SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

UG - COURSES – AFFILIATED COLLEGES

Course Structure for **B.Sc. Zoology**
(Choice Based Credit System)
(with effect from the academic year 2017- 2018 onwards)

Semester-V				
Part	Subject Status	Subject Title	Subject Code	Credit
III	Core	ANIMAL PHYSIOLOGY	SMZO51	4
	Core	ANIMAL BIOTECHNOLOGY	SMZO52	4
	Elective	SERICULTURE	SMZO5A	4
	Elective	APICULTURE	SMZO5D	4
	Common	PERSONALITY DEVELOPMENT	SCSB5A	2
	Practical	MAJOR PRACTICAL - V	SMZOP5	4
	Practical	MAJOR PRACTICAL - VI	SMZOP6	4
	Practical	MAJOR PRACTICAL - VII	SMZOP7	4

Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. **Scheme for internal Assessment**:
Maximum marks for written test: **20 marks**
3 internal tests, each of **I hour** duration shall be conducted every semester.
To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be:
Written test- 20 marks; Assignment -5 marks Total - 25 marks

B. Scheme of External Examination
3 hrs. examination at the end of the semester
A – Part : 1 mark question two - from each unit
B – Part : 5 marks question one - from each unit
C – Part : 8 marks question one - from each unit

- **Conversion of Marks into Grade Points and Letter Grades**

S.No	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	O	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	A	8	Very Good
4	60-69	B+	7	Good
5	50-59	B	6	Above Average
6	40-49	C	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

- **Cumulative Grade Point Average (CGPA)**

$$\mathbf{CGPA} = \frac{\mathbf{\Sigma\,(GP \times C)}}{\mathbf{\Sigma C}}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

- **Classification**
  a) First Class with Distinction : CGPA $\geq$ 7.5*****
  b) First Class : CGPA $\geq$ 6.0
  c) Second Class : CGPA $\geq$ 5.0 and $<$ 6.0
  d) Third Class : CGPA $<$ 5.0

ANIMAL PHYSIOLOGY

OBJECTIVE

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

OUTCOME

Students learned about various physiological systems and their activates

UNIT I

- Introduction – Animal physiology and Biochemistry
- Carbohydrates – Classification – Structure and functions of glucose, fructose, sucrose and glycogen
- Proteins – classification – structure and function of albumin and glycoproteins.
- General structure of amino acids – essential, non essential aminoacids.
- Lipids – classification – structure and functions of lecithin, Cephalin, glycol lipids and cholesterol
- Prostaglandins – Introduction – Structure – Classification –Functions.

UNIT II

- Enzymes – classification – Nomenclature and properties – Mechanism of enzymeaction.
- Digestion – Role of enzymes in carbohydrate, Protein and Fat Digestion in man absorption of digested food materials inman.
- Metabolism – Carbohydrates – Glycogenesis, glycogenolysis, glycolysis – Krebs‟s cycle.
- Protein‟s – Deamination – Transamination – Urea cycle.
- Lipids –β-Oxidation.

UNIT III

- Respiration – respiratory pigments – Distribution – composition – properties – Functions
- -Transport and exchange of oxygen and carbon-di-oxide - Anaerobiosis - Respiratory Quotient.
- Circulation – Origin and conduction of heat beat – cardiac cycle – ECG – Blood pressure
- -Heart diseases – Artherosclerosis, Angiogram.
- Excretion – kinds of excretory products – structure of kidney – Nephron – Mechanism of urine formation in man – composition of urine – Nephritis – Dialysis.

UNIT IV

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

UNIT V

- Endocrine system – Fine structure and functions of Pituitary, thyroid, Parathyroid, Adrenal, Islets of Langerhans – Testis,Ovary.
- Reproductive Physiology - Ovary, Graafian follicles, menstrual cycle, pregnancy, lactation, menopause - the role of hormones.

PRACTICALS

- Rate of Oxygen consumption in a fish.
- Effect of temperature on the opercular movement of fish – Calculation ofQ10.
- Action of salivary amylase in relation to enzyme concentration.
- Qualitative test for carbohydrate (glucose), protein and lipid.
- Demonstration of blood pressure using sphygmomanometer.
- Estimation of Haemoglobin – demonstration only.
- Counting of different kinds of blood cells using haemocytometer – demonstration only.
- Qualitative test for ammonia, Urea and Uric acid.

Spotters

Slides, models and charts – glucose, fructose, glycogen, sucrose, Amino acid, Cholesterol, Intestinal Villi, Haemoglobin, myoglobin, ECG, Sphygmomanometer, Haemometer, Haemocytometer, Kymograph, Cardiac Muscle, Striated and Non – Striated Muscle, Simple MuscleTwitch.

