



Department of Zoology

SRI SAI BABA NATIONAL DEGREE COLLEGE :: ANANTAPUR

About Us

Department Profile

In view of the rapid expansion of the frontiers of animal science as one of the important subjects of study, the College established The Department of Zoology in 1982 with following UG course and subject combinations.

B.Sc., Botany-Zoology-Chemistry (TM&EM)

Taking into consideration the need for more employment opportunities for our young graduates, the department started a restructured course – B.Sc., Biochemistry-Zoology-Chemistry (English Medium) in 1993-94.

A distinguished teaching faculty of Zoology has served the department since its establishment. At present there are two regular Associate Professors and one Assistant Professor in the department taking care of the academic needs of more than 250 students.

There are two well-furnished and well-equipped spacious laboratories for the department for conducting practicals. A museum with a good number of preserved specimens showcased in glass cabinets is an added advantage for the students in the lab. Our students collected some of them during their Zoological tours. The museum is highly useful to the students as well as teachers in enriching morphological knowledge of different animal species. The lab has advanced scientific equipment like colorimeters, pH meter, high-speed centrifuge, research microscope, thermostatic ovens, thermostatic water bath, refrigerator etc.

The department has been employing innovative teaching techniques for imparting quality education. For instance, discussion is made an integral part of teaching. One of the practical hours every fortnight is used for the purpose. Topics in the regular syllabus are briefly outlined at least seven days in advance. The entire class is to come prepared for a discussion on the topic, monitored by a staff member. The process initiated by a couple of questions from the teacher, slowly gains momentum and a lively discussion follows. Quite a large number of students, who are usually silent spectators, take active part with the encouragement of the teacher. Considerable amount of syllabus and curriculum is covered and repeated in this way.

In the process of imparting quality education, the faculty is using ICT-enabled teaching aids including, glass boards, Bio-visual charts, LCD, OHP, a good number of permanent microscopic slides, biological specimens, charts,

models and a few relevant CDs. Besides, the students were also academically assisted by the departmental library with more than 200 titles.

The student enrichment programmes like guest lectures by eminent university professors and field trips to the research institutions like Central Sericulture Research Centre, Rapthadu have also been organized. For keeping abreast of the latest developments in animal science in the highly competitive world, the department has introduced a new paper “Health Management” under CBIDE for Commerce and B.Sc., (MPC) students. To give a different academic exposure to our students the department organized seminars on “Career Opportunities in Life Sciences”, “B-Cell & T-Cell Pattern of Antigen Reorganization, Responses and Consequences” and workshops on “PCR Technology” and “Fruit Preservation Technology”.

The teachers of the department have special focus on involving and improving presentation and articulation skills of students through seminars, group discussions and quiz competitions etc. They also guide the students to undertake study projects of local relevance to develop their research abilities and skills of interpretation. The teachers of the department frequently take up remedial coaching classes and counseling sessions to the students in respective subjects to improve their performance in the semester end examination.

The department is also assisting the students through Students Club – pursuit – focusing on curricular and extra-curricular activities for effective participation and expression. The department has encouraged students to participate in curricular and extra-curricular activities including sports, NSS and NCC activities. In tune with the slogan “personality development through community service,” the teachers actively participated and involved the students in participating and organizing various awareness programmes on HIV/AIDS, communicable health hazards, blood grouping, voluntary blood donation, literacy and gender sensitizing programmes including ragging, eve-teasing and dowry system.

As a result of these enriching facilities and the committed efforts of the faculty, students have become responsible citizens serving various private and public concerns with respectable positions like software engineers, professors, revenue divisional officers, municipal commissioners, DSPs etc. Our Alumni, showing a lot of concern for the Institution, donated Rs.75,000/- towards instituting an endowment scholarship.

