Aquaculture: Pond design and construction, Water quality management, Culture practices of Fish (*Catla catla*) & Prawn (*Penaeus monodon*), Feedings, Harvesting and Marketing.

Unit II

Hrs15

Ornamental fish culture: Ornamental fishes (Guppy, Moly, Gold fish, Angel Zebra danio), Aquarium maintenance, feedings, breeding and marketing.

Disease management: Diseases (Fin Rot, Dropsy, Swim Bladder disorder, Body flukes) & their control measures.

Reference

1. T.V.R. Pillay (1994) Aquaculture – Principles, Practices, Fishing News Book, Blackwell – London.
2. V.C. Jhingron and Gopalakrishana Rajm Pand chosh, methodology for survey of brackish water area in India, for coastal – aquaculture indopacific fish council, 14th session.
3. C.M.C.R.I, Coastal Aquaculture – Marine Prawn Culture.
4. Jhingran, V.G(1998), Fish and Fisheries of Indian Hindustan Publishing corporation, New Delhi.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
V	17U5ZOSSD	SOFT SKILLS DEVELOPMENT	1	-

Unit : I

Proficiency in English – Group Discussion - Interview – Presentation Skills
– Percentage and its application – Error Correction.

Unit : II

Communication Skills – Art of Listening, Art of Reading, Art of Writing.
Corporate Skill – Time Management, Stress Management.

Text Books

1. Meena K and Ayothi (2013) A Book on Development of Soft Skills (Soft. Skills: A Road Map to Success) P.R. Publishers & Distributors, No. B -20 & 21 V.M.M. Complex, Chatiram Bus Stand, Tiruchirappalli – 620002.
2. Hariharan S, Sundararajan N and Shanmugapriya S.P. (2010) Soft Skills, MJP Pubglishers, Chennai – 600 005.

References

1. Alex K (2012) Soft Skills – Know yourself & Know the world, S.Chand & Company LTD. Ram Nagar, New Delhi – 110 055.
2. Martin Avis, Effective Time Management Skills for everyone, Avis Consultancy, London.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	17U6ZOC8	ANIMAL PHYSIOLOGY AND ENVIRONMENTAL BIOLOGY	5	5

Objectives:

1. To study the types of food components, metabolism of carbohydrate, protein and lipid, Blood composition and its function, respiratory pigments and transport of O₂ and CO₂.
2. To study the structure and functions of Heart and Kidney, Osmo - ionic regulation in aquatic animals and modes of excretion.
3. To study the different types of effectors and receptors, muscle contractions and transmission of nerve impulse.
4. To study the physico-chemical parameters in eco system and to know the animal relationship and population.
5. To study about the animal association and various types of pollution.

Unit I

Hrs 18

Nutrition: Food – Physiology of digestion in Man –Metabolism of Carbohydrates, Proteins and lipids. Blood – Composition and functions. Structure and functions of Hemoglobin – Transport of O₂ and CO₂ in Blood.

Unit II

Hrs 18

Vertebrate heart – Structure and physiology of circulation (man). Osmoionic regulation in Fishes. Mode of Excretion – Ammonotelism, Ureotelism and Uricotelism. Human kidney – Structure and functions – Urine formation.

Unit III

Hrs 18

Muscles – Types – Chemistry of muscle contraction - Structure of Neuron - Transmission of nerve impulse, Reflex action - Role of hormones in reproductive cycles. Physiology of photo receptors (Eye).

ENVIRONMENTAL BIOLOGY

Unit IV

Hrs18

Abiotic Factors of the environment –temperature, light. Pond as an Ecosystem - Trophic levels, Food Chain and Food Web, Ecological pyramids, Energy flow. Animal population.

Unit V

Hrs 18

Animal Associations: Symbiosis / Mutualism, Commensalism, Parasitism. Antagonism. Pollution: Water pollution, Air pollution, Noise pollution, Soil Pollution and radioactive pollution.

Reference

1. Geise, A.C – Cell Physiology 95th Edn (Saunders, Phill) 1979.
2. Knut, Schindt, Nelson – Animal Physiology 3rd Edn, (prentice Hall, 1977).
3. Hoar, S.W – General and Comparative physiology (Prentice Hall, 1976)
4. Prosser and Brown – Comparative Animal Physiology, 1961.
5. Verma, P.S, Tyagi, B.S., and Agarwal, V.K.–Animal Physiology, 3rd Edn, S, Chand and Company, New Delhi.
6. Nagabushnam.R, and R. Sarojini – Animal Physiology.
7. Odum, E.P – Ecology (Hr. and W.)
8. Odum, E.P – Fundamentals of Ecology. (W.B. Saunders, Philadelphia).
9. Mallamby, K. – The Biology of Pollution, Edward Arnold.
10. Dowdeswell, W.H – An introduction to Animal Ecology.
11. Allee, W.C. Emerson, A.E., Park, O. and Park, T. and Schmidt, - Principles of Animal Ecology, W.B. Saunders, Philadelphia.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	17U6ZOC9	MOLECULAR BIOLOGY AND r-DNA TECHNOLOGY	5	5