REFERENCE BOOKS: ANIMAL PHYSIOLOGY

1. Agarwal, R.A, A.K. Srivastava and Kaushal Kumar. Animal Physiologyand Biochemistry (third edition).S.Chand & Company Limited, NewDelhi.
2. Arora, M.P. Animal Physiology (sixth edition) Himalaya Publishing house, Ramdoot,Dr. Bhalerao Marg, Girgaon,Mumbai.

3. Berry, A.K. A Text Book of Animal Physiology with related Biochemistry(6th
4. Edition). EMKAY Publications, Post box No.9410. B – 19 East Krishna Nayar, Swami Dayanad Marg, Delhi.

5. Das, A.K. Medical Physiology, Vol. I and Vol. II Books and allied (P) Limited, No.1 E/2 Shubam Plaza (1st Floor), 83/1 Beliaghata Main Road,Kolkata.
6. Goyal, K.A and K.V. Sastry, Animal Physiology,6th Revised Edition, Rastogi Publication, Gangotri, Shivaji Road,Meerut.
7. Guyton, A.C. (1981).Text Book of Medical Physiology, W.B. Saunders co.
8. Hill. Animal Physiology, ANE Books India, Anantika Niwas,19 Doraiswamy Road, T- Nagar,Chennai.
9. Hoar, W.S.(1975). Text Book Of Medical Physiology, W.B.SaundersCo.
10. Juneja, Kavita, Animal physiology. Anmol Publications Pvt. Ltd, 4374/4B AnsariRoad, Daryaganj. NewDelhi
11. Nagabhushanam, R.M.S. Kodarkar and R. Sarogini. Text Book of Animal Physiology2nd Edition. Oxford & IBH Publishing Company Private Limited, S – 155, Panchshila Park, New Delhi.
12. Nigam, H.C. Animal Physiology. Vishal Publishing Company, Books Market Old Railway Road,Jalandhaar.
13. Prosser, L. and A. Brown Comparative Animal Physiology. Saunders & Co.Philadelphia.
14. Prosser, C.L.(1978). Comparative Animal Physiology. W.B. Saundersco.
15. William, S. Hoar, General and Comparative Physiology. Prentice – Hall of India, M-97 Connaught Circus, NewDelhi.

ANIMAL BIOTECHNOLOGY

OBJECTIVES

- To introduced various concepts, principles of biotechnology
- To introduced the concepts of isolation, cloning and insertion of various genes into a prokaryotes
- To describe the utilization of biotechnology in various biological fields

OUTCOME

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

UNIT: I

Definition, History old and new Biotechnology, Scope and importance of biotechnology. Biotechnology in India. Research promotions and priorities in India, Restriction enzymes; enzymes useful for genetic engineering.

Steps in Gene cloning –

preparation of desired DNA, Isolation of Plasmid vector, Insertion of desired gene into vector DNA, Introduction of recombinant DNA into host cells - prokaryotic and Eukaryotic animal cells. (Transformation, Transfection, Transduction, Microinjection, Biolistics, Electroporation, Liposome fusion). Screening and selection of recombinants. (Insertional inactivation, blue-white selection, Direct selection), Hybridization techniques (Colony hybridization), Blotting techniques (Southern, Northern and Western).

UNIT: II

Genomic library, DNA probe, cloning vectors: Plasmids – types, characteristic features, properties of an ideal gene cloning vector. Plasmid vector (pBR 322,pUC8, Ti plasmid), Bacteriophage vector (Lambda phage and M13), cosmid, phagemid, plant viral vector (CaMV), Animal Viral Vector (SV40); Yeast artificial chromosome, Transposons as vectors. Gene Amplification through PCR.

UNIT: III

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

UNIT: IV

Transgenic animal technology – Introduction, Methods of trans genesis (Any 3 methods), Dolly, applications. Gene therapy – Definition, classification, Bone marrow and Liver transplantation. Enzyme technology: Definition, Production of β Galactosidase enzyme, Enzyme immobilization and their application. Bioethics: Intellectual property right, patenting of Biotech products. Bio safety – definition, Biosafety guidelines in India.

UNIT: V

Applied Biotechnology

Biotechnological methods of sewage water treatment – primary, secondary and tertiary treatment. Bioremediation: Definition, types, Role of genetically engineered organisms in bioremediation (Super bug, phyto remediation) Biofuel: - Ethanol, Biogas. Aqua culture technology: - DOT-ELISA, Gene probe PCR. Human genome project; DNA finger printing techniques and its application in forensic medicine, Microarrays, Biochip, Bioweapons.

PRACTICALS

- Isolation of genomic DNA –Demonstration.
- Isolation of plasmid –Demonstration
- Protoplast preparation and fusion –Demonstration
- Estimation of Co2in any three effluent / sewage water samples –(Individual)
- Isolation of Protein by PAGE –Demonstration.
- **Models / charts / photos:** PBR 322, PUC 8, Ti plasmid, Lambda Phage, M13 Phage, SV40, CaMv, Restriction enzyme, recombinant DNA, Gene cloning, Electroporation, Microinjection, Lipofection, Southern blotting, Monoclonal antibody, stem cells, Dolly, Trans genesis, Animal cloning, organ culture, Anaerobic digester,Fermentor.

