Shri Swami Vivekanand Shikshan Sanstha's

VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR

DEPARTMENT OF ZOOLOGY

Syllabus for the Third Year B.Sc. (Zoology)

Program: (Undergraduate) B.Sc.

Course: Zoology

SYLLABUS OF COURSE TO BE OFFERED

Core Courses, Elective Courses & Ability Enhancement Courses

Credit Based Semester and Grading System with Effect from the Academic Year **2020–2021**

STRUCTURE OF COURSE

Sr. No	Paper	Name of Paper	Marks	Internal Assessment	Credits
SEMESTER-V					
(DSE) Discipline Specific Electives					
1	DSE-1008E1	**Section-I** Animal biotechnology **Section-II** Animal biotechnology	80	20	4
2	DSE-1008E2	**Section-I** Applied zoology **Section-II** Applied zoology	80	20	4
3	SEC-1008C	Research Methodology			2
4	AECC	English	50		4
SEMESTER-VI					
(DSE) Discipline Specific Electives					
5	DSE-1008F1	**Section-I** Ecology & Aquatic Biology **Section-II** Ecology & Aquatic Biology	80	20	4
6	DSE-1008F2	**Section-I** Immunology **Section-II** Immunology	80	20	4
8	SEC-1008D	Sericulture			2
9	AECC	English	50		4
10	Practical Paper -I	Practical's based on DSE-1008E1	50		4
11	Practical Paper -II	Practical's based on DSE-1008E2	50		4
12	Practical Paper -III	Practical's based on DSE-1008F1	50		4
13	Practical Paper -IV	Practical's based on DSE-1008F2	50		4

"Education for Knowledge, Science and Culture"
-Shikshanmaharshi Dr. Bapuji Salunkhe
Shri Swami Vivekanand Shikshan Sanstha's
VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR
B. Sc. Part – III CBCS Syllabus with effect from June, 2020
ZOOLOGY-DSE -1008E1
Semester: V Zoology-Paper- V
ANIMAL BIOTECHNOLOGY
Theory: 72 Hours - (92 lectures of 48 minutes) Credits -04

Section I

Unit 1: Introduction **15**

Concept and scope of biotechnology

DNA structure, DNA replication, Transcription and Translation

Unit 2: Molecular Techniques in Gene manipulation **21**

Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda , Bacteriophage, , BAC, MAC and Expression vectors (Characteristics)

Restriction enzymes: Nomenclature, detailed study of Type II.

Transformation techniques: Calcium chloride method and Electroporation.

Construction of genomic and cDNA libraries and screening by colony and plaque hybridization

Southern, Northern and Western blotting; DNA sequencing: Sanger method, Polymerase Chain Reaction, DNA finger printing

Section II

Unit 3: Genetically Modified Organisms **18**

Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection

Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knockout mice.

Production of transgenic plants: *Agrobacterium* mediated transformation.

Applications of transgenic plants: insect and herbicide resistant plants.

Unit 4: Culture Techniques and Applications **18**

Animal cell culture:1. Cell culture techniques and types 2. Requirments 3. Types of media 4 . Sterilization technique 5. Stem cell culture 6. Application

Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia)

Recombinant DNA in medicines: Recombinant insulin and human growth hormone, Gene therapy

Microtechnique, Application of biotechnology in animal husbandry, medicine and agriculture

VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR
B. Sc. Part – III CBCS Syllabus with effect from June, 2020
ZOOLOGY-DSE -1008E2
Semester: V Zoology-Paper- VI
APPLIED ZOOLOGY
Theory: 72 Hours - (92 lectures of 48 minutes) Credits -04

Section I

Unit 1: Introduction to Host-parasite Relationship **8**

Host, Definitive host, Intermediate host, Parasitism, Types of Parasites, Symbiosis, Commensalism, Reservoir, Zoonosis, Types of parasites

Unit 2: Epidemiology of Diseases **8**

Transmission, Prevention and control of diseases: Tuberculosis, Typhoid, Dengue & swine flue