Objectives:

1. To study the DNA replication, denaturation, renaturation, hybridization, mutations, recombinations, and functions of prokaryotes and eukaryotes and role of enzymes.
2. To study different types of RNA and its role in protein synthesis.
3. To study Gene cloning and construction of r-DNA and also different types of cloning vectors.
4. To know about different methods of gene transfer techniques.
5. To study Hybridoma Technology for the production of Monoclonal antibodies.
6. To study about the application of r-DNA Technology and genetically engineered microbes in agriculture.

Unit I

Hrs 18

DNA replication in Prokaryotes and Eukaryotes. DNA denaturation and renaturation, hybridization, Functions of Nucleases, ligases, DNA polymerases and Restriction endonucleases.

Unit II

Hrs 18

Role of RNAs in Transcription and Translation of protein synthesis. Post transcriptional and translational modifications, Genetic code, Codon and anticodons. Cloning vectors – Plasmids, Phagemids, Cosmids, YAC vectors and Shuttle vectors.

Unit III

Hrs 18

Gene cloning by Recombinant DNA Technology - Construction of r-DNA, Blotting techniques – Southern, Northern and Western, cDNA Library.

Unit IV

Hrs 18

Methods of Gene transfer, Electroporation, Shot gun method, microinjection, protoplast fusion in plant, cell fusion in animal cells. Hybridoma technology.

Unit V

Hrs 18

Applications of r-DNA technology – Artificial insulin and Growth Hormone production – Genetically modified micro organisms – Biochips – Biosensor.

Reference

1. Primorse – Molecular Biochemistry, AMS Press, 2000.
2. Purohit, S.S, - Molecular Biology and Biotechnology, Daya Publishing House, New Delhi, 2002.
3. Agarwal, K.C. – Fundamental of Molecular Biology and Biotechnology, Daya Publishing House, New Delhi.
4. Helen Kreuzer – Recombinant DNA and Biotechnology, 2nd Edn, ASM Press, Washington DC.
5. Purohit, S.S – A text book of Biotechnology for Indian Universities, Agrobios, Jodhpur 2002.
6. Dubey, R.C. – A text book of Biotechnology, S.Chand and Co, New Delhi, 2002.
7. Gupta, P.K. – Biotechnology and Genomics, Rastogi Publications, 2004.
8. Joshi, P – Genetic Engineering and its applications, Agrobios, ISBN, India, Jodhpur 2002.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	17U6ZOC10	APPLIED ZOOLOGY	4	4

Objectives:

1. To study about the culture of aquatic organism.
2. To study about the culture of Bee keeping.
3. To study about the economic importance of poultry farming.
4. To generate the motivations for self employment.
5. To learn about the rural based and welfare oriented agro based industry

UNIT :I – Apiculture

Types of Honey bee – Life history of Honey bee – Bee colony – Collection of Honey – Medicinal value of Honey and Bee wax artificial Bee Hive – Enemies and disease of honey bees and their control methods.

UNIT – II - Sericulture

Scope of Economics of Sericulture – Central silk Board – Types of culture (Eri, Tasar, Muga and Mulberry silk worm) – Mulberry cultivation – Life cycle of *Bombyx mori* – Disease and pest of Silkworm – Prevention and control measures.

UNIT – III – Aquaculture

Economics of aquaculture – Water quality Management – Carp – composite fish culture – Integrated fish farming – Hypophysation Techniques – Prawn culture – Economic of Prawn culture – Aquaculture Institution in India.

UNIT – IV – Ornamental Fish culture

Aquarium design & construction– Requirements for aquarium – Ornamental fishes – Maintenance of water quality- food and feeding– Aquarium plants – Disease management and their control.

UNIT – V –Dairy Farming

Scope of Dairy Farming – Livestock in India – Dairy animals – Management of Milk cow. Nutritive value of milk – Milk products . Pasteurization and Lactometer - Livestock Diseases and their control.

