Agenda

Board of studies for B.Sc., Advanced Zoology and Biotechnology – June 2019

1. The syllabus for B.Sc Advanced Zoology and Biotechnology has been designed as per the guidelines provided by Tamil Nadu State Council for Higher Education (TANSCHE).
2. Mandatory papers and Electives paper are selected as per the suggestions provided.

Members:

1. Dr.T.Kumaran

Dr. T. KUMARAN, M.Sc., M.Phil., Ph.D.,
HEAD OF THE DEPARTMENT OF
ADVANCED ZOOLOGY & BIOTECHNOLOGY,
Dr. AMBEDKAR GOVT. ARTS COLLGE
VYASARPADI, CHENNAI - 600 039.

2. Dr. K.Sivakumari

Dr. K. SIVAKUMARI
M.Sc.,M.Phil.,Ph.D.,F.A.Z.,
Professor and Head
Department of Zoology
Presidency College (Autonomous)
Chennai-600 005

3. Dr.M.G.Raghunathan

Dr. M.G. RAGUNATHAN,
M.Sc., M.Phil., Ph.D.
Associate Professor & Head
Dept. of Adv. Zoology & Biotechnology
Guru Nanak College, Chennai - 600 042.

4. Dr.A.Premalatha

5. Dr P.Arumugam

Dr. P. ARUMUGAM, M.Sc.,M.Phil.,Ph.D.,
Director
ARMATS BIOTEK TRAINING & RESEARCH INSTITUTE
No. 14/18C, Mettu Street, (Link Road),
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6. M. Nandhini

MINUTES OF THE MEETING HELD ON 10.6.2019

(Board of studies for B.Sc., Advanced Zoology and Biotechnology)

The board of studies decided the following recommendations / modifications/ deletions/ additions be made to B.Sc Advanced Zoology and Biotechnology syllabus with effect from 2019-20 onwards.

1. Study of classification of animals upto order with examples .
2. Specific topics were emphasized in biochemistry- Carbohydrates, Lipids and Proteins
3. Measurement of cell to be included. Enumeration of RBC and WBC to be done individually in Cell biology practicals
4. Modifications in Biotechnology and Developmental Biology practicals suggested
5. Fish- Urinogenital system deleted from Practicals, mounting of Mouth parts of honey bee added
6. Water cycle and phosphorus cycle added to environmental biology
7. Endocrine glands and endocrine disorders specified in Animal physiology
8. Theories on embryogenesis, laws of cleavage and IUI added in Developmental biology
9. Geological time scale to be studied in detail
10. Primary and Secondary data, Methods of data collection, Standard error included. Simple problems were suggested
11. General characters of invertebrate phylum included. Paramecium, Leucosolenia and Neries were included in type study .
12. Fish- Digestive system and Shark - Placoid scales included in allied practicals
13. Suggestions made to include a few spotters for Allied Zoology practicals from syllabus based on allied zoology paper-ii
14. Minerals and Vitamins to be specified in NME paper Public Health and Hygiene

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6. M. Nandhini

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Dr. Ambedkar Government Arts College (Autonomous)
Vyasarpadi, Chennai-600 039.

Department of Advanced Zoology and Biotechnology

Minutes of the meeting of Board of Studies (UG Zoology) held on 10.6.2019
The following members were present in the meeting

S.No	Name of the Members	Designation & Institution	Signature
1	Dr.T.Kumaran Convenor	Assistant Professor & Head Department of Advanced Zoology and Biotechnology Dr.Ambedkar Govt. Arts College Vyasarpadi, Chennai-39.	
2	Dr. K.Sivakumari University Nominee	Associate Professor & Head PG & Research Dept. of Zoology Presidency College (Autonomous), Chennai-600005	
3	Dr.M.G.Raghunathan Subject Expert I	Associate Professor & Head PG Department of Zoology Guru Nanak College (Autonomous) Chennai-600045	
4	Dr.A.Premalatha Subject Expert II	Associate Professor & Head Department of Advanced Zoology and Biotechnology Meenakshi College for Women (Autonomous) Kodambakkam, Chennai-24.	
5	Dr P.Arumugam Industrialist	Director Armot Biotech Maduvankarai Ekattuthangal, Chennai.	
6	M.Nandhini Alumni	20,A block,Udayasuriyan Nagar,Vyasarpadi, Chennai 39	M. Nandhini

Dr.Ambedkar Government Arts College (Autonomous)
Vyasarpadi, Chennai-600 039.

Department of Advanced Zoology and Biotechnology

The following resolutions were adopted in the meeting 10.6.2019

RESOLVED that the draft syllabi proposed for B.Sc., Advanced Zoology & Biotechnology by the Department of Advanced Zoology & Biotechnology were discussed on 10.6.2019_and approved for the students admitted from the academic year 2019-2020.

S.No	Name of the Members	Designation & Institution	Signature
1	Dr.T.Kumaran Convenor	Assistant Professor & Head Department of Advanced Zoology and Biotechnology Dr.Ambedkar Govt. Arts College Vyasarpadi, Chennai-39.	
2	Dr. K.Sivakumari University Nominee	Associate Professor & Head PG & Research Dept. of Zoology Presidency College (Autonomous), Chennai-600005	
3	Dr.M.G.Raghunathan Subject Expert I	Associate Professor & Head PG Department of Zoology Guru Nanak College (Autonomous) Chennai-600045	
4	Dr.A.Premalatha Subject Expert II	Associate Professor & Head Department of Advanced Zoology and Biotechnology Meenakshi College for Women (Autonomous) Kodambakkam, Chennai-24.	
5	Dr P.Arumugam Industrialist	Director Armot Biotech Maduvankarai Ekattuthangal, Chennai.	
6	M.Nandhini Alumni	20,A block,Udayasuriyan Nagar,Vyasarpadi, Chennai 39	M. Nandhini

Dr. Ambedkar Government Arts college (Autonomous), Vyasarpadi, Chennai-39.

Department of Zoology

Board of Studies Meeting held on 10th June 2019

List of Staff Members

S. no	Name of the staff members	Designation	Signature
1.	Dr. T. Kumaran	Head and Assistant professor	
2.	Mrs. I. Malaichelvi	Assistant professor	
3.	Dr. V. Mathivanan	Assistant professor	
4.	Dr. M. Sasikala	Assistant professor	
5.	Dr. T. Mathuram	Assistant professor	
6.	Dr. K. Samyappan	Assistant professor	
7.	Dr. S. Gladis Helen Hepsiba	Assistant professor	
8.	Dr. R. Saravanan	Assistant professor	
9.	Dr. N. Thirunavukkarasu	Assistant professor	

Dr. Ambedkar Government Arts College (Autonomous)

Vyasarpadi, Chennai - 600 039

(ACCREDITED BY NAAC 'B')

SYLLABUS

B.Sc., Degree (Advanced Zoology and Biotechnology)

Under Choice Based Credit System

(For candidates admitted from 2019-2020 onwards)

B.Sc. Advanced Zoology and Biotechnology
Course Structure under Choice Based Credit System
(For candidates admitted from the academic year 2019-2020 onwards)
FIRST YEAR
FIRST SEMESTER

Part	Sub code	Course Title	Inst. Hrs. / Week	Credit	Exam Hrs	Marks		Total marks
						Int.	Ext	
I	**19UAFTA1**	Language Course - I	6	3	3	25	75	100
II	**19UAFEN1**	English Course -I	4	3	3	25	75	100
III	**19UAAZC1**	Core Paper I - Invertebrata	6	4	3	25	75	100
III	-	**Major Practical**	3	-	*	-	-	-
III	**19UAPBA1**	Allied I- Allied Botany- Paper I	4	4	3	25	75	100
III	-	**Allied Botany - Practical**	3	-	*	-	-	-
IV	**19UAAZN1**	NME - Paper -I Economic Zoology	2	2	3	25	75	100
IV	**19UASBE1**	SS- I -Essentials of Language and Communication	2	3	3	40	60	100
		Total	**30**	**19**				**600**

SECOND SEMESTER

Part	Sub code	Course Title	Inst. Hrs. / Week	Credit	Exam Hrs	Int.	Ext	Total marks
I	**19UBFTA2**	Language Course - II	6	3	3	25	75	100
II	**19UBFEN2**	English Course -II	4	3	3	25	75	100
III	**19UBAZC1**	Core Paper II - Chordata -	6	4	3	25	75	100
III	**19UBAZC2**	Core Paper III - **Major Practical – I Invertebrata and Chordata**	3	4	3	40	60	100
III	**19UBPBA2**	Allied-II -Allied Botany- Paper II	4	4	3	25	75	100
III	**19UBPBA3**	**Allied Botany - Practical**	3	2	3	40	60	100
IV	**19UBAZN2**	NME -Paper- II Public Health and Hygiene	2	2	3	25	75	100
IV	**19UBSBE2**	SS II - Essentials of Spoken and Presentation skills	2	3	3	40	60	100
		Total	**30**	**25**				**800**