The department proposes to

- ❖ start M.Sc. Zoology
- ❖ establish a Research Centre
- ❖ secure UGC Major Research Projects
- ❖ introduce add-on courses with employment orientation like ‘Lab Technician’, ‘Food Processing and Preservation’





Department of Zoology

SRI SAI BABA NATIONAL DEGREE COLLEGE :: ANANTAPUR

Faculty



Dr. B. Sivaramakrishna, Professor and Head, with more than 30 years of illustrious teaching and research career, has published 30 research papers in national and international reputed journals. He has also participated and presented 25 papers at national seminars /workshops/conferences. He has produced 7 M.Phils., and is guiding Ph.D. scholars. A man of teaching credentials, he has contributed 2 units and edited the textbook of Zoology for Intermediate, authored and edited two textbooks for I and III year B.Sc. brought out by Spectrum Publications, Hyderabad. He is a professional member of the Indian Biophysical Society, Mendelian Society of India, and National Environmental Science Academy. He is also serving various academic bodies including the Board of Studies, S.K. University, OTRI, JNTU College of Engineering, Anantapur, besides being the member of the advisory committee of the District Science Centre and participated in District and State Level Science Fares for two decades. He was an adjudicator for the 93rd Indian Children Science Congress held at Hyderabad, and also acted as the Quiz Master for YUVA Adolescent Quiz Programme in 2008. He is instrumental in the conduct of a two day “Lab-to-Land” programme benefitting more than 200 high school teachers in the district. He came into limelight when the National Environmental Science Academy (NESA), New Delhi honoured him with “**Best Scientist Award**” in 1993. He is associated with international voluntary service organizations like the Lions Club and the Rotary Club and local organizations like Janavignana Vedika . He is the present Vice President and PRO of the Lions club of Anantapur. He participated actively in social, cultural, and community service activities in association with voluntary social organizations. In recognition of his commendable performance, the Government of Andhra Pradesh honoured him with “**State Meritorious Teacher Award**” in 1994.

Kum. K. Likhitha, Assistant professors, who joined the team latter, with 1 year of experience, is specialized in teaching physiology and molecular genetics. She has also participated at national seminars /workshops/conferences. She is also serving the women students on the campus as the Member of NCC unit.



Technical Support/ Non-teaching Staff



Smt C. Umadevi
Attender



Sri P. Viswanath
Attender



Department of Zoology

SRI SAI BABA NATIONAL DEGREE COLLEGE :: ANANTAPUR

Student Zone

➤ Syllabus

B.Sc. ZOOLOGY COURSE STRUCTURE UNDER CBCS

YEAR	SEM	PAPER	TITLE	MARKS (100)		CREDITS
				MID SEMESTER	END SEMESTER	
I	I	I	Animal Diversity – I	25	75	03
			Biology of Non-Chordates			
	Practical - I		10	40	02	
	II	II	Animal Diversity – II	25	75	03
Biology of Chordates						
Practical - II		10	40	02		
II	III	III	Cell biology, Genetics, Molecular Biology & Evolution	25	75	03
			Practical - III	10	40	02
	IV	IV	Physiology, Cellular Metabolism & Embryology	25	75	03
			Practical - IV	10	40	02
		V	Immunology & Animal Biotechnology	25	75	03
			Practical - V	10	40	02



S S B N DEGREE COLLEGE (AUTONOMOUS):: ANANTAPURAMU
B.Sc. ZOOLOGY SYLLABUS UNDER CBCS

[2020-21 Batch onwards]

I Year B.Sc.-Zoology: I Semester

Course I: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

Work load: 60 hrs per semester]

[4 hrs/week

Course Outcomes:

By the completion of the course the graduate should be able to –

- Describe general taxonomic rules on animal classification
- Classify Protozoa to Coelenterata with taxonomic keys
- Classify Phylum Platyhelminthes to Annelida phylum using examples from parasitic adaptation and vermin composting
- Describe Phylum Arthropoda to Mollusca using examples and importance of insects and Molluscs
- Describe Echinodermata to Hemichordata with suitable examples and larval stages in relation to the phylogeny

UNIT I

- ❖ Principles of Taxonomy – Binomial nomenclature – Rules of nomenclature
- ❖ Whittaker's five kingdom concept and classification of Animal Kingdom.