Reference:

1. Fish and Fisheries – Kamaleshwar Pandey and J.P.Shukla, Rastogi Publication.
2. Fishery Biology and Aquaculture – K.Shanmugam (Leo Padhippagam).
3. Mishra, R.C., 1985 – Honey bees and their management in India, ICAR.
4. Sharma, P. and Singh, L. 1987 – Hand Book of bee keeping, Controller Printing and Stationery, Chandigarh.
5. N.S.R. Sastry, C.K. Thomas and R.A.Singh–Farm animal management and poultry production, Vikas Publishing House Private Ltd., Delhi.
6. Ullal, S.R. and Narasimihanna, M.N. 1977. Hand Book of Practical Sericulture, Central Silk Board, Bombay.
7. M.Seethalakshmi, Dr.R.Shanthi – Saras Publications – Vermitechnology.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	17U6Z0CP6	Core – PL – ANIMAL PHYSIOLOGY, ENVIRONMENTAL BIOLOGY, MOLECULAR BIOLOGY AND r-DNA TECHNOLOGY	6	4

Objectives:

1. To learn the estimation of O₂ consumption by fish, Enumeration of RBC and WBC and qualitative tests for nitrogenous excretory products.
2. To know about determination of Urine sugar in Man, demonstration of blood pressure in Man.
3. To study about the dissolved O₂, CO₂, salinity, pH in water samples, identification of plankton and animal relationship with suitable examples.
4. To learn the techniques of isolation of DNA, RNA and plasmid, southern blotting and separation of proteins by PAGE Electrophoresis.

Animal Physiology

1. Estimation of O₂ consumption in fresh water fish.
2. Total and differential counts of blood cells.
3. Qualitative tests for ammonia, urea and uric acid.
4. Demonstration of blood pressure in Man.
5. Determination of Urine sugar in Man.

Environmental Biology

1. Measurement of Physico – Chemical parameters in aquatic environment.
 - a. Dissolved Oxygen
 - b. Salinity
 - c. pH (Using pH paper (or) pH meter or Lovibond Comparator).
 - d. Free Carbon –di-oxide, carbonates and bicarbonates.
2. Study of examples illustrating animal associations.
3. Study tour and report .

Molecular Biology and r-DNA Technology

1. Plasmid extraction
2. DNA Isolation

Field work Report : A record of lab work and report on field trip (places of zoological interest) should be maintained and submitted at the time of practical examination for valuation.

Mark Details

Methodology	= 20
Execution	= 30
Result	= 10
Total	= 60

Reference

1. Okotore, R.O. – Basic Separation technique in Biochemistry.
2. Sareen – Instrumental methods in Environmental Analysis.
3. S.C. Rastogi – Experimental Physiology

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	17U6ZOEL3A	Major Elective - III BIOINFORMATICS	4	4

Objectives:

1. To study about the scope of Bioinformatics and usage of www.
2. To study about the various databases in related with protein and nucleic acid sequences.
3. To know about the gene sequencing studies.

Unit I

Hrs15

Scope of Bioinformatics, Application of Bioinformatics - Computer – Types of computers, Browsers used in Biology; Internet – Email.

Unit II

Hrs15

Biological databases – Objectives of Biological databases, properties of databases, Symbols used in databases – Single letter codes for nucleotides, single letter codes for Amino-acids, Standard genetic code. Classification of biological database – Generalized databases, specialized databases.

Unit III

Hrs15

Bioinformatics tool: Uses of bioinformatics tool – classification of bioinformatics tools – Homology and similarity tools – BLAST, FASTA clustral W – protein functional analysis tools : PFAM, SCANPS – Sequence analysis tools – structural analysis tools : PROTPARAM, GOR – Molecular modelling and visualizing tools – MMTK – visualizing tool – Rasmol – phylogenetic analysis tools - PHYLIP.

Unit IV

Hrs15

Sequence alignment: Criteria for sequence alignment – sequence alignment techniques – optimal alignment – Global alignment and local alignment. Multiple sequence alignment. Structural alignment.

Unit V

Hrs15

Usage of protein sequence database – SWISSPROT – one letter code and three letter code for amino acids – signal region. Cross reference to EMBL and DDBJ. Genome and its significance. Human genome project – Potential benefits of Human Genome Project.

References

1. Information Theory and Living system – L.I. Garfield (1992), Columbia University.
2. Nucleic acid and Protein Sequence Analysis – M.J. Bishop and C.J. Ramalinga (1987), IRL Press.
3. Text Book of Bioinformatics – Sundharalingam and Kumaresan, Suras Publication.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	17U6ZOEL3B	Major Elective – III BIOINSTRUMENTATION	4	4

Objectives:

1. To know the principle and Working mechanism of the following instruments.

UNIT-I:

Hrs15

Microscopic Techniques: Principles and Applications of Light, Phase Contrast, Fluorescence Microscopy, Scanning and Transmission Electron Microscopy, Confocal Microscopy, Cytophotometry and Flow Cytometry, patch clamping, advances of microscopy. Centrifugation: Preparative and Analytical Centrifuges, Sedimentation analysis RCF, Density Gradient Centrifugation.

UNIT-II:

Hrs15

Chromatography Techniques: Theory and Application of Paper Chromatography, TLC, Gel Filtration Chromatography, Ion Exchange Chromatography, Affinity Chromatography, GLC and HPLC.