Unit 3: Parasitic Protozoa **8**

Life history and pathogenicity of *Entamoeba histolytica, Plasmodium vivax, Trichomonas*

Unit 4: Insects of Economic Importance **12**

Biology, Control and damage caused by *Helicoverpa armigera*, *Pyrilla perpusilla* and *Papilio demoleus, Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum, milibug, aphids and white fly*

Section II

Unit 5: Insects of Medical Importance **6**

Medical importance and control of *Pediculus humanus corporis*, *Anopheles*, *Culex*, *Aedes*, *Xenopsylla cheopis*

Unit 6: Dairy technology **6**

Selection of breed, Types of breeds, (4 exotic and 4 indigenous), Management ,Food, fodder and Shelter

Unit 7: Poultry Farming **6**

Principle of poultry breeding, Types of poultry breeds broilers & Layers, Management, Feeding ,Shelter, processing and preservation of eggs, Back yard poultry forming

Unit 8: Fish Technology **7**

Fish farming construction & Maintenance. Induced breeding and transportation of fish **s**eed

Unit 9: Animal feed preparation **6**

Cattle feed, rat feed, fish feed, poultry feed

Unit 10: Animal and Crop waste Management **5**

Poultry waste management, Sugarcane and wheat waste management

Skill Enhancement Courses

Research Methodology (CREDITS 2)

Unit 1: Foundations of Research **5**

Meaning, Objectives, Motivation: Research Methods *vs* Methodology, Types of Research: Analytical *vs* Descriptive, Quantitative *vs* Qualitative, Basic *vs* Applied

Unit 2: Research Design **8**

Need for research design: Features of good design, Important concepts related to good design- Observation and Facts, Prediction and Explanation, Development of Models. Developing a research plan: Problem identification, Experimentation, Determining experimental and sample designs

Unit 3: Data Collection, Analysis and Report Writing **12**

Observation and Collection of Data-Methods of data collection- Sampling Methods, Data Processing and Analysis Strategies, Technical Reports and Thesis writing, Preparation of Tables and Bibliography. Data Presentation using digital technology

Unit 4: Ethical Issues **5**

Intellectual property Rights, Commercialization, Copy Right, Royalty, Patent law, Plagiarism, Citation, Acknowledgement

SUGGESTED READINGS

- Anthony, M, Graziano, A.M. and Raulin, M.L. 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
- Walliman, N. 2011.Research Methods- The Basics. Taylor and Francis, London, New York.
- Wadhera, B.L.: Law Relating to Patents, Trade Marks, Copyright Designs and Geographical Indications, 2002, Universal Law publishing
- C.R.Kothari: Research Methodology, New Age International, 2009
- Coley, S.M. and Scheinberg, C.A. 1990, "Proposal writing". Stage Publications.

ANIMAL BIOTECHNOLOGY

PRACTICAL **(Credits 4)**

1. Genomic DNA isolation from *E. coli*
2. Plasmid DNA isolation (pUC 18/19) from *E. coli*
3. Restriction digestion of plasmid DNA.
4. Construction of circular and linear restriction map from the data provided.
5. TLC-Thin Layer chromatography

6. Microtchnique (Any two slide)

7. Separation of protein by SDS-PAGE

8. Separation of DNA by Agarose gel electrophoresis

9. Study the following technique through photograph

Southern Bloting, Nothern blotting, western blotting , DNA sequencing, PCR, DNA finger printing