SECOND YEAR

THIRD SEMESTER

Part	Sub code	Course Title	Inst. Hrs. / Week	Credit	Exam Hrs	Marks		Total marks
						Int.	Ext	
I	**19UCFTA3**	Language Course - III	6	3	3	25	75	100
II	**19UCFEN3**	English Course - III	4	3	3	25	75	100
III	**19UCAZC1**	Core Paper IV- Cell Biology and Biochemistry	6	4	3	25	75	100
III	-	**Major Practical - II**	3	-	*	-	-	-
III	**19UCCHA1**	Allied –III - Allied Chemistry Paper I	4	4	3	25	75	100
III	-	**Allied Chemistry - Practical**	3	-	*	-	-	-
IV	**19UCSBE3**	SS III- Personality Enrichment	2	3	3	40	60	100
IV	**19UCEVS1**	Environmental Studies	2	2	3	25	75	100
		Total	**30**	**19**				**600**

FOURTH SEMESTER

Part	Sub code	Course Title	Inst. Hrs. / Week	Credit	Exam Hrs	Int.	Ext	Total marks
I	**19UDFTA4**	Language Course – IV	6	3	3	25	75	100
II	**19UDFEN4**	English Course – IV	4	3	3	25	75	100
III	**19UDAZC1**	Core Paper V- Genetics	6	4	3	25	75	100
III	**19UDAZC2**	Core Paper VI- **Major Practical – II-Cell biology and Genetics**	3	4	3	40	60	100
III	**19UDCHA2**	Allied IV- Allied Chemistry - Paper II	4	4	3	25	75	100
III	**19UDCHA3**	**Allied Chemistry - Practical**	3	2	3	40	60	100
IV	**19UDSBE4**	SS IV-Computer basics and Office Automation	2	3	3	40	60	100
IV	**19UDVBE1**	Value Based Education	2	2	3	25	75	100
V	**19UDEXT1**	Extension activities	-	1	-	-	-	-
		Total	**30**	**26**				**800**

THIRD YEAR

FIFTH SEMESTER

Part	Sub code	Course Title	Inst. Hrs. / Week	Credit	Exam Hrs	Marks		Total marks
						Int.	Ext	
III	**19UEAZC1**	Core Paper VII- Biotechnology	4	4	3	25	75	100
III	**19UEAZC2**	Core Paper VIII- Microbiology and Immunology	5	4	3	25	75	100
III	**19UEAZC3**	Core Paper IX- Environmental Biology	5	4	3	25	75	100
III	**19UEAZC4**	Core Paper X- Animal physiology	5	4	3	25	75	100
III	-	**Major Practical – III**	3	-	*	-	-	-
III	-	**Major Practical – IV**	3	-	*	-	-	-
III	**19UEAZE1**	Elective I -Biostatistics and Biological Techniques	5	5	3	25	75	100
		Total	**30**	**21**				**500**

SIXTH SEMESTER

Part	Sub code	Course Title	Inst. Hrs. / Week	Credit	Exam Hrs	Int.	Ext	Total marks
III	**19UFAZC1**	Core Paper XI- Developmental Biology	5	4	3	25	75	100
III	**19UFAZC2**	Core Paper XII- Evolution	4	4	3	25	75	100
III	**19UFAZC3**	Core Paper XIII- Applied Zoology	5	4	3	25	75	100
III	**19UFAZC4**	Core Paper XIV- **Major Practical – III- Animal Physiology, Biotechnology and Developmental biology**	3	4	3	40	60	100
III	**19UFAZC5**	Core Paper XV- **Major Practical – IV-Environmental Biology, Immunology and Microbiology**	3	4	3	40	60	100
III	**19UFAZE1**	Elective II-Medical Laboratory Techniques	5	5	3	25	75	100
III	**19UFAZE2**	Elective III-Aquaculture	5	5	3	25	75	100
		Total	**30**	**30**				**700**

* Examination at the end of even semester

ELECTIVE SUBJECTS (For 3rd year major Zoology students)

V Semester	VI Semester
Elective -I	**Elective - II & III**

Biostatistics and Biological Techniques	Medical Laboratory techniques
	Aquaculture

ALLIED ZOOLOGY (For B.Sc. Chemistry and PBPBT first year students)

1.Allied Zoology - I
2.Allied Zoology - II
3.Allied Zoology - Practical

NON MAJOR ELECTIVE COURSE (For 1ST year students)

I Semester	II Semester
Non Major Elective -I	**Non Major Elective- II**
Economic Zoology	Public Health and Hygiene

B.Sc- CORE COURSE COMPONENTS

PART -I – LANGUAGE

PART-II- ENGLISH

PART-III- CORE MAJOR (THEORY AND PRACTICALS) AND ELECTIVES

PART-III - CORE ALLIED (THEORY AND PRACTICALS)

PART- IV- NON- MAJOR ELECTIVES

PART -IV- SOFT SKILLS

PART- IV- ENVIRONMENTAL STUDIES

PART- IV- VALUE EDUCATION

PART-V- EXTENSION ACTIVITIES

PRACTICAL EXAMINATION FOR MAJOR AND ALLIED

***Practical Examination will be conducted during the end of EVEN SEMESTER (second , fourth and sixth semesters). Each practical with 3 hours duration.**

MARK DISTRIBUTION (END SEMESTER PRACTICAL EXAMINATION)

PRACTICALS : 50 MARKS

RECORD: 10 MARKS

TOTAL: 60 MARKS

QUESTION PAPER PATTERN FOR PRACTICALS

1.MAJOR PRACTICAL QUESTION – 20 MARKS

2.MINOR PRACTICAL QUESTION - 15 MARKS

3.SPOTTERS 5 X 3 = 15 MARKS

4.RECORD 10 MARKS

QUESTION PAPER PATTERN FOR THEORY (MAJOR , ALLIED AND NME)

(For candidates admitted from the academic year 2019-20 onwards)

Time: 3 hrs

Marks :75

SECTION A (10 X 2 = 20 marks) 10 OUT OF 12 QUESTIONS TO BE ANSWERED

ANSWER ALL QUESTIONS. EACH ANSWER SHOULD NOT EXCEED 50 WORDS

QUESTIONS 1 TO 10 (TWO QUESTIONS FROM EACH UNIT) AND QUESTION 11 AND 12 FROM ANY UNIT

SECTION B (5 X 5 = 25 marks) 5 OUT OF 8 QUESTIONS TO BE ANSWERED

ANSWER ANY FIVE QUESTIONS. EACH ANSWER SHOULD NOT EXCEED 200 WORDS

QUESTIONS 13.14,15,16,17 (ONE QUESTION FROM EACH UNIT) AND QUESTIONS 18,19, 20 FROM ANY UNIT

SECTION C (3 X 10 = 30 marks) 3 OUT OF 5 QUESTIONS TO BE ANSWERED

ANSWER ANY THREE QUESTIONS. EACH ANSWER SHOULD NOT EXCEED 500 WORDS

QUESTIONS 21, 22, 23, 24, 25 (ONE QUESTION FROM EACH UNIT)

SEMESTER-I
CORE PAPER I - INVERTEBRATA

SUB CODE : 19UAAZC1

Objectives

1. To understand the taxonomy, relationship and evolution of animals.

2. To identify the animals of invertebrate phyla and to recognize their distinguishing features.
3. To appraise the diversity of animals in a phylogenetic context.
4. To understand how different body designs solve biological problems related to physiological and environmental challenges.
5. To develop an appreciation for the role of invertebrates in biological communities, ecological interactions, and conservation problems

Unit I: Classification of Animal kingdom and Protista

Concept of five kingdom classification. Introduction to Protista and Animal kingdom - Systems of classification and nomenclature - levels of organization - Types of coelom and symmetry.

Protista : General characters of Protista and Classification (upto order) with examples.

Type study**:** Paramecium

General topics**:** Protozoan parasites - Life cycle of *Plasmodium* and *Entamoeba histolytica*, Locomotion in Protozoa, Nutrition in Protozoa

UNIT-II : Porifera and Coelenterata

Phylum Porifera : - General Characters and Classification (upto order) with examples

Type Study- Leucosolenia

Phylum Coelenterata- General Characters and Classification (upto order) with examples

Type Study-Obelia geniculata

Salient features of *Ctenophora*

General topics - Canal system in Sponges, Polymorphism in coelenterates, Types of Corals and Coral reefs

UNIT-III: Platyhelminthes and Aschelminthes

Phylum Platyhelminthes -General Characters and Classification (upto order) with examples - Type Study- Taenia solium

Phylum Aschelminthes -General Characters and Classification (upto order) with examples - Type Study- Ascaris

General Topics - Nematode parasites , Parasitic adaptations

Unit – IV: Arthropoda and Annelida

Phylum Annelida - General Characters and Classification (upto order) with examples

Type Study- Neries

Phylum Arthropoda - General Characters and Classification (upto order) with examples

Type Study- Prawn

General Topics : Metamerism in Annelida, Mouth parts of insects, Peripatus and its affinities, Custacean larva and their significance, Salient features of Arachnida

Unit – V: Mollusca and Echinodermata

Phylum Mollusca: -General Characters and Classification (upto order) with examples

-Type study – Freshwater mussel

Phylum Echinodermata -General Characters and Classification (upto order) with examples

-Type Study- Asterias (Star fish)

General Topics: Torsion in gastropods , Economically important Mollusca. Larval forms of Echinoderms

Books for reference (Use latest Editions)