Phylum Protozoa

- ❖ General Characters and classification of protozoa up to classes with suitable examples
- ❖ Locomotion, nutrition and reproduction in Protozoans
- ❖ Elphidium (type study)

UNIT –II

Phylum Porifera

- ❖ General characters and classification up to classes with suitable examples
- ❖ Skeleton in Sponges
- ❖ Canal system in sponges

Phylum Coelenterata

- ❖ General characters and classification up to classes with suitable examples
- ❖ Metagenesis in Obelia
- ❖ Polymorphism in coelenterates
- ❖ Corals and coral reefs

Phylum Ctenophora :

- ❖ General Characters and Evolutionary significance (affinities)

Unit – III

Phylum Platyhelminthes

- ❖ General characters and classification up to classes with suitable examples
- ❖ Life cycle and pathogenicity of *Fasciola hepatica*
- ❖ Parasitic Adaptations in helminthes

Phylum Nemathelminthes

- ❖ General characters and classification up to classes with suitable examples
- ❖ Life cycle and pathogenicity of *Ascaris lumbricoides*

Unit – IV

Phylum Annelida

- ❖ General characters and classification up to classes with suitable examples
- ❖ Evolution of Coelom and Coelomoducts
- ❖ Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Phylum Arthropoda

- ❖ General characters and classification up to classes with suitable examples
- ❖ Vision and respiration in Arthropoda
- ❖ Metamorphosis in Insects
- ❖ Peripatus - Structure and affinities
- ❖ Social Life in Bees and Termites

Unit – V

Phylum Mollusca

- ❖ General characters and classification up to classes with suitable examples
- ❖ Pearl formation in Pelecypoda
- ❖ Sense organs in Mollusca

Phylum Echinodermata

- ❖ General characters and classification up to classes with suitable examples
- ❖ Water vascular system in star fish
- ❖ Larval forms of Echinodermata

Phylum Hemichordata

- ❖ General characters and classification up to classes with suitable examples
- ❖ *Balanoglossus* - Structure and affinities

REFERENCE BOOKS:

1. L.H. Hyman „*The Invertebrates' Vol I, II and V.* – M.C. Graw Hill Company Ltd.
2. Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
3. E.L. Jordan and P.S. Verma „*Invertebrate Zoology' S. Chand and Company.*
4. R.D. Barnes „*Invertebrate Zoology' by: W.B. Saunders CO., 1986.*
5. Barrington. E.J.W., „*Invertebrate structure and Function' by ELBS.*
6. P.S. Dhama and J.K. Dhama. *Invertebrate Zoology.* S. Chand and Co. New Delhi.
7. Parker, T.J. and Haswell, „*A text book of Zoology' by, W.A., Mac Millan Co. London.*
8. Barnes, R.D. (1982). *Invertebrate Zoology, V Edition*”

PRACTICAL COURSE – I
ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

Work load: 30 hrs per semester]

[2 hrs/week

Learning Outcomes:

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labeled record of identified museum specimens

1. Study of museum slides / specimens / models (Classification of animals up to orders)

- ❖ **Protozoa:** Amoeba, Paramecium, Paramecium Binary fission and Conjugation, Volvox, Entamoeba histolytica, Plasmodium vivax
- ❖ **Porifera:** Sycon, Spongilla, Euspongia, Sycon- T.S & L.S, Spicules, Gemmules
- ❖ **Coelenterata:** Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatulid.
- ❖ **Platyhelminthes:** Planaria, Fasciola hepatica, Fascioloides forms – Miracidium, Redia, Cercaria, Echinococcus granulosus, Taenia solium, Schistosoma haematobium.
- ❖ **Nemathelminthes:** Ascaris (Male & Female), Dracunculus, Ancylostoma, Wuchereria
- ❖ **Annelida:** Nereis, Aphrodite, Chaetoptera, Hirudinaria, Trochophore larva
- ❖ **Arthropoda:** Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly. xiii.
- ❖ **Mollusca:** Chiton, Pila, Unio, Pteropoda, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva
- ❖ **Echinodermata:** Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva
- ❖ **Hemichordata:** Balanoglossus, Tornaria larva