10. To study following Instruments.

a) pH meter b) Spectrophotometer c) Calorimeter d) Cooling Centrifuge

e) Laminar Air flow f) CO_2 incubator

11. Project report on animal cell culture

12. Visit to tissue culture laboratory and biofertilizer industry

SUGGESTED READINGS

- Brown, T.A. (1998). *Molecular Biology Labfax II: Gene Cloning and DNA Analysis*. II
- Edition, Academic Press, California, USA.
- Glick, B.R. and Pasternak, J.J. (2009). *Molecular Biotechnology - Principles and*
- *Applications of Recombinant DNA*. IV Edition, ASM press, Washington, USA.
- Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009).
- *An Introduction to Genetic Analysis*. IX Edition. Freeman and Co., N.Y., USA.
- Snustad, D.P. and Simmons, M.J. (2009). *Principles of Genetics.* V Edition, John Wiley and Sons Inc.
- Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). *Recombinant DNAGenes and Genomes- A Short Course*. III Edition, Freeman and Co., N.Y., USA.
- Beauchamp, T.I. and Childress, J.F. (2008). *Principles of Biomedical Ethics.* VI Edition,
- Oxford University Press.

APPLIED ZOOLOGY

PRACTICAL **(CREDITS 4)**

1. Study of *Plasmodium vivax, Entamoeba histolytica,* and their life stages through permanent slides/photomicrographs or specimens.

2. Study of arthropod vectors associated with human diseases: *Pediculus, Culex, Anopheles, Aedes* and *Xenopsylla.*

3. Study of insect damage to different plant parts/stored grains through damaged products/photographs.

4. Identifying feature and economic importance of *Helicoverpa* (*Heliothis*) *armigera, Papilio demoleus, Pyrilla perpusilla, Callosobruchus chinensis, Sitophilus oryzae* and *Tribolium castaneum.*

5. Media preparation of microbial culture and cultivation of microbes for decomposition of poultry and crop waste-wheat and sugarcane

6. Study of dairy products

7. Types of cattles breed

8. Types of poultry breeds

9. Types of cattle breeds

10. Types of Poultry breeds

11. Dairy byproducts

12. Visit to poultry farm or cattle farm. Submission of visit report

SUGGESTED READINGS

- Park, K. (2007). *Preventive and Social Medicine*. XVI Edition. B.B Publishers.
- Arora, D. R and Arora, B. (2001). *Medical Parasitology*. II Edition. CBS Publications
- and Distributors.
- Kumar and Corton. *Pathological Basis of Diseases*.
- Atwal, A.S. (1986). *Agricultural Pests of India and South East Asia*, Kalyani
- Publishers.
- Dennis, H. (2009). *Agricultural Entomology*. Timber Press (OR).
- Hafez, E. S. E. (1962). *Reproduction in Farm Animals*. Lea & Fabiger Publisher
- Dunham R.A. (2004). *Aquaculture and Fisheries Biotechnology Genetic Approache*s.
- CABI publications, U.K.
- Pedigo, L.P. (2002). *Entomology and Pest Management*, Prentice Hall.

VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR
B. Sc. Part – III CBCS Syllabus with effect from June, 2020
ZOOLOGY-DSE -1008F1
Semester: VI Zoology-Paper- VII
ECOLOGY & AQUATIC BIOLOGY
Theory: 72 Hours - (92 lectures of 48 minutes) Credits -04

Section I

UNIT 1: Ecology **10**

Introduction and scope of Ecology,

Structure, function, types & components of ecosystem, energy flow and cycling of minerals food chain, food web & Ecological pyramids, Introduction to biomes and their types

Unit 2 : Aquatic Biomes **18**

Brief introduction of the aquatic biomes: Freshwater ecosystem (wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.

UNIT 3: Marine Biology **08**

Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.

Section II

UNIT 4: Freshwater Biology **16**

Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, Physico–chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; dissolved gases (Oxygen, Carbon dioxide). Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous.

UNIT 5: Streams and their conservation **5**

Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes and Conservation of streams

UNIT 5: Management of Aquatic Resources **15**

Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment, Water quality assessment- BOD and COD.

VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR
B. Sc. Part – III CBCS Syllabus with effect from June, 2020
ZOOLOGY-DSE -1008F2
Semester: VI Zoology-Paper- VIII
IMMUNOLOGY
Theory: 72 Hours - (92 lectures of 48 minutes) Credits -04

Section I

Unit 1: **Overview of the Immune System** **10**

Introduction to basic concepts in immunology, components of immune system, principles of innate and adaptive immune system

Unit 2: **Cells and Organs of the Immune System** **9**

Haematopoeisis, Cells of immune system and organs (primary and secondary lymphoid organs) of the immune system

Unit 3: Antigens **8**

Basic properties of antigens, B and T cell epitopes, haptens and adjuvants

Unit 4: **Antibodies** **9**

Structure, classes and function of antibodies, hybridoma technology, monoclonal antibodies, Hybridoma technology, antigen antibody interactions as tools for research and diagnosis, ELISA & its types

Section II

Unit 5: **Working of the immune system** **15**

Structure and functions of MHC, exogenous and endogenous pathways of antigen presentation and processing, basic properties and functions of cytokines, Complement system: Components and pathways.

Unit 6: **Immune system in health and disease** **15**

Gell and Coombs' classification and brief description of various types of hypersensitivities, Introduction to concepts of autoimmunity and immunodeficiency and Autoimmune disorders

Unit 7: Vaccines **6**

General introduction to vaccines, types of vaccines, production of vaccines

Skill Enhancement Courses

SERICULTURE

(CREDITS 2)

Unit 1: Introduction **3**

Sericulture: Definition, history and present status; Silk route Types of silkworms, Distribution and Races Exotic and indigenous races Mulberry and non-mulberry Sericulture

Unit 2: Biology of Silkworm **3**

Life cycle of *Bombyx mori* Structure of silk gland and secretion of silk

Unit 3: Rearing of Silkworms **13**

Selection of mulberry variety and establishment of mulberry garden Rearing house and rearing appliances Disinfectants: Formalin, bleaching powder, RKO Silkworm rearing technology: Early age and Late age rearing Types of mountages Spinning, harvesting and storage of cocoons

Unit 4: Pests and Diseases **4**

Pests of silkworm: Uzi fly, dermestid beetles and vertebrates Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial Control and prevention of pests and diseases

Unit 5: Entrepreneurship in Sericulture **2**

Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture. Visit to various sericulture centres.

SUGGESTED READINGS

- Handbook of Practical Sericulture: S.R. Ullal and M.N. Narasimhanna CSB, Bangalore
- Appropriate Sericultural Techniques; Ed. M. S. Jolly, Director, CSR & TI, Mysore.
- Handbook of Silkworm Rearing: Agriculture and Technical Manual-1, Fuzi Pub. Co. Ltd., Tokyo, Japan1972.
- Manual of Silkworm Egg Production; M. N. Narasimhanna, CSB, Bangalore 1988.
- Silkworm Rearing; Wupang—Chun and Chen Da-Chung, Pub. By FAO, Rome 1988.
- A Guide for Bivoltine Sericulture; K. Sengupta, Director, CSR & TI, Mysore 1989.
- Improved Method of Rearing Young age silkworm; S. Krishnaswamy, reprinted CSB, Bangalore, 1986.

AQUATIC BIOLOGY

PRACTICAL **(Credits 4)**

1. Study of Pond Ecosystem on field
2. Identify the important macrophytes, phytoplanktons and zooplanktons present in a lake ecosystem.
3. Determine the amount of Turbidity/transparency, Dissolved Oxygen, Free Carbon dioxide, Alkalinity (carbonates & bicarbonates), Hardness in water collected from a nearby lake/ water body.
4. Instruments used in limnology (Secchi disc, Van Dorn Bottle, Conductivity meter, Turbidity meter, PONAR grab sampler) and their significance with the help of photographs.
5. O_2 consumption by any aquatic animal
6. Determine the BOD & COD of water sample.
7. A Project Report on a visit to a Sewage treatment plant/Marine bioreserve/ Fisheries Institutes.