1. Barnes, R.D. Invertebrate Zoology (1982) 6th Edition. Holt Saunders International Edition.
2. Ekambaranatha Ayyar and T.N. Ananthakrishnan, Manual of Zoology Vol – I , Part I & II S.Viswanathan Pvt. Ltd. Chennai..
3. Kotpal RL, Agarwal SK & Khetarpal RP Invertebrates, Rastogi Publications, Meerut.
4. Jordan and Verma Invertebrate Zoology S. Chand and Co, New Delhi
5. Anderson TA, Invertebrate Zoology, Oxford University Press, New Delhi.
6. Barrington EJW, Invertebrate Structure and Functions. English Language Book Society.
7. Hyman LH, The Invertebrates (6 Volumes). McGraw-Hill Companies Inc. NY

SEMESTER –II

CORE PAPER- II : CHORDATA

SUB CODE : 19UBAZC1

Objectives

1. To understand the taxonomy, relationship and evolution of animals.

2. To identify the classes of vertebrate animals and recognize their distinguishing features
3. To get an idea of adaptation and importance of chordates.
4. To identify any vetebrate animal at basic level

UNIT I Prochordates and Pisces

General Characters of Prochordates and classification ; Chordates - Classification (upto order) with examples , Agnatha- General characters, Salient features Cyclostomes

Prochordates and Pisces : Type study: Amphioxus , Scoliodon

General Topics: Affinities of Hemichordates, Retrogressive metamorphosis in Ascidia , Accessory respiratory organs in fishes, Migration in fishes

UNIT II Amphibia

Amphibians-General characters and classification upto order with examples

Type study- Frog

General Topics : Parental care in Amphibians, Metamorphosis in Amphibians, Limbless Amphibians

UNIT III Reptilia

Reptilia-General characters and classification upto order with examples

Type study- Calotes

General Topics : Skull of Reptiles, Identification of Poisonous and non poisonous snakes of south India, Poison Apparatus and Biting mechanism

UNIT IV Aves

Aves- General characters and classification upto order with examples

Type study- Pigeon

General Topics : Flight adaptations in birds, Migration in birds, Salient features of Archaeopteryx, Flightless birds

UNIT V Mammals

Mammals - General characters and classification upto order with examples

Type study- Rabbit

General Topics :

Prototherians (Egg laying) mammals,

Diversity of Marsupials (Pouched mammals),

Dentition in Mammals

Aquatic adaptations in mammals

Books for references (Use latest Editions)

1. Ekambaranatha Ayyar and T.N. Ananthakrishnan, Manual of Zoology Vol – II, S. Viswanathan Pvt. Ltd. Chennai..
2. Kotpal RL Mordern Text Book of Zoology Vertebrates, Rastogi Publications, Meerut.
3. Young, J.Z. 1950. Life of Vertebrates. Clarendon Press, Oxford, UK.
4. Pough Harvey F, Christine M .Janis and John B. Heiser .2002. Vertebrate Life, Pearson Education Inc. New Delhi.
5. Verma PS, Chordate Zoology, S Chand Publishers, New Delhi

CORE PAPER III

PRACTICAL I: INVERTEBRATA AND CHORDATA

SUB CODE : 19UBAZC2

I. DISSECTION

1. Cockroach - Digestive system and Nervous system
2. Prawn- Nervous system
3. Fish - Digestive system

II. MOUNTING

1. Mouth parts of Cockroach, honey bee and Mosquito
2. Earthworm-Body setae
3. Prawn- appendages (maxilla, mandible, maxillepeds and uropod)
4. Shark- Placoid scales

III . SPOTTERS

A.Classify giving reasons

Paramecium, Scypha, Obelia, Taenia solium, Nereis, Prawn, Sea star, Balanoglossus, Amphioxus, Shark, Frog, Calotes**,** Pigeon, Rabbit

B- Draw labeled sketches:

Obelia medusa, Tape worm T.S, Nereis T.S, Bipinnaria larva

C- Comment on Biological significance:

Entamoeba, Paramecium-Conjugation, Plasmodium, Ascaris, Madrepora, Tubiphora, Heteronereis. Peripatus, Nauplius larva, Glochidium larva, Echineis, Exocetus, Hippocampus, Hyla, Sea snake, Cobra, Russel's viper, Bat

D – Relate structure and function:

Sponge – Spicules . Sponge – Gemmule. *Taenia* – Scolex Neries – Parapodium

Penaeus – Petasma. Starfish - Tube feet, Quill feather of pigeon

E-Osteology and Dentition

Frog - Skull, Vertebral column, Pectoral girdle , Pelvic girdle, Fore limb and Hind limb

Pigeon- Synsacrum, Rabbit – Dentition

SEMESTER – III

CORE COURSE IV : CELL BIOLOGY AND BIOCHEMISTRY

SUB CODE : 19UCAZC1

Objectives

1. To give an insight to the ultra-structure of cellular components.
2. To give an idea about the biochemistry.

3. To give a clear idea about how the basic metabolism occur inside the cell.
4. To Know the structures of biomolecules, membranes and organelles.
5. To develop an idea how cellular components are used to generate and utilize energy in cells.
6. To explain the cellular components underlying mitotic cell division.

UNIT – I : Cell structure, Plasma membrane and Cell organelles

Cell theory – Prokaryotic and eukayotic cell , Plasma membrane – Models, ultra structure and functions. Cell junctions - Ultrastructure and functions of Endoplasmic reticulum, Golgi complex, Lysosomes and Centrioles

UNIT – II: Mitochondria, Nucleus and Cell division

Mitochondria- Ultrastructure and functions, Structure and functions of Nucleus and Nucleolus – Cell division - Mitosis, Meiosis and Interphase nucleus. Cell cycle

Cancer Biology – Types of cancer and properties of cancer cells , Apotosis

UNIT – III : Chromosomes, DNA and Protein synthesis

Chromosomes – Structure, types, Giant chromosomes (Polytene and lampbrush), DNA structure and function - Chromatin – Nucleosome – DNA Replication in prokaryotes and eukaryotes

Ultra structure, function and types of ribosomes, Types and Structure of RNA - Genetic code- Protein synthesis in prokaryotes – Post transcriptional modifications (Outline)

UNIT – IV: Biomolecules and Enzymes

Classification of Carbohydrates – Monosaccharides, Oligosaccharides, Disaccharides, Polysaccharides. Structure of carbohydrates with reference to (glucose, fructose, lactose, maltose and sucrose).

Classification of amino acids and proteins (Fibrous, Globular, Simple, Conjugated) - Structure of proteins (Primary, secondary and tertiary)

Classification of lipids - Simple lipids (Fats and Waxes), Compound lipids (Phosholipids and Glycolipids) and Fatty acids (Saturated and Unsaturated)

Enzymes- Classification and Mechanism of enzyme action - Factors influencing enzyme action, Enzyme Inhibition (Competitive and Non competitive) .

UNIT –V: Cell Metabolism

Carbohydrate Metabolism - Glycolysis and Krebs cycle. Electron transport chain and formation of ATP. Glycogenesis, Glycogenolysis, Gluconeogenesis. Deamination and Transamination. Beta-oxidation of fatty acids.

Books For Reference (latest editions): Cell Biology

1. Karp, G. 2010. Cell And Molecular Biology: Concepts And Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. And De Robertis, E.M.F. 2006. Cell And Molecular Biology. 8th Edition. Lippincott Williams And Wilkins, Philadelphia.
3. Cooper, G.M. And Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th Edition. Asm Press & Sunderland, Washington, D.C.; Sinauer Associates, Ma.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. And Bertoni, G. P. 2009. The World Of The Cell. 7th Edition. Pearson Benjamin Cummings Publishing, San Francisco.
5. Verma,P.S. And Agarwal,V.K. Cytology 8th Edition S.Chand And Co.
6. Gupta P.K. – Cell And Molecular Biology, Rastogi Publication, Meerut
7. Veer Bala Rastogi – Introduction To Cell Biology, Rastogi Publication, Meerut

Books For Reference (latest editions): Biochemistry

1.J.L.Jain 2009.Fundamentals of biochemistry. Nitin, Sunjay Jain Books.

2. E.E.Conn and P.K.Stump. Outlines of Biochemistry- John wiley and Sons publications.

3. Harper's Illustrated Biochemistry-28th Edition: McGraw-Hill Medical;

4.Veerakumari, L. 2005 Biochemistry, MJP Publishers, Chennai

5.Ambika Shanmugam, Biochemistry for medical students

SEMESTER – IV

CORE PAPER V: GENETICS

SUB CODE : 19UDAZC1

Objectives

1. Students will learn the basic principles of inheritance at the molecular, cellular and organismal levels.
2. Students will understand causal relationships between molecule/cell level phenomena ("modern" genetics) and organism-level patterns of heredity ("classical" genetics).
3. Students will learn the mechanism of Mutation and will able to understand how mutations bring changes in an organism.