2. Dissections:

- ❖ **Prawn:** Appendages, Digestive system, Nervous system, Mounting of Statocyst
- ❖ **Insect Mouth Parts**
- ❖ **Laboratory Record work shall be submitted at the time of practical examination**
- ❖ An “**Animal album**” containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose
- ❖ **Computer - aided techniques should be adopted or show virtual dissections**

REFERENCE MANUALS:

1. Practical Zoology- Invertebrates S.S. Lal
2. Practical Zoology - Invertebrates P.S. Verma
3. Practical Zoology - Invertebrates K.P. Kurl
4. Ruppert and Barnes (2006) Invertebrate Zoology, 8th Edition, Holt Saunders International Edition



S S B N DEGREE COLLEGE (AUTONOMOUS):: ANANTAPURAMU
B.Sc. ZOOLOGY SYLLABUS UNDER CBCS

[2020-21 Batch onwards]

I Year B.Sc.-Zoology: II Semester

Course-II: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

Work load: 60 hrs per semester]

[4 hrs/week

Course Outcomes:

By the completion of the course the graduate should able to -

- Describe general taxonomic rules on animal classification of chordates
- Classify Protochordata to Mammalia with taxonomic keys
- Understand Mammals with specific structural adaptations
- Understand the significance of dentition and evolutionary significance
- Understand the origin and evolutionary relationship of different phyla from Prochordata to mammalia.

Unit - I

- ❖ General characters and classification of Chordata upto classes
- ❖ Protochordata- Salient features of Cephalochordata , Affinities of Cephalochordata.
- ❖ Salient features of Urochordata
- ❖ Structure and life history of Herdmania
- ❖ Retrogressive metamorphosis –Process and Significance

Unit - II

- ❖ Cyclostomata, General characters, Comparison of Petromyzon and Myxine
- ❖ Pisces : General characters of Fishes
- ❖ Scoliodon: External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and functions of the Brain.
- ❖ Migration in Fishes
- ❖ Types of Scales
- ❖ Dipnoi

Unit - III

- ❖ General characters of Amphibia
- ❖ Classification of Amphibia up to orders with examples.
- ❖ Ranahexadactyla: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and functions of the Brain
- ❖ Reptilia: General characters of Reptilia, Classification of Reptilia up to orders with examples
- ❖ Calotes: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain
- ❖ Identification of Poisonous snakes and Skull in reptiles

Unit - IV

- ❖ Aves General characters of Aves
- ❖ Columba livia: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain
- ❖ Migration in Birds
- ❖ Flight adaptation in birds

Unit - V

- ❖ General characters of Mammalia
- ❖ Classification of Mammalia upto sub - classes with examples
- ❖ Comparison of Prototherians, Metatherians and Eutherians
- ❖ Dentition in mammals

REFERENCE BOOKS

1. J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi). 646 pages. Reprinted
2. Arumugam, N. Chordate Zoology, Vol. 2. SarasPublication. 278 pages. 200 figs.
3. A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). 852 pages. (Revised edition of Parker & Haswell, 1961).
4. M. EkambaranathaAyyar, 1973. A manual of zoology. Part II. (S. ViswanathanPvt. Ltd., Madras).
5. P.S. Dhami & J.K. Dhami, 1981. Chordate zoology. (R. Chand & Co.). 550 pages.
6. Gurdarshan Singh & H. Bhaskar, 2002. Advanced Chordate Zoology. Campus Books, 6 Vols., 1573 pp., tables, figs.
7. A.K. Sinha, S. Adhikari & B.B. Ganguly, 1978. Biology of animals. Vol. II. Chordates. (New Central Book Agency, Calcutta). 560 pages.
8. R.L. Kotpal, 2000. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.
9. E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.). 1092 pages.
10. G.S. Sandhu, 2005. Objective Chordate Zoology. Campus Books, vii, 169 pp.
11. Sandhu, G.S. & H. Bhaskar, H. 2004. Textbook of Chordate Zoology. Campus Books, 2 vols., xx, 964 p., figs.
12. Veena, 2008. Lower Chordata. (Sonali Publ.), 374 p., tables, 117 figs.