REFERENCE BOOKS:

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

SERICULTURE

OBJECTIVE

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

OUTCOME

Students learned how to rear, maintain and uses of silk

UNIT I

Importance of sericulture, sericulture industry in India, sericulture as cottage industry, role of Central Silk Board, Moriculture, Mulberry varieties – High yielding varieties – Varieties for rainfed conditions. Morphology of mulberry plant, methods of propagation, irrigation, manuring – Biofertilizers – Green manuring – Triacontanol for increased mulberry productivity – Seriboost, pruning, harvesting and storing of mulberry leaves, package of practices for mulberry cultivation.

UNIT II

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

UNIT III

Classification of mulberry silkworm, habit and habitats of silkworm, voltinism, races of silkworms, life cycle of mulberry silkworms, structure of egg, larva, pupa and adult, sexual dimorphism digestive system, circulatory system, excretory system, respiratory system, nervous system and reproductive system, endocrine glands, glands of silkworm.

UNIT IV

Rearing of silkworm: Rearing house – Rearing appliances – Rearing operation – Disinfection – Brushing – Maintenance of optimum conditions, Feeding – bed cleaning – spacing. Rearing of young ages – Chawki rearing - Rearing of late age larva: Shelf rearing. Floor rearing, shoot rearing. Application of sampoorna. Mounting: Methods – precautions, Cocoon marketing: Characteristics of cocoon – defective cocoons – methods of harvesting.

UNIT V

Diseases of silkworms; Protozoan – pebrine, Viral – Flacherie, gattine, grasserie Bacterial – Flacherie, septicemia, sotto, court, Fungal – Muscardine, Pests – Uzy fly, dermestid beetle of silkworm. Silk reeling: cocoon stifling – types, storage of stifled cocoons, sorting, cocoon, boiling and deflossing – brushing,

Process of reeling: Different methods, silk waste and byproducts of silk reeling. Raw silk and marketing.

PRACTICALS:

1. Dissection of silk glands, digestive and nervoussystems.
2. Dissection of male and female reproductivesystem.
3. Selection of mulberry leaves according to differentstages.
4. Life history – egg, larva, pupa andadult.
5. Sexual dimorphism in larva, pupa andadult.
6. Mulberry varieties such as MR2, S30, S36,V2.
7. Chandrike.
8. Rearing tray and rearingstand.
9. Raw silk.
10. Report on field visit to sericulturefarm.

REFERENCE BOOKS:

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

APICULTURE

OBJECTIVE

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

OUTCOME

Students learned about selection, rearing and maintenance of apiary

UNIT I

Definition, Scope, Classification of bees, Rock bee, Indian bee, Little bee and Dammer bee- their identification and habits, choice of species in Apiculture. Bee colony-Distinctive features, Identification and Functions of queen, drones and workers, Structure and functions of Legs, mouth parts and sting of worker bee. Development of Honey bee-egg, larva and pupa-time taken for the development of queen, drone and worker. Food of the bee- honey and pollen-royal jelly. Artificial feeding. Behaviour of bees-dances.

UNIT II

Principles of apiculture, Arranging an apiary, position-space-direction,acquiring bees-care of newly captured colonies-handling the bees. Bee keeping-Primitive methods and their Advantages and Disadvantages. The bee comb and its architecture-Different kinds of cells-Burr comb. Different types of Modern hives – Architecture - Parts of artificial hive and its advantages - other appliances used in apiaries.

UNIT III

Honey bee products. Honey- Collection and Extraction, Preservation and storage –Physical properties,Chemical composition,nutritive value, medicinal values-honey as daliy food. Bee wax-Production , method of extraction-characteristics and uses. Bee venom-method of collection - composition of venom- its uses.

UNIT IV

Enemies of bees-Greater wax moth, lesser wax moth, ants, wasps, lice, beetles, birds and their management. Diseases of bees-adult and brood diseases- Bacterial, Fungal, Viral & Protozoan; Prevention and Control measures.

UNIT V

Swarming-Prevention and control. Robbing and Fighting-Prevention and control. Uniting stocks-Different methods. Queen rearing. Supersedure. Foraging, inter-relationships of plants and bees.

PRACTICALS

1. Mountings of Legs, mouth parts and sting.
2. Spotters:

   Queen, worker, Drone, Artificial hive, Queen excluder, smoker, honey
3. extractor, honey, Bee comb and Comb foundation sheet.
4. Report on field visit to apiary.

REFERENCE BOOKS:

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