UNIT – I :Mendelian Genetics and Gene Interactions

Mendelian inheritance – Laws of Mendel – Monohybrid and Dihybrid experiments - Back and Test Cross. Interaction of genes – Complimentary and Supplementary factors, Epistasis (Dominant and Recessive) and Lethal genes in man - Multiple alleles- Blood group inheritance in man. Polygenic inheritance (Skin colour in man) Complete, Incomplete dominance (Feather colour in fowl) and Co-dominance (ABO blood group)

UNIT – II : Linkage and Crossing over

Linkage - Complete and Incomplete linkage - Linkage in *Drosophila*- linkage groups - Crossing Over- Types and Mechanism, Chromososme map and its construction

UNIT – III : Inheritance

Sex determination - Chromosomal theory, Barr bodies, Genic balance mechanism and environmental determination. Sex linked Inheritance - X and Y linked inheritance in man. Chromosomal variation (Euploidy, Aneuploidy, Monosomy and Nullisomy). Syndromes (Down's, Kleinfelter's and Turner's syndromes). Non disjunction - Types, Gynandromorphs. Cytoplasmic inheritance - Plasmagenes - Shell coiling in *Limnaea* and Kappa particles in *Paramecium*

UNIT – IV:Mutation and Chromosomal Abberations

Gene concept - Cistron, Recon, Muton, Split gene, Promoter, Repetitive DNA , Transposons - Gene regulation - Lac operon model. Mutation - Types of mutation- Molecular basis of mutation -Single gene mutation - Sickle cell anemia - Physical and chemical mutagens. Chromosomal aberrations. Inborn errors of metabolism (Phenylketoneuria, Alkatonuria and Albinism)

UNIT – V Microbial and Applied Genetics

Microbial genetics - Bacterial genome - Transformation – Conjugation- F factor -Sexduction -

Transduction - Generalised and Specialised - Plasmids

Applied Genetics – Inbreeding – Out-breeding - Heterosis - Eugenics, Euphenics and Euthenics. Pedigree analysis- Genetic counselling.

Books For Reference (latest editions):

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). 8th Ed. Principles Of Genetics. Wiley India.
2. Snustad, D.P., Simmons, M.J. (2009). Principles Of Genetics. V Edition. John Wiley And Sons Inc.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. 9th Edition. Benjamin Cummings.
4. Russell, P. J. (2009). Genetics- A Molecular Approach. 3rd Edition. Benjamin Cummings.
5. Meyyan RP Fundamentals of Genetics, Saras Publication, Nagercoil
6. Primrose SB, Twyman R. Principles of gene manipulation and genomics. John Wiley & Sons
7. Immanuel,C and Vincent ,S., Applied Genetics. MJP Publishers
8. ,P.S.Verma and Agarwal,V.K. 2004. Genetics. 8 Th Edition S.Chand and Co.
9. Strickberger MW, Genetics, Pearson publishers

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CORE PAPER VI

PRACTICAL II - CELL BIOLOGY AND GENETICS

SUB CODE : 19UDAZC2

CELL BIOLOGY

1. Use of Microscopes- Light microscope, Camera Lucida
2. Micrometry – Stage and Ocular Micrometer – Measurement of an organism
2. Human Blood smear preparation – To study types of blood cells
3. Differential Count of WBC -To study different types of leucocytes
4. Counting of RBC and WBC using Haemocytometer
5. Mounting of buccal epithelium and observing living cells using vital staining.
6. Mitosis in Onion root tip squash preparation to observe cell division
7. Study of prepared slides of histology

a. Columnar epithelium	b. Ciliated epithelium	c. Glandular
d. Connective tissue	e. Cartilage T.S.	f. Bone T.S.
g. Cardiac tissue	h. Striated muscle	i. Non striated muscle
j. Nervous tissue	k. Ovary T.S.	l. Testis T.S.

GENETICS

1. Mendelian Inheritance – Monohybrid and Dihybrid cross using colour beads
2. Study of Mendelian traits in Human – Attached ear lobe, Rolling tongue, Widow's peak, Bent little finger (Expression of dominant and recessive gene to be studied among the students of the class and results tabulated)
3. Gene Interaction – Straight and Curly hair trait (Expression of dominant and recessive gene to be studied among the students of the class and results tabulated)
4. Morphology of male and female Drosophila - Sex identification of Drosophila- Sex comb and abdominal segment
5. Observation of common mutants of Drosophila – Vestigial wing, Bar eye, White eye, Ebony body (Photographs / slides)
6. Identification of human blood groups and its inheritance
7. Squash preparation of polytene chromosome from salivary gland of Chironomous larva
8. Study of Normal Karyotype – Human Male and Female- Photographs

SEMESTER V

CORE PAPER VII: BIOTECHNOLOGY

SUB CODE : 19UEAZC1

Objectives

1. The objective of this course is to give a firm foundation in the fundamentals of modern Molecular techniques.
2. The course will give an insight to the mechanism of Gene Expression and Regulation.
3. The course will give a nut shell idea of various protocols followed in Biotechnology in relation to animal science.
4. The course will give an insight to the current applications of biotechnology and advances in the different areas like medical, microbial, environmental, bioremediation, agricultural, animal and forensics.
5. The learner will be able to understand how microbes is used engineer various genes.

UNIT I - Recombinant DNA technology

Introduction to Biotechnology - Tools used in genetic engineering- Restriction enzymes and ligases. Cloning Vectors – Types, plasmids (pBR 322,), Linkers and adaptors , Gene cloning in *E.coli*. Screening of recombinants.

Applications of Recombinant DNA technology in medicine - Commercial Production of Insulin. Human Genome Project

UNIT II - Techniques in Biotechnology

DNA isolation methods- Polymerase chain reaction technique and its application- Southern, Western and Northern Blotting techniques and its application. DNA finger printing and its application. RAPD, RFLP, FISH , DNA probes and diagnosis

UNIT III - Applications of Biotechnology

Production of single cell protein from microbes. Production of alcoholic beverages and organic acids.

Biofertilizers- Rhizobium, Azotobacter. Biopesticides (Bacillus thuringiensis). Biogas production – Biofuels - Biopolymers (Xanthan Gum, PHB).

Biological process for wastewater treatment. Bioremediation of Xenobiotics, hydrocarbons, Oil spills (Superbugs)

Transgenic animals and their advantages

UNIT IV- Enzyme Biotechnology

Microbial production and application of enzymes – Production of industrial enzymes (proteases, amylases, lipases, cellulases). Ribozymes - Artificial enzymes - Immobilization of enzymes - Methods and its application. Biosensors

UNIT V- Animal tissue culture

Animal cell tissue culture – Applications, Requirements and Culture media – Primary culture. Steps involved in mammalian cell culture- *He la* and *W I38* cell lines – Maintenance of cell lines – Techniques and Application of organ culture. Animal cloning – Dolly.

Cryobiology – Methods of cryopreservation.

Books for reference (latest editions):

1. Glick, B.R. And Pasternak, J.J. (2009). Molecular Biotechnology- Principles And Applications of Recombinant DNA. 4th Edition. ASM Press, Washington, Usa.
2. Butler, M. (2004). Animal Cell Culture and Technology: The Basics. Ii Edition. Bios Scientific Publishers.
3. Brown TA. Gene cloning. London: Chapman and Hall; 1995.
4. Primrose SB, Twyman R. Principles of gene manipulation and genomics. John Wiley & Sons

CORE PAPER VIII : MICROBIOLOGY AND IMMUNOLOGY

SUB CODE : 19UEAZC2

Objectives

1. The course is intended to make an awareness of the students about the classification, diversity, organization, application and pathogenicity of the microorganisms existing the ecosystem.
2. The course will help the students to learn about the various microbial culture techniques and its handling.
3. The course will give an idea that how microbes are used in various industries for generation of various products related to day to day life.
4. The course will give an insight to the cellular components involved in the immunity.
5. The course will give an awareness of the mechanism, types and concepts regarding immune response.

UNIT – I- Classification of microorganisms and Bacterial cell structure

Scope of Microbiology - Whittaker's Five- kingdom concept - Classification of microorganisms, Salient features of Bacteria, Virus, Algae, Fungi. Ultra Structure of bacterial cell- chemical composition of Bacterial cell wall – Structure of bacteriophage- Viroids and Prions

UNIT –II- Bacterial growth and culture

Sterilization techniques - Culture of bacteria - Types of culture media - characteristics of bacterial colonies - methods of maintenance of culture. Bacterial growth – Growth curves. Factors influencing bacterial growth. Staining techniques- Simple and Differential staining (Gram, Acid-fast, Flagellar)

UNIT – III- Applied Microbiology

Bio- fermenters and its role in mass culture – Methods of fermentation - Basics concepts of Probiotics - Culture of yeast and its economic importance

- Microbes in various food products - Milk products (Fermented Milk curd, butter and cheese) , Preservation of milk. Microbes in Food spoilage

Microbial Nitrogen fixation

UNIT – IV: Components of immune system

Immunity – Types - Innate and Acquired Immunity, Cells of immune system - Primary and

secondary lymphoid organs

Antigens - Epitopes, Paratope, Haptens , Adjuvants . Immunoglobulins –Types, Structure and biological functions

Primary and secondary Immune Response . Antigen-antibody reaction (Agglutination, Precipitation, Complement fixation)

Production and applications of monoclonal antibodies.