PRACTICAL COURSE – II
ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

Work load: 30 hrs per semester]

[2 hrs/week

Learning Outcomes:

- To understand the taxidermic and other methods of preservation of chordates
- To identify chordates based on special identifying characters
- To understand internal anatomy of animals through demo or virtual dissections, thus directing the student for “empathy towards the fellow living beings”
- To maintain a neat, labeled record of identified museum specimens

OBSERVATION OF THE FOLLOWING SLIDES / SPOTTERS / MODELS

1. Protochordata :Herdmania, Amphioxus, Amphioxus T.S through pharynx.
2. Cyclostomata :Petromyzon and Myxine.
3. Pisces : Pristis, Torpedo, Hippocoampus ,Exocoetus, Echeneis, Labeo, Catla, Clarius,Channa, Anguilla.
4. Amphibia :Ichthyophis, Amblystoma, Axolotl larva, Hyla,
5. Reptilia: Draco, Chamaeleon, Uromastix,,Testudo, Trionyx, Russels viper, Naja,
 - i. Krait, Hydrophis, Crocodile.
6. Aves : Psittacula, Eudynamis, Bubo, Alcedo.
7. Mammalia: Ornithorhynchus,Pteropus,Funambulus.

Dissections-

1. Scoliodon IX and X, Cranial nerves
2. Scoliodon Brain
3. Mounting of fish scales

Note:

1. Dissections are to be demonstrated only by the faculty or virtual.
2. Laboratory Record work shall be submitted at the time of practical examination.

REFERENCE BOOKS:

1. S.S.Lal, Practical Zoology – Vertebrata
2. P.S.Verma, A manual of Practical Zoology – Chordata



S S B N DEGREE COLLEGE (AUTONOMOUS)::
ANANTAPURAMU
B.Sc. ZOOLOGY SYLLABUS UNDER CBCS

[2021-22 Batch onwards]

II Year B.Sc.-Zoology: III Semester
Course-III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY
AND EVOLUTION

Work load: 60 hrs per semester]

[4 hrs/week

Course Outcomes:

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Cell Biology, Animal Biotechnology and Evolution and by the completion of the course the graduate shall able to –

- To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.
- Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.
- To understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals
- Acquiring in-depth knowledge on various aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders
- Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.
- Understand the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society

Unit – I Cell Biology

- ❖ Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
- ❖ Electron microscopic structure of animal cell.
- ❖ Plasma membrane –Models and transport functions of plasma membrane.
- ❖ Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes
- ❖ Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

(Note: 1. General pattern of study of each cell organelle – Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams)

2. Need not study cellular respiration under mitochondrial functions)

Unit – II Genetics - I

- ❖ Mendel's work on transmission of traits
- ❖ Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes
- ❖ Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance

- ❖ Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination)
- ❖ Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

Unit – III Genetics - II

- ❖ Mutations & Mutagenesis
- ❖ Chromosomal Disorders (Autosomal and Allosomal)
- ❖ Human Genetics – Karyotyping, Pedigree Analysis (basics)
- ❖ Basics on Genomics and Proteomics

UNIT IV: Molecular Biology

- ❖ Central Dogma of Molecular Biology
- ❖ Basic concepts of -
 - DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuous mode, Origin & Propagation of replication fork)
 - Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications (basics)
 - Translation – Initiation, Elongation and Termination
- ❖ Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes

Unit - V

- ❖ Origin of life
- ❖ Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory
- ❖ Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium
- ❖ Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

REFERENCE BOOKS:

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell „Molecular Cell Biology“ W.H.Freeman and company New York.
2. Cell Biology by De Robertis
3. Bruce Alberts, Molecular Biology of the Cell
4. Rastogi, Cytology
5. Varma & Aggarwal, Cell Biology
6. C.B. Pawar, Cell Biology
7. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India.
8. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
9. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.

10. Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
11. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co.
12. Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
13. Molecular Biology by freifelder
14. Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited
15. Hall, B. K. and Hallgrimsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
16. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
17. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
18. Minkoff, E. (1983). Evolutionary Biology. Addison-Wesley.
19. James D. Watson, Nancy H. Hopkins „Molecular Biology of the Gene“
20. Jan M. Savage. Evolution, 2nd ed, Oxford and IBH Publishing Co., New Delhi.
21. Gupta P.K., „Genetics

PRACTICAL COURSE – III

CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

Work load: 30 hrs per semester]

[2 hrs/week

I. Cell Biology

- ❖ Preparation of temporary slides of Mitotic divisions with onion root tips
- ❖ Observation of various stages of Mitosis and Meiosis with prepared slides
- ❖ Mounting of salivary gland chromosomes of Chironomous

II. Genetics

- ❖ Study of Mendelian inheritance using suitable examples and problems
- ❖ Problems on blood group inheritance and sex linked inheritance
- ❖ Study of human karyotypes (Down's syndrome, Edwards, syndrome, Patau syndrome, Turner's syndrome and Klinefelter syndrome)

III. Evolution

- ❖ Study of fossil evidences
- ❖ Study of homology and analogy from suitable specimens and pictures
- ❖ Phylogeny of horse with pictures
- ❖ Study of Genetic Drift by using examples of Darwin's finches (pictures)
- ❖ Visit to Natural History Museum and submission of report

REFERENCE BOOKS

1. Burns GW. 1972. The Science of Genetics. An Introduction to Heredity. Mac Millan Publ. Co.Inc.
2. Gardner EF. 1975. Principles of Genetics. John Wiley & Sons, Inc. New York.
3. Harth and Jones EW. 1998. Genetics – Principles and Analysis. Jones and BarHett Publ. Boston.
4. Levine L. 1969. Biology of the Gene. Toppan.
5. Pedder IJ. 1972. Genetics as a Basic Guide. W. Norton & Company, Inc.
6. Rastogi VB. 1991. A Text Book of Genetics. KedarNath Ram Nath Publications, Meerut, Uttar Pradesh, India.
7. Rastogi VB. 1991. Organic Evolution. KedarNath Ram Nath Publications, Meerut, Uttar Pradesh, India.
8. Stahl FW. 1965. Mechanics of Inheritance. Prentice-Hall.
9. White MJD. 1973. Animal Cytology and Evolution. Cambridge Univ.Press.



S S B N DEGREE COLLEGE (AUTONOMOUS):: ANANTAPURAMU
B.Sc. ZOOLOGY SYLLABUS UNDER CBCS

[2021-22 Batch onwards]

II Year B.Sc.-Zoology: IV Semester
Course-IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM
AND EMBRYOLOGY

Work load: 60 hrs per semester]

[4 hrs/week

Course Outcomes:

This course will provide students with a deep knowledge in Physiology, Cellular metabolism and Molecular Biology and by the completion of the course the graduate shall able to –

- Understand the functions of important animal physiological systems including digestion, cardio-respiratory and renal systems.
- Understand the muscular system and the neuro-endocrine regulation of animal growth, development and metabolism with a special knowledge of hormonal control of human reproduction.
- Describe the structure, classification and chemistry of biomolecules and enzymes responsible for sustenance of life in living organisms
- Develop broadunderstanding the basic metabolic activities pertaining to the catabolism and anabolism of various biomolecules
- Describe the key events in early embryonic development starting from the formation of gametes upto gastrulation and formation of primary germ layers.