UNIT-III:

Hrs15

Electrophoretic Techniques: Theory and Application of PAGE, Agarose Gel Electrophoresis 2DE, Iso-electric Focusing, Immuno diffusion, Immuno Electrophoresis , ELISA , RIA , Southern , Northern and Western Blotting .

UNIT-IV:

Hrs15

Spectroscopic Techniques : Theory and Application of UV and Visible Spectroscopy, Fluorescence Spectroscopy, MS , NMR, ESR, Atomic Absorption Spectroscopy, X- ray Spectroscopy, LASAR , Raman Spectroscopy . MALDI

UNIT-V:

Hrs15

Radio-isotopic Techniques : Introduction to Radioisotopes and their Biological Applications , Radioactive Decay – Types and Measurement , Principles and Applications of GM Counter , Solid and Liquid Scintillation Counter, Autoradiography, RIA , Radiation Dosimetry .

RECOMMENDED BOOKS:

1. Physical Biochemistry: Application to Biochemistry and Molecular Biology – Freilder.
2. Biochemical Technique : Theory and Practice , - Robyt & White
3. Principle of Instrumental Analysis – Skoog & West
4. Principle & Technique – Practical Biochemistry 5th Ed. (2000) - Walker J. & Wilson K.
5. Biochemical Technique Theory & Practical- White, R.
6. Principle of Instrumental Analysis – Skoog et al.
7. Microbiology – Fundamental & Application (1995) -Atlas, R.M.
8. Biophysical Chemistry – Upadhyay & Nath.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	17U6ZOEL4A	Major Elective – IV ANIMAL AND ENVIRONMENTAL BIOTECHNOLOGY	4	3

Objectives:

1. To study about techniques of animal tissue cultures, cryopreservation of sperms and embryo transformation.
2. To study about the role of microbes in Bio-gas production, Ethanol production and conventional fuels, Bioleaching, Biomining and Biofertilizers.
3. To study about the sewage treatment methods.

Unit I

Hrs 15

Animal cell culture – Techniques – Culture media for animal cells – Natural media – Artificial media – Complete culture media – Serum as culture medium – Serum free media – Disaggregation methods – Proliferation – differentiation – Stem cell cultures.

Unit II

Hrs 15

Cryopreservation of sperms – Embryo transfer technique – IPR – Bioethics – Transgenic animals.

Unit III

Hrs 15

Microbial quality of food and drinking water – conventional fuel (coal, natural gas and fire wood) and their impact on degradation of environment, Production of Biogas and ethanol.

Unit IV

Hrs 15

Treatment of sewage by microbes – Treatment of industrial effluents and oil slick, oil spills by microbes – Degradation of chemical pesticides by microbes – Bioleaching and Biomining.

Unit V

Hrs 15

Biofertilizers – N₂ fixing microbes (*Azolla*, *Azotobacter*, *Azospirillum*) for use in Agriculture – *A. fumifasciens* for crop improvement – Biocontrol agents – Biopesticides.

References:

1. Purohit, S.S. – Biotechnology
2. Agarwal, K.C. – Fundamentals of Molecular Biology and Biotechnology.
3. Jagdand, S.N. – Environmental Biotechnology.
4. Rang, M. – Animal Biotechnology.
5. Trevan, M.D., Boofey, S. – Biotechnology.
6. Sathyanarayana, U. – Biotechnology.

B.Sc., Zoology with Biotechnology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	17U6ZOEL4B	Major Elective – IV POULTRY SCIENCE	4	3

Unit I

Hrs15

Poultry production in Tropics and India, Economics of Poultry production, Egg production trends in India, demand and supply pattern.

Unit II

Hrs15

Common breeds of poultry – American class, English class, Mediterranean class, Asiatic class - Indian class. Important characters of modern breeds of poultry.

Unit III

Hrs15

Incubation and hatchery management: Selection and care of eggs for incubation, Hatchery hygiene and prevention of hatchery borne diseases. Management of young birds, brooding conditions; farm operations during brooding period. Lighting, vaccination, debeaking, coccidiosis control.

Unit IV

Hrs15

Management of growers: Culling, optimal-crowding, feeding.
Management of layers: Light, culling by distinction of non-layers, Deep Litter Management, Housing and equipments, floor space, feeders and waters.
Feed composition and nutrients: Grower and layer feeds.

Unit V

Hrs15

Marketing: Problems, quality of eggs, grading of eggs and meat.
Prevention and control of diseases: Common bacterial, fungal, viral and protozoan diseases.
Parasites: Nematode.
Arthropod pests: Ticks, mites and their control. Marketing problems: quality of eggs, grading of eggs and meat.

References:

1. Harbansingh and Moore (1982) – Livestock and Poultry Production, Prentice Hall of India Private Ltd., New Delhi 110 001.
2. N.S.R. Sastry, C.K. Thomas and R.A. Singh – Farm animal management and poultry production, Vikas Publishing House Private Ltd., Delhi.