UNIT – V- Mechanism of Immune action

Mechanism of Cell mediated and Humoral immunity (Activation of T cell and B cell)

Basic concepts of major histocompatibility complex.- Basic properties and functions of Cytokines, Interferons and complement proteins. Types of hypersensitivity. Concepts of autoimmunity and Immunodeficiency. Vaccines–Types of vaccines- Immunization schedule

Reference Books:

1. Pelczar Jr. M.J. Chan E.C.S. and Kreig N.R. 2001 Microbiology – McGraw Hill Inc. NewYork.
2. Stainer R.Y., Ingraham J.L., Wheelis M.L. and Painter P.R. 1999 General Microbiology – Macmillan Education Ltd. London.
3. Ahmed, N., F.M.Qureshi and O.Y. Khan, 2001. Industrial environmental Biotechnology, Horizon Press.
4. Roitt I.M. 2000. Essential Immunology. Blackwell Scientific Publishers.
5. Chakravarthy, A. K.1996. Immunology, Tata Mc Graw Hill, New Delhi.
6. Kuby, J. 1999, Immunology W.H. Freeman and Company, New York.
7. Dubey RC and Maheshwari DK, A Textbook of Microbiology, S. Chand Publishers, New Delhi.
8. Mani A, Selvaraj A.M , Narayanan L.M , Arumugam A, Microbiology, Saras Publication, Nagercoil.
9. Willey JM, Sherwood L, Woolverton CJ. Prescott's microbiology. Singapore: McGraw-Hill.
10. Delves PJ, Martin SJ, Burton DR, Roitt IM. Essential immunology. John Wiley & Sons.

CORE PAPER IX- ENVIRONMENTAL BIOLOGY

SUB CODE : 19UEAZC3

Objectives

1. To develop awareness about the environment and the interaction of various components.
2. To understand about various ecosystems.
3. To make an awareness about various effects of pollution and its management.
4. To create an awareness about the biodiversity and need for its conservation.

UNIT – I : Components of Ecosystem

Components of ecosystem: Environmental factors - Abiotic factors – Soil, Light and Temperature as ecological factors. Limiting factors- basic concepts - Leibig's law of minimum - Shelford's law of tolerance

Biotic factors – Animal relationships – Symbiosis, Commensalism, Mutualism, Antagonism, Predation, Parasitism and Competition.

UNIT – II : Nutrient cycles and Ecosystem Interactions

Biogeochemical cycles – Water, Nitrogen, Sulphur , Carbon, Phosphorus and Oxygen.

Ecosystem – Pond ecosystem – Primary and secondary production – Food chain – Food web – Trophic levels – Energy flow – Ecological Pyramids

UNIT-III : Population and Community Ecology

Community Ecology – Types of communities – Characteristics of community – Stratification – Ecotone – Edge effect – Ecological niche – Ecological succession.

Population Ecology - Characteristics affecting population –Density dependent factors - Population dynamics and Growth curves

UNIT – IV: Habitat Ecology and Waste Management

Habitat Ecosystem: Characteristic features and faunal adaptations in Freshwater (Lotic and Lentic), Marine, Estuarine, Mangrove, Tundra, Savanna, Caves, Forest and Desert ecosystems.

Significance and Conservation of wetlands, Ecological effects of dams, hydroelectric projects

Management of Solid waste, Plastic waste, Medical waste and e-waste.

UNIT – V : Biodiversity Conservation and Management

Wild life conservation and management - Significance, causes of extinction, Conservation of Indian Endangered species and threatened species- Red data book- IUCN, WWF, CITES. Biodiversity hot spots in India. Brief out lines of Indian laws of conservation. Community reserves, Biosphere reserves, National parks , Sanctuaries and Tiger reserves in India. Human animal conflicts.

Green chemistry – Designing a green synthesis - Basic principles of green chemistry. Organic farming and its merits

Books for references (Use latest Editions)

1. Verma PS, & Agarwal VK, Environmental Biology: Principles of Ecology, S Chand Publishers, New Delhi.
2. Sharma PD, Elements of Ecology, Rastogi Publications, Meerut.
3. Chapman JL & Reiss MJ, Ecology: Principles and Applications, Cambridge University Press, New Delhi.
4. Odum EP, Fundamentals of Ecology, W.B Saunders College Publishing, Philadelphia.
5. Caughley G, Sinclair AR. Wildlife ecology and management. Blackwell Science.
6. Divan S, Rosencranz A. Environmental law and policy in India: Cases, materials and statutes. New Delhi: Oxford University Press

CORE PAPER X: ANIMAL PHYSIOLOGY

SUB CODE : 19UEAZC4

Objectives

1. To familiarise students with the principles and basic facts of Animal Physiology.
2. To give students an insight about the molecular and cellular basis of physiological functions in animals.
3. To give an idea about the regulation of organ system functions in a whole animal using a conceptual model of feedback to explain homeostasis.
4. To create an awareness to the students about how the structure-function relationships synchronise along with the molecular signals

Unit-I : Nutrition and Respiration

Nutrition -–.Nutrients- Minerals – Macrominerals (Phosphorus, Calcium, Sodium and Potassium) Microminerals- (Zinc, Selenium, Cobalt, iron, iodine, Magnesium) . Vitamins – Fat and Water soluble vitamins- Biological functions and their deficiency. Types of nutrition. Digestion and absorption of carbohydrates, proteins and fats in the alimentary canal of man.

Respiration : Respiratory pigments- structure of haemoglobin, Transportation of gases - Bohr effect - Regulation of respiration - bronchitis, asthma - Physiological effects of smoking

UNIT II : Circulation and Excretion

Blood- composition and functions, Mechanism of blood clotting. Types of Hearts – Heartbeat and pace maker – Cardiac cycle – ECG - Pulse and blood pressure.

Cardiac abnormality- Atherosclerosis, myocardial infarction, angiogram, angioplasty - Lymph

Excretion : Excretory products, Urea cycle , Nephron structure and mechanism of urine formation in mammals,. Osmo-regulation in fishes.

Renal disorders – Nephritis, renal calculi. Dialysis and kidney transplantation

UNIT III : Muscle and Nerve Physiology

Properties of Muscle - Types of muscles - Ultra structure of striated muscle fibre, muscle proteins - rigor mortis - Physiological and biochemical events in muscle contraction.

- Structure of Neuron - types of neurons - nerve impulse propagation through myelinated and non-myelinated nerve fibres. Neurotransmitters - Reflex action - Nerve disorders - epilepsy, Alzheimer’s disease, Parkinson’s disease

Unit IV : Sensory Physiology

Sense organs - Receptors - Classification of receptors- Structure of eye, physiology of vision, visual elements and pigments, photo chemistry of vision - Eye defects – myopia, hyperopia, presbyopia, astigmatism, cataract - Structure of ear and mechanism of hearing - Hearing impairments – deafness, labyrinthine disease - Chemoreceptors - Olfactory, gustatory and tactile sense organs

Unit V Endocrine glands and Reproductive Physiology

Endocrine glands in man – Pituitary, Thyroid, Parathyroid, Pancreas, Adrenals, Testis and Ovary – Hormones secreted, Biological functions and Disorders (Acromegaly, Gigantism, Dwarfism, Goitre, Graves disease, Cretinism, Myxedema, Diabetes mellitus) - Feed-back mechanism of endocrine axis. Hormones in pregnancy, parturition and lactation.

Books For Reference (latest editions):

1. Best And Taylor. (1990). Physiological Basis Of Medical Practice. Wilkins Co. ·
2. Eckert, R. And D. Randell. (1987). Animal Physiology, Cbs Publishers And Distributors N. Delhi. ·
3. Ganong, W.F. (2003), Review Of Medical Physiology, Mcgraw Hill, New Dellhi. ·
4. Guyton, A.C. (1981). Text Book Of Medical Physiology, W.B. Saunders Co. ·
5. Nagabhushanan, R., Kaobarkar M.S. And Sarojini, R. (1983). A Text Book Of Animal Physiology, Oxford Ibh Publishing Co., New Delhi.
6. Arumugam N &.Mariakuttikan A Animal Physiology Saras Publications, Nagercoil
7. Tyagi BS, Agarwal VK &Verma PS Animal Physiology S. Chand Publishers, New Delhi.

SEMESTER VI

CORE PAPER XI : DEVELOPMENTAL BIOLOGY

SUB CODE : 19UFAZC1

Objectives

1. To create an awareness to the students about the theories, concepts and basics of Developmental Biology.
2. To provide students about the idea of sex cells, fertilization, cleavage, differentiation and development of organs.
3. To gain knowledge on the induction, organizers and development of extra embryonic structures.
4. To provide adequate explanation to students about the late embryonic developments and post embryonic development and ageing.
5. To give an idea about teratogenesis, *invitro* fertilization, stem cells and amniocentesis.

UNIT – I : Gametogenesis and Fertilization

Theories of embryogenesis- Origin of germ cells - Gametogenesis - Process of Spermatogenesis , Types of Sperms. Structure of mammalian sperm. Oogenesis and structure of mammalian ovum- Types of eggs, Egg membranes (Primary, secondary and tertiary). Fertilization - mechanism, theories and significance. Parthenogenesis (Natural and Artificial) and its significance

UNIT – II : Blastulation and Gastrulation

.Cleavage - Planes and Patterns of cleavage - Factors controlling cleavage – Types of blastula - Blastulation Fate map and its construction, Gastrulation- Morphogenetic movements. Cleavage and gastrulation in chick and mammal (pig)

UNIT III : Organogenesis and Placentation

Organogenesis – Development of brain, heart, kidney and eye in frog. Extra embryonic membranes in chick, Placentation in mammals – Types and functions

UNIT IV : Applied Embryology

Organizer concept – Structure – mechanism of induction and competence. Nuclear transplantation - Teratogenesis – Regeneration: Types , events and factors.