UNIT I Animal Physiology - I

- ❖ Process of digestion and assimilation
- ❖ Respiration - Pulmonary ventilation, transport of oxygen and CO₂ (Note: Need not study cellular respiration here)
- ❖ Circulation - Structure and functioning of heart, Cardiac cycle
- ❖ Excretion - Structure and functions of kidney urine formation, counter current Mechanism

UN IT II Animal Physiology - II

- ❖ Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers
- ❖ Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction
- ❖ Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas
- ❖ Hormonal control of reproduction in a mammal

UNIT III Cellular Metabolism – I (Biomolecules)

- ❖ Carbohydrates - Classification of carbohydrates. Structure of glucose
- ❖ Proteins - Classification of proteins. General properties of amino acids
- ❖ Lipids - Classification of lipids
- ❖ Enzymes: Classification and Mechanism of Action

UNIT IV Cellular Metabolism – II

- ❖ Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain, Glycogen metabolism, Gluconeogenesis
- ❖ Lipid Metabolism – β -oxidation of palmitic acid
- ❖ Protein metabolism - Transamination, Deamination and Urea Cycle

Unit – V Embryology

- ❖ Gametogenesis
- ❖ Fertilization
- ❖ Types of eggs
- ❖ Types of cleavages
- ❖ Development of Frog upto formation of primary germ layers

REFERENCE BOOKS

1. Eckert H. Animal Physiology: Mechanisms and Adaptation. W.H. Freeman & Company.
2. Flory E. An Introduction to General and Comparative Animal Physiology. W.B. Saunders Co., Philadelphia.
3. Goel KA and Satish KV. 1989. A Text Book of Animal Physiology, Rastogi Publications, Meerut, U.P.
4. Hoar WS. General and Comparative Physiology. Prentice Hall of India, New Delhi.
5. Lehninger AL. Nelson and Cox. Principles of Biochemistry. Lange Medical Publications, New Delhi.
6. Prosser CL and Brown FA. Comparative Animal Physiology. W.B. Saunders Company, Philadelphia.
7. Developmental Biology by Balinsky
8. Developmental Biology by Gerard Karp
9. Chordate embryology by Varma and Agarwal
10. Embryology by V.B. Rastogi
11. Austen CR and Short RV. 1980. Reproduction in Mammals. Cambridge University Press.
12. Gilbert SF. 2006. Developmental Biology, 8th Edition. Sinauer Associates Inc., Publishers, Sunderland, USA.
13. Longo FJ. 1987. Fertilization. Chapman & Hall, London.
14. Rastogi VB and Jayaraj MS. 1989. Developmental Biology. Kedara Nath Ram Nath Publishers, Meerut, Uttar Pradesh.
15. Schatten H and Schatten G. 1989. Molecular Biology of Fertilization. Academic Press, New York.

PRACTICAL COURSE – IV

ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY

Work load: 30 hrs per semester]

[2 hrs/week

I. ANIMAL PHYSIOLOGY

- ❖ Qualitative tests for identification of carbohydrates, proteins and fats
- ❖ Study of activity of salivary amylase under optimum conditions
- ❖ T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
- ❖ Differential count of human blood

II. CELLULAR METABOLISM

- ❖ Estimation of total proteins in given solutions by Lowry's method.
- ❖ Estimation of total carbohydrate by Anthrone method.
- ❖ Qualitative tests for identification of ammonia, urea and uric acid
- ❖ Protocol for Isolation of DNA in animal cells

III. EMBRYOLOGY

- ❖ Study of T.S. of testis, ovary of a mammal
- ❖ Study of different stages of cleavages (2, 4, 8 cell stages)
- ❖ Construction of fate map of frog blastula

REFERENCE BOOKS:

1. Harper's Illustrated Biochemistry
2. Cell and molecular biology: Concepts & experiments. VI Ed. John Wiley & sons. Inc.
3. Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
4. Laboratory techniques by Plummer