SUGGESTED READINGS

- **Anathakrishnan** : Bioresources Ecology 3rd Edition
- **Goldman** : Limnology, 2nd Edition
- **Odum and Barrett** : Fundamentals of Ecology, 5th Edition
- **Pawlowski** : Physicochemical Methods for Water and Wastewater Treatment, 1st
- Edition
- **Wetzel** : Limnology, 3rd edition
- **Trivedi and Goyal** : Chemical and biological methods for water pollution studies
- **Welch** : Limnology Vols. I-II

IMMUNOLOGY

PRACTICAL **(CREDITS 4)**

1. Demonstration of lymphoid organs (Photographs/slides)
2. Histological study of spleen, thymus and lymph nodes through slides/ photographs
3. Preparation of stained blood film to study various types of blood cells
4. Antigen antibody reaction by double immuno-diffusion method
5. ABO blood group determination.
6. Total RBC and WBC count.
7. Demonstration of

a) ELISA (Photograph)

b) Immunoelectrophoresis (Photograph)

8. Project

SUGGESTED READINGS

- Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). *Immunology*, VI Edition. W.H. Freeman and Company.
- David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology,* VII Edition, Mosby, Elsevier Publication.
- Abbas, K. Abul and Lechtman H. Andrew (2003.) *Cellular and Molecular*
- *Immunology.* V Edition. Saunders Publication.

Nature of Question Paper

Instructions: 1) All the questions are **compulsory**.
2) Answers to the two sections should be written in separate answer books.
3) Figures to the right indicate **full** marks.
4) Draw neat labeled diagrams **wherever** necessary.

Time : 3 hours **Total Marks: 80**

SECTION-I

Q.1. Choose correct alternative. **(8)**

i)
A) B) C) D)

ii)
A) B) C) D)

iii)
A) B) C) D)

iv)
A) B) C) D)

v)
A) B) C) D)

vi)
A) B) C) D)
vii)
A) B) C) D)
viii)
A) B) C) D)

Q.2. Attempt any Two. **(16)**

A)
B)
C)

Q.3. Attempt any Four **(16)**

A)
B)
C)
D)
E)
F)

SECTION-II

Q.4. Choose correct alternative. **(8)**

i)
A) B) C) D)
ii)
A) B) C) D)
iii)
A) B) C) D)
iv)
A) B) C) D)
v)
A) B) C) D)
vi)
A) B) C) D)
vii)
A) B) C) D)
viii)
A) B) C) D)

Q.5. Attempt any Two. **(16)**

A)
B)
C)

Q.6. Attempt any Four **(16)**

A)
B)
C)
D)
E)
F)

Scheme of marking (Theory)

Sem.	Core Course	Marks	Evaluation	Sections	Answer Books	Standard of passing
V	DSE-1008E	80	Semester wise	Two sections each of 40 marks	As per Instruction	35% (28 marks)
	DSE-1008E1	80	Semester wise	Two sections each of 40 marks	As per Instruction	35% (28marks)
IV	DSE-1008F1	80	Semester wise	Two sections each of 40 marks	As per Instruction	35% (28 marks)
	DSE-1008F2	80	Semester wise	Two sections each of 40 marks	As per Instruction	35% (28marks)

Scheme of marking (CIE) Continuous Internal Evaluation

Sem.	Core Course	Marks	Evaluation	Sections	Answer Books	Standard of passing
V	DSE-1008 E1	20	Concurrent	-	As per Instruction	35% (7 marks)
	DSE-1008 E2	20	Concurrent	-	As per Instruction	35% (7 marks)
VI	DSE-1008 F1	20	Concurrent	-	As per Instruction	35% (7 marks)
	DSE-1008 F2	20	Concurrent	-	As per Instruction	35% (7 marks)

Scheme of marking (practical)

Sem.	Course	Marks	Evaluation	Sections	Standard of passing
V AND VI	DSE-1008 E1 and E2 (Pr), SEC-1008C	200	Annual	As per Instruction	35%
	DSE1008 F1and F2 (Pr), SEC-1008D				

***A separate passing is mandatory**