Stem cells – Types, Embryonic stem cells and its significance.

UNIT –V : Human Reproduction and Reproductive Technology

Human reproduction – Puberty, adolescence, Menstrual cycle and menopause - Pregnancy – trimester development - Twins – Monozygotic and Dizygotic twins.

Birth Control - Contraception - Contraceptive methods

Causes for Infertility in human male and female - Assisted Reproductive Technology- Intrauterine insemination (IUI) in human, Artificial insemination (AI) in cattle, IVF – Embryo Transfer and its advantages in human, ICSI, ZIFT, GIFT - Amniocentesis

Books for reference (Use latest Editions)

1. Arumugam NA Text Book of Embryology, Saras Publication Nagercoil.
2. Balnisky BI An Introduction to Embryology, W.B. Saunders and Co.
3. BerrilNJ,Kars G(1986). Developmental biology, McGraw Hill
4. Gilbert SF (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
5. Majumdar NN Vetebrate embryology; Tata McGraw-Hill, New Delhi.
6. Verma PS and Agarwal VK Chordate Embryology, S. Chand Publishers, New Delhi.

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CORE PAPER XII- EVOLUTION

SUB CODE : 19UFAZC2

Objectives

1. To develop an idea of the adaptations and its significance in relation to evolution.
2. To make the students aware of how organic evolution occurred and how the various life forms come into existence.
3. To make the students aware of the historical periods during the evolution of earth and status of fauna during the particular age.
4. To develop an idea of the distribution of the various faunal components.
5. To develop an idea regarding the evolution of various vertebrate forms

UNIT I : Origin of life and Evidences for evolution

Origin of life - Abiogenesis, Biogenesis, Cosmic theory, Biochemical origin of life - Urey and Miller experiment. Evidences for evolution: Morphological and Anatomical, Embryological, Physiological and Biochemical, paleontological. Fossils & Fossilization - Living and Extinct Fossils

UNIT – II : Theories of Organic Evolution

Lamarkism, Neo Lamarkism, Darwinism, Neo Darwinism with reference to Industrial melanism. , Mutation theory and New version of mutation theory. Modern Synthetic theory of evolution. Natural selection. Modern concepts of evolutionary forces - Convergent and Divergent evolution

UNIT – III : Adaptation and Isolation

Adaptation - Adaptive radiation in Darwin's finches. Mimicry and Colouration (Types and significance).

Hardy- Weinberg equilibrium –- Factors affecting gene frequency. Genetic drift

Speciation- Types of speciation - Factors involved in Speciation. Isolation –Types and isolating mechanism.

UNIT – IV: Animal Distribution

Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities. Wallace line, Discontinuous distribution - Continental Drift. Geological time scale

UNIT - V Evolution of Higher forms

Evolutionary significance of Dipnoi – Origin of Amphibia – Golden age of Reptiles - Major types of Dinosaurs and reason for extinction, Affinities of Archaeopteryx, Evolution of Horse.and Evolution of Man - Fossil evidences- Cultural evolution of man

Books for references (Use latest Editions)

1. Verma PS, & Agarwal VK Cell Biology, Genetics, Evolution and Ecology, S Chand Publishers, New Delhi.
2. Gupta PK, Cytology, Genetics & Evolution, Rastogi Publications, Meerut.
3. Arumugam N Organic Evolution, Saras Publication, Nagercoil.
4. Barton NH, Briggs DEG, Eisen JA, Goldstein DB and Patel NH, Evolution. Cold Spring, Harbour Laboratory Press.
5. Hall BK &Hallgrimsson B, Evolution, Jones and Bartlett Publishers.

CORE PAPER XIII – APPLIED ZOOLOGY

SUB CODE : 19UFAZC3

Objectives

1.To Know the different types of pests affecting crops and pest control methods

2.To know the insects of commercial importance and their economically important products

3.To gain knowledge of the various types of poultry breeds and their management

4. To attain knowledge on the livestock development in India and its future prospects

Unit I – Insect Pests and their control

Definition of Pest- Causes for insects attaining pest status- Damage and loss due to pests.

Brief account on pests affecting agricultural crops

Rice (Rice stem borer, Rice gall midge, Rice hopper) , Sugarcane (Sugar cane leaf hopper, root borer, shoot borer), Cotton (Pink and spotted boll worm), Coconut (Rhinoceros beetle), Vegetables (Red pumpkin beetle, Cabbage butterfly, Hadda beetle (tomatoes and potatoes), Brinjal shoot borer), . Insect pests of stored grains (Rice weevil, Khapra beetle (wheat), Pulse beetle)

Insect pest control methods (Physical, mechanical, chemical and biological), IPM

UNIT II- Beneficial Insects

Sericulture- Mulberry and non-mulberry silkworms- common cultivable species- Biology of Bombyx mori- Types of silk. economic importance of silk

Apiculture-Types of Honey bees for rearing- Bee hive products-Chemical composition, nutritional and medicinal value of honey

Economic importance of lac insect

UNIT III - Vermiculture

Vermiculture- Selection of species for vermiculture –Vermicomposting- Organic resources for vermiculture - Vermicomposting methods (Pit Method and Heap Method)- Harvesting of vermicompost - Factors affecting vermicomposting. Advantages of vermicompost.

UNIT IV – Poultry management

Breeds of chicken- Indigenous breeds and exotic breeds (American, Asiatic, English and Mediterranean breeds) - Construction of poultry house- Intensive method of poultry rearing (Deep litter system and Cage system)- Feeding equipments . Incubation of eggs (Natural and artificial). Diseases affecting poultry and their prevention methods.

UNIT V-Dairy, sheep and Piggery farming

Livestock development in India and its future prospects. Cattle breeds- (Dairy, Draught and Dual purpose breeds). Exotic breeds of cows. Buffalo breeds in India. Indigenous and exotic breeds of sheep for wool and meat production. Piggery - economically important breeds and economic importance

Books For Reference (latest editions):

1. B. Vasantharaj David and T. Kumaraswami 1982. Elements of Economic Entomology, Popular Book Depot, Chennai.
2. Nayar, K.K., Ananthakrishnan, T.N. and B.V. David,V 1992 General And Applied Entomology Tata Mcgraw, New Delhi,
3. P.G. Fenemore Manual. Silkworm Rearing. FAO Agricultural Service Bulletin, Rome
4. Sukla, G.S. and Upadhyay, V.B., 2000 Economic Zoology – Rastogi Publications, Meerut, India.
5. Jawaid Ahsan and Subhas Prasad Sinha, 2000 A Handbook On Economic Zoology- S. Chand & Co., Ltd., New Delhi.
6. Ashok Kumar and Prem Mohan Nigam, 1991 Economic and Applied Entomology Emkay Publications, New Delhi.
7. Shammi, Q.J. And Bhatnagar, S., 2002 Applied Fisheries: Agrobios (India), Jodhpur – India.
8. Major Hall, C.B. 2005 Ponds and Fish Culture - Agrobios (India), Jodhpur – India.
9. Keith Wilson, N.D.P., 2005 A Handbook of Poultry Practice –Agrobios (India), Jodhpur – India.
10. Banerjee, G.C. 1992 Poultry – Iii- Edition –Oxford & Ibh Publishing Co. Pvt. Ltd., New Delhi.

CORE PAPER XIV
PRACTICAL III : ANIMAL PHYSIOLOGY, BIOTECHNOLOGY AND DEVELOPMENTAL BIOLOGY

SUB CODE : 19UFAZC4

ANIMAL PHYSIOLOGY

1. Use of Kymograph unit and B.P. apparatus.
2. Survey of Digestive enzymes in cockroach (mid gut region)
3. Detection of nitrogenous waste products in fish tank water, frog tank water, bird excreta and mammalian urine.
4. Effect of temperature or pH on Ptyalin activity in human saliva
5. Qualitative analysis of carbohydrates (Glucose, Fructose and Lactose)
6. Qualitative analysis of amino acids (tyrosine, tryptophan and arginine)
7. Estimation of Haemoglobin by Sahli's Haemoglobinometer.

BIOTECHNOLOGY

Demonstration of PCR technique.

Blotting techniques- Southern blotting and Western blotting (Demonstration)

Visit to biotechnology industries and laboratory – report to be submitted along with record

DEVELOPMENTAL BIOLOGY

Study of the following prepared slides, museum specimens, materials and photographs.

1. Sections of testis and ovary showing the maturation stages of gametes.
2. Slides of mammalian Sperm and Ovum.
3. Study of Egg types – Frog's egg, Hen's egg.
4. Slides of cleavage stages, blastula, gastrula of frog.
5. Slides of different stages of chick embryo- 24 Hours, 48 Hours, 72 hours and 96 Hours.
6. Placenta of sheep and Man.