S S B N DEGREE COLLEGE (AUTONOMOUS):: ANANTAPURAMU
B.Sc. ZOOLOGY SYLLABUS UNDER CBCS

[2021-22 Batch onwards]

II Year B.Sc.-Zoology: IV Semester

Course-V: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Work load: 60 hrs per semester]

[4 hrs/week

Course Outcomes:

This course will provide students with a deep knowledge in immunology, genetics, embryology and ecology and by the completion of the course the graduate shall able to –

- To get knowledge of the organs of Immune system, types of immunity, cells and organs of immunity.
- To describe immunological response as to how it is triggered (antigens) and regulated (antibodies)
- Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.
- Get familiar with the tools and techniques of animal biotechnology.

Unit – I Immunology – I (Overview of Immune system)

- ❖ Introduction to basic concepts in Immunology
- ❖ Innate and adaptive immunity, Vaccines and Immunization programme
- ❖ Cells of immune system
- ❖ Organs of immune system

Unit – II Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)

- ❖ Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants; Factors influencing immunogenicity
- ❖ Antibodies: Structure of antibody, Classes and functions of antibodies
- ❖ Structure and functions of major histo compatibility complexes
- ❖ Exogenous and Endogenous pathways of antigen presentation and processing
- ❖ Hypersensitivity – Classification and Types

Unit – III Techniques

- ❖ Animal Cell, Tissue and Organ culture media: Natural and Synthetic media,
- ❖ Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures
- ❖ Stem cells: Types of stem cells and applications
- ❖ Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

Unit – IV Applications of Animal Biotechnology

- ❖ Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology
- ❖ Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery
- ❖ Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications
- ❖ Manipulation of reproduction in animals: Artificial Insemination, In vitro fertilization, super ovulation, Embryo transfer, Embryo cloning

Unit - V

- ❖ PCR: Basics of PCR.
- ❖ DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2 hrs)
- ❖ Hybridization techniques: Southern, Northern and Western blotting
- ❖ DNA fingerprinting: Procedure and applications
- ❖ Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing; Agriculture: Monoculture in fishes, polyploidy in fishes

REFERENCE BOOKS

1. Immunology by Ivan M. Riott
2. Immunology by Kubey
3. Sreekrishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New Age International Publ. New Delhi, India.

PRACTICAL COURSE – V
IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Work load: 30 hrs per semester]

[2 hrs/week

I. Immunology

- ❖ Demonstration of lymphoid organs (as per UGC guidelines)
- ❖ Histological study of spleen, thymus and lymph nodes (through prepared slides)
- ❖ Blood group determination
- ❖ Demonstration of
 - ELISA
 - Immunoelectrophoresis

II. Animal biotechnology

- ❖ DNA quantification using DPA Method.
- ❖ Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
- ❖ Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
- ❖ Cleaning and sterilization of glass and plastic wares for cell culture.
- ❖ Preparation of culture media.

REFERENCE BOOKS

1. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. Julie Jameson
2. Practical Immunology A Laboratory Manual; LAP LAMBERT Academic Publishing
3. Manual of laboratory experiments in cell biology by Edward, G
4. Laboratory Techniques by Plummer



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➤ **Beyond Syllabus**

Recommended Co-Curricular Activities:

Measurable

- Assignments (in writing and doing forms on the aspects of outside the syllabus content. (*Shall be individual and challenging*))
- Student seminars (on topics of the syllabus and related aspects. (*Individual activity*))
- Quiz (on topics where the content can be compiled by smaller aspects and data (*Individuals or groups as teams*))
- Field studies (individual observations and recordings as per syllabus content and related areas (*Individual or team activity*))
- Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (*team activity*))

General

- ❖ Group Discussion
- ❖ Visit to Research Stations, Science Museum Centres to understand the basic principles of anatomy and physiology with live examples.
- ❖ Visit to dairy forms, Poultry forms and Indian institute of science.



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Events