CORE PAPER XV -PRACTICAL IV

ENVIRONMENTAL BIOLOGY, MICROBIOLOGY AND IMMUNOLOGY

SUB CODE : 19UFAZC5

ENVIRONMENTAL BIOLOGY

1. Estimation of O_2, salinity, free CO_2, Carbonates and bicarbonates in water samples.
2. Use of Rain guage, Maximum & minimum thermometer, Hygrometer, Anemometer and Barometer.
3. Adaptations of aquatic and terrestrial animals based on study of museum specimens - rocky, sandy, muddy shore animals, flying and burrowing animals.
4. Study of natural ecosystem and field report of the visit to be submitted along with record

MICROBIOLOGY

1. Sterilization techniques
2. Media preparation- Broth, agar, slants, plating
3. Spotters: *Staphylococcus aureus, E.coli, Rhizopus, Aspergillus flavus, A.niger, Pencillium, Candida albicans.*
4. Instruments- Autoclave, culture plate, Inoculation chamber
5. Staining: Simple and differential staining of bacteria- To identify gram positive and gram negative bacteria
6. Examination of milk- Methyl blue reduction test.

IMMUNOLOGY

1. Antigen and antibody reactions - Haemagglutination- using human blood groups.
2. Immunoelectrophoresis (Demonstration)
3. Study of prepared slides- Histology of thymus, Spleen, Bone marrow and Lymph node

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ELECTIVE PAPER I : BIOSTATISTICS AND BIOLOGICAL TECHNIQUES

SUB CODE : 19UEAZE1

OBJECTIVES

1. To understand the basic concepts of biostatistics
2. To expose students to biological instrumentation techniques
3. To introduce them to the principles and methods of various instruments used in biology and to prepare them to use these techniques in research.

UNIT – I :Classification and Presentation of data

Biostatistics – Definition and Scope – Collection of Data (Primary and secondary). Variable - Discrete and Continuous. Presentation of Data - Classification and Types of classification, Tabulation – Types of Tables. Diagrams and graphs - Bar diagram(Simple and Multiple), Pie diagram, Frequency diagram : histograms, frequency polygon , frequency curve, Ogives, line graphs. Characteristics of frequency distribution.

UNIT – II : Measures of Central tendency and Dispersion

Measures of Central tendency - Mean, Median, Mode - Weighted Arithmetic mean (Individual, Discrete and Continuous)

Measures of Dispersion - Range, Mean deviation , Standard deviation and Standard error

UNIT-III : Correlation and Regression

Correlation and its Types , Regression and Regression Equations ,and Regression lines.

Samples – Principle and Sampling methods. Test of significance – large and small sample test – test for proportions - Student's – t test, F test, Chi square - test

UNIT-IV: Cytological Techniques

Cytological Techniques - Tissue Fixation, Embedding, Sectioning and Staining. Cell fractionation - Isolation of sub-cellular components. Principles and working mechanism of light, phase-contrast and electron microscopes (SEM & TEM).

UNIT V : Biochemical Techniques

Centrifuge – Principle and Working mechanism - Types of centrifugation

Chromatography – Principles, Types (Paper and Thin Layer Chromatography) and Applications

Electrophoresis-Principle, Types (Paper and Agarose Gel) and Applications

Principles and Uses of Colorimeter, Principle and Components of UV -VIS Spectrophotometer

Reference Books:

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1. Rangaswamy R.A., 1995.Textbook of Agriculture Statistics, New Age International Publishers.
2. S.P. Gupta 2011. Practical Statistics. 9th edition
3. Gurumani, N. 2004, Introduction to Bio-statistics, M.J.P. Publishers, Chennai.
4. Veerakumari, L. 2005 Bioinstrumentation, MJP Publishers, Chennai.

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ELECTIVE PAPER II: MEDICAL LABORATORY TECHNIQUES

SUB CODE : 19UFAZE1

Unit I

Introduction and scope - Good Laboratory Practice (GLP). Records and Preparation of reports. Cleaning, maintenance and care of glasswares. Sterilization methods- (Flame, Steam, Chemical, Pressure). Safety precautions and first aid treatment for superficial wounds, burns, chemical poisoning, contamination of infected microbiological specimens and electric shock. Disposal of specimens and infected materials

Unit-II

Collection of specimens and samples (blood, urine, stool, semen, CSF, sputum). Blood smear preparations. Haematological tests –Clinical significance of total RBC , WBC , Differential count , Platelet count and Haemoglobin content - Red cell indices and its significance (MCV, MCH and MCHC). Methods and clinical significance of ESR, PCV, Clotting time, Bleeding time and Prothrombin time.

Liver Function Test- Enzymes (SGOT, SGPT) and Bilirubin (Total and Direct)

Unit III

Urine Analysis (Routine examination and analysis for albumin, glucose ketones, bile pigments,

Microscopical examination).

Analysis of stools –Routine examination –Macroscopic and microscopic examination for parasites- Concentration techniques -Sedimentation and Flotation methods.

Pregnancy test

Analysis of semen, Sputum and cerebrospinal fluid.

Unit IV

Microbial, protozoan and helminth diseases – A brief study on Causative organism, Symptoms and Clinical test as mentioned

Bacterial diseases – Tuberculosis (Skin test-Mantoux, Sputum smear study), Typhoid (Widal test)

Viral disease – AIDS (HIV antibodies screening, CD4 count), Hepatitis B (HBsAg)

Protozoans – Amoebic dysentery (Stool Examination), Malaria (MP and MF Smear study and Quantitative buff test (QBC) for MP and MF).

Helminth parasites- Filariasis (Smear test, Circulating filarial antigen and Antibody detection IgG 4)

Unit V

Brief study on Cause, Symptoms and Clinical test for the following diseases as mentioned

Life style disease -

Cardiac disorders (ECG, Echocardiography and lipid profiles).

Diabetes (Fasting blood glucose, Glycated haemoglobin (HbA1c), Urine analysis for urine sugars, ketone bodies and albumin)

Auto immune disease – Rheumatoid arthritis (C-reactive protein, Rheumatoid factor,RF)

Cancer- Liver cancer (alpha fetoprotein), GI tract cancer (CA19.9), Ovarian cancer (CA125) and Breast cancer (CA15.3).

Books For Reference (latest editions):

1. Baker F.J. And Silverton R.E 1998. Introduction To Medical Laboratory Technology. Hodder Arnold Publication.

2. Mukherjee K.L. 2003. Medical Laboratory Technology – A Procedure Manual For Routine Diagnostic Tests, Vol. I, II & III . Jayepee Brothers, New Delhi.

ELECTIVE PAPER III: AQUACULTURE

SUB CODE : 19UFAZE2

Objectives

1. To understand fisheries and fishery resources of India.
2. Information about the biology of the fishes and their management
3. To Know the fishery resources and their sustainable utilization.
4. To know the preservation and processing methods .
5. To have an exposure on the organizations involved in aquaculture in India

Unit - I

Introduction to aquaculture - scope and export importance. Different culture practices - Extensive, semi intensive, intensive. Types of culture - Monoculture, Monosex culture, Polyculture. Criteria for selection of site and species for aquaculture practices.

Unit - II

Fish farm design and construction - Hatchery technology of fish and shrimps - Types of fish ponds (breeding pond, hatchery unit, brooders pond, nursery pond, stocking pond and rearing pond) – Maintenance and management of different ponds. Brood stock management – larval rearing techniques - seed packing and transportation -. Feeds for cultivable species – natural, supplementary and artificial feeds.

Unit – III

Culture methods - Integrated fish farming - Paddy cum Pokkali fish culture, pen culture, cage culture, race way culture, sewage fed fish culture. Induced breeding in Indian major carps – Live feed culture (Rotifers and Artemia) – Carp culture (poly culture / Composite fish culture).

Unit-IV

Culture of marine and freshwater prawn . Mariculture practices - Molluscan culture – edible oyster (mussel) and pearl oyster, seaweed culture.

Preservation and processing of fish and prawn

Problems associated with aquaculture - Man made hazards, Economic factors

Unit-V

Common fish diseases (bacterial, viral and parasitic diseases) – Cause, Prevention and treatment
Organizations involved in aquaculture - CMFRI, CIFA, CIBA, MPEDA and TANUVAS

Reference books:

1. Mathew Landan, 1991. Introduction to aquaculture, John Wilay and Sons Inc..
2. V.R.P. Sinha, 1993. A compendium of aquaculture Technologies for developing countries, Oxford and IBH Publishing Company PVT. Ltd.
3. V.G. Jhingran,1991. Fish and fisheries of India, Hindustan Publishing Corporation, Delhi.
4. T.V.R. Pillay – Aquaculture principles and practives, Fishing new Books, Blackwell Science Ltd., Oxford.
5. Shanmugam, K. 1990. Fishery Biology and Aquaculture, Hindustan Pub. Corporation, New Delhi.
6. C.V. Kurian and Sebastein – Prawn and Prawn fisheries of India, Hindustan Publishing House, New Delhi.
7. Elvire Balugal, A. 1984. Aquaculture systems and practices – A selected Review, Daya Publishing House, New Delhi.
8. B.N.Yadav, 1995. Fish Endocrinology, Daya Publishing House, New Delhi.

ALLIED ZOOLOGY (THEORY) - PAPER– I

SUB CODE : 19UAAZA1

Unit – I:

Introduction: Invertebrata- General characters of all phylum , Study of types and life history of the following.

Protozoa – Type study: Paramecium

Porifera – Type study : Leucosolenia

Coelenterata – Type study: Obelia geniculata

Platyhelminthes- Type study : Taenia solium

Unit – II

Annelida – Type study: Neries

Arthropoda – Type study: Prawn

Mollusca – Type study: Freshwater mussel

Echinodermata – Type study: Sea star

Unit – III

Prochordates – *Amphioxus* – Structure and affinities

Pisces- Type study : Shark (External morphology, Digestive system , Structure of heart, Respiratory system, Urinogenital system and Structure of Brain**)**

Unit – IV

Amphibia- Type study: Frog. (External morphology, Digestive system , Structure of heart, Respiratory system, Urinogenital system and Structure of Brain**)**

Reptilia: Type study -Calotes. (External morphology, Digestive system , Structure of heart, Respiratory system, Urinogenital system and Structure of Brain**)**

Unit – V

Aves- Type study: Pigeon (External morphology, Digestive system , Structure of heart, Respiratory system, Urinogenital system and Structure of Brain**)**

Mammalia- Type study: Rabbit. (External morphology, Digestive system , Structure of heart, Respiratory system, Urinogenital system and Structure of Brain**)**

Reference Books:

1. P.S. Dhami and J.K. Dhami – Invertebrate Zology – S. Chand and Co. New Delhi.
2. Jordan, E.K. and P.S. Verma, 1993. Chordate Zoology, 12th edition, S. Chand & Co. Ltd., Ram Nagar, New Delhi

Ekambaranatha Ayyar, M and Ananthakrishnan, T.N. 1993, Outlines of Zoology, Vol.I and II, Viswanathan and Co. Madras

ALLIED ZOOLOGY (THEORY) - PAPER – II

SUB CODE : 19UBAZA1

Unit – I:

Cell Biology - Structure of animal cell, Structure and function of Mitochondria, nucleus and nucleolus and Golgi bodies. Types and properties of cancer cells.

Genetics: Molecular structure and functions of gene- Multiple alleles with reference to Blood group inheritance in man– Sex linked inheritance X and Y linked inheritance in man.

Unit – II:

Developmental Biology: Gametogenesis –Spermatogenesis and Oogenesis–Structure of mammalian sperm and ovum. Types of eggs- Types of cleavage and morphogenetic movements. Process of cleavage and gastrulation in chick and mammals (pig) - Intrauterine insemination (IUI) and *in vitro* fertilization techniques in human

Unit – III:

Human Physiology: Digestion- Digestion of carbohydrates, proteins and fats. Excretion-Structure and function of nephron- Urine formation - kidney failure. Structure of heart, Blood pressure. Heart diseases – Ischemia, Myocardial infarction, Rheumatic heart disease, Stroke. Organ Transplantation.

Unit – IV:

Environmental Biology: Biological effects of light and temperature. Waste management-Methods of sewage and industrial effluents treatment –Solid waste management

Unit-V:

Evolution –Principles of Lamarkism and Darwinism - Neo Darwinism (Industrial melanism). Speciation- Types and Factors responsible for speciation.

Reference books:

1. Verma, P.S. and V.K. Agarwal, 2010 Reprint, Cell Biology, Genetics, Molecular Biology, Physiology, Evolution and Ecology, S. Chand & Co., New Delhi
2. Sambasiviah, I, Kamalakara Rao, A.P. Augustine Chellapa, S (1983). Text book of Animal Physiology, S. Chand & Co, New Delhi.
3. Verma, P.S. and Agarwal, V.K. (1983). Animal Ecology, S. Chand & Co, New Delhi.
4. Verma, P.S. and Agarwal, V.K. and Tyagi, B.S. (1991). Chordate Embryology S. Chand & Co, New Delhi.
4. Rastogi, V.B. and Jayaraj, M.S. (2000). Text book of Genetics, Kedarnath Ramnath Publishers, Meerut.
5. T.S.Gopalakrishnan, Itta Sambasivaiah and A.P.Kamalakararao,1984 Principles of organic Evolution, Pearl publications, Chennai.

Allied Zoology Practical

SUB CODE : 19UBAZA2

I.Dissection:

1. Cockroach: Digestive and Nervous system
2. Prawn: Nervous system
3 : Digestive system

II. Mounting:

1. Mouth parts of cockroach
2. Mouth parts of Mosquito
3. Earthworm-Body setae
4. Prawn- appendages- (Mandible, maxilla , maxillepeds and uropod)
5. Shark – Placoid Scales

III. Spotters:

Entamoeba
Plasmodium
Paramecium
Paramecium-Conjugation
Sycon
Obelia geniculata
Fasciola hepatica (Entire & Transverse section)
Taenia solium (Entire & Transverse section)
Neries (Entire & Transverse section)
Fresh water mussel
Star fish
Amphioxus
Shark (Entire and Placoid scale)
Pigeon (Entire and quill feather)
Rabbit
Section of ovum
Section of testis

NON MAJOR ELECTIVE- PAPER I - ECONOMIC ZOOLOGY

SUB CODE : 19UAAZN1

UNIT I- VERMICULTURE

Vermiculture- Selection of species for vermiculture –Vermicomposting- Organic resources for vermiculture

Vermicomposting methods (Pit Method and Heap Method)

Harvesting of Compost - Factors affecting vermicomposting

Advantages of vermicompost.

UNIT II-SERICULTURE AND APICULTURE

Mulberry and Non-mulberry silk worms- Biology of Bombyx mori

Types of silk- Silk worm rearing methods (brief study)

Types of Honey bees for rearing, Structure of Bee comb

Modern bee hive structure (Langstroth hive and Newton's hive)- Bee Keeping equipments

Nutritional value of honey.

Beehive products (Bee wax, Bee venom, Propolis and Royal jelly).

UNIT III- AQUACULTURE

Purpose and importance of aquaculture – Types of culture systems (Traditional, Intensive, Semi Intensive and Extensive) - Types of fish pond- (Hatchery, breeding, Nursery, Rearing and Stocking). Types of culture- Monoculture and Polyculture. Culture of major carps**.** Induced breeding in major carps**.**

UNIT IV –POULTRY MANAGEMENT

Breeds of chicken- Indigenous breeds and exotic breeds (American, Asiatic, English and Mediterranean breeds)

Intensive method of poultry rearing (Deep litter system and Cage system) – Poultry rearing – Egg selection and Incubation of eggs (Natural and artificial). Factors involved in brooding.

UNIT V-DAIRY FARMING

Livestock development in India and its future prospects

Cattle breeds- (Dairy, Draught and Dual purpose breeds)- Exotic breeds of cows (Jersey)

Indigenous and exotic Breeds of goat and sheep in India

REFERENCE BOOKS

1.G.S. Shulka and V.B. Upadhyay- 2000. Economic Zoology Rastogi Publ.Meerut.

2.Jawaid Ahsan and Subhas Prasad Sinha,2000- A Hand book on Economic Zoology-S.Chand and Company,New Delhi

3.Ashok Kumar and Prem Mohan Nigam,1991. Economic and Applied Entomology, Emkay Publications,New Delhi

4.Keith Wilson NDP.,2005-A Hand Book of Popultry Practice-Agrobios,Jodhpur India

NON MAJOR ELECTIVE - PAPER II- PUBLIC HEALTH AND HYGIENE

SUB CODE : 19UBAZN1

Unit – I

Environment and Health: Determinants of health (Physical, mental and social health) - Primary Health care centres in India and its functions
Types of Immunisation- Vaccines- Immunization schedule.

Unit – II

Nutrition and Health: Classification of foods – Carbohydrates, Proteins and fats (Sources and functions) - Balanced diet. – Protein Malnutrition (Kwashiorkar and Marasmus)
Minerals (Dietary Sources, functions and deficiency) Macrominerals (Phosphorus, Calcium, Sodium and Potassium) Microminerals - (Zinc, Selenium, Cobalt , iron, iodine, Magnesium) . Vitamins – Fat and Water soluble vitamins- Dietary Sources, Biological functions and their deficiency

Unit – III

Communicable diseases: Causative organism, symptoms and modes of transmission.
Bacterial diseases- Whooping cough, Typhoid, Cholera, Tuberculosis, Diptheria.
Viral diseases- Poliomyletis, Mumps,. Measles, Chicken pox, Hepatitis.
Vector borne diseases- Malaria, Filaria and Rabies.

Unit – IV

Non - Communicable Diseases (Causes, symptoms and Management): Hypertension , Coronary heart Disease, Diabetes, Obesity and Cancer
Causes of mental ill-health- Alcoholism and Drug dependence- Prevention

Unit – V

Health Education: Health Services Organisations- (WHO.UNICEF,UNDP,USAID and Indian Red Cross) - Health programmes in India
AIDS - Causes, prevention and Management
First aid - Aim , Evaluation of victim and Casualty Treatment

.**Books for Reference:**

1. Park and Park, 1995. Text Book of Preventive and Social Medicine. M/S. Banarsidas Bhanot Publishers, Jabalpur.
2. Verma S. 1998. Medical Zoology, Rastogi Publications, New Delhi.