

THIRUVALLUVAR UNIVERSITY

BACHELOR OF SCIENCE

B.Sc. ZOOLOGY DEGREE COURSE

(With effect from 2020 - 2021)

The Course of Study and the Scheme of Examinations

S. No.	Part	Study Components		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
SEMESTER I									
1.	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2.	II	English (CE)	Paper-1	6	4	Communicative English I	25	75	100
3.	III	Core Theory	Paper-1	6	4	Invertebrata	25	75	100
	III	Core Practical	Practical-1	4	0	Invertebrata and chordata	0	0	0
4.	III	Allied -1	Paper-1	4	3	(To choose 1 out of 3) 1. Chemistry – I 2. Botany – I 3. Economic Entomology – I	25	75	100
	III	Allied- 1	Practical-1	2	0		0	0	0
5.	III	PE	Paper 1	6	3	Professional English I	25	75	100
6.	IV	Environmental Studies		2	2	Environmental studies	25	75	100
		Sem. Total		36	20		150	450	600
SEMESTER II									
7.	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
8.	II	English (CE)	Paper-2	6	4	Communicative English II	25	75	100
9.	III	Core Theory	Paper-2	5	4	Chordata	25	75	100
10.	III	Core Practical	Practical-1	3	2	Invertebrata and chordata	25	75	100
11.	III	Allied-1	Paper-2	4	3	(To choose 1 out of 3) 1. Chemistry II 2. Botany II 3. Economic Entomology II	25	75	100
12.	III	Allied Practical - 1	Practical-1	2	2		25	75	100
13.	III	PE	Paper 1	6	3	Professional English II	25	75	100
14.	IV	Value Education		2	2		25	75	100
15.	IV	Soft Skill		2	1		25	75	100
		Sem. Total		36	25		225	675	900

		SEMESTER III						CIA	Uni. Exam	Total
16.	I	Language	Paper-3	6	4	Tamil/Other Languages	25	75	100	
17.	II	English	Paper-3	6	4	English	25	75	100	
18.	III	Core Theory	Paper-3	4	4	Cell and molecular Biology	25	75	100	
	III	Core Practical	Practical- II	3	0	Cell and molecular Biology	0	0	0	
19.	III	Allied-2	Paper-3	4	3	(To choose 1 out of 3) 1. Chemistry - I 2. Botany - I 3. Economic Entomology - I	25	75	100	
		Allied Practical - 2	Practical-2	3	0		0	0	0	
20.	IV	Skill Based Subject	Paper-1	2	2	(To choose 1 out of 2) 1.Vermiculture 2. Single Cell Protein Culture	25	75	100	
21.	IV	Non-Major Elective	Paper-1	2	2	(To choose 1 out of 2) 1.Public Health and Hygiene 2.Poultry Farming	25	75	100	
		Sem. Total		30	19		150	450	600	
		SEMESTER IV						CIA	Uni. Exam	Total
22.	I	Language	Paper-4	6	4	Tamil/Other Languages	25	75	100	
23.	II	English	Paper-4	6	4	English	25	75	100	
24.	III	Core Theory	Paper-4	4	4	Genetics and Biotechnology	25	75	100	
25.	III	Core Practical	Practical-2	3	3	Cell and molecular Biology and Genetics and Biotechnology	25	75	100	
26.	III	Allied-2	Paper-4	4	3	(To choose 1 out of 3) 1. Chemistry II 2. Botany II 3. Economic Entomology II	25	75	100	
27.	III	Allied Practical - 2	Practical-2	3	2		25	75	100	
28.	IV	Skill Based Subject	Paper-2	2	2	(To choose 1 out of 2) 1. Sericulture 2 .Apiculture	25	75	100	
29.	IV	Non-Major Elective	Paper-2	2	2	(To choose 1 out of 2) 1. Bio-Fertilizer Production 2. Aquarium Fish keeping	25	75	100	
		Sem. Total		30	24		200	600	800	
		SEMESTER V						CIA	Uni. Exam	Total
30.	III	Core Theory	Paper-5	6	6	Bio-Statistics and Bio-Informatics	25	75	100	
	III	Core Practical	Practical-3	3	0	Bio-Statistics and Bio-Informatics Developmental Biology and Immunology Animal Physiology	0	0	0	
31.	III	Core Theory	Paper-6	6	6	Developmental Biology and Immunology	25	75	100	

		Core Practical	Practical-4	3	0	Environmental Biology Economic Zoology	0	0	0
32.	III	Core Theory	Paper-7	6	5	Animal Physiology	25	75	100
33.	III	Internal Elective	Paper-1	3	3	(To choose 1 out of 2) 1. NanoTechnology in Life Sciences 2.Human Endocrinology	25	75	100
34.	IV	Skill Based Subject	Paper-3	3	2	(To choose 1 out of 2) 1. Animal Behavior 2.VegetableMeat Culture	25	75	100
		Sem. Total		30	22		125	375	500
SEMESTER VI							CIA	Uni. Exam	Total
35.	III	Core Theory	Paper-8	5	5	Environmental Biology	25	75	100
36.	III	Core Theory	Paper-9	5	5	Economic Zoology	25	75	100
37.	III	Core Practical	Practical-3	3	3	Bio-Statistics and Bio- Informatics Developmental Biology and Immunology Animal Physiology	25	75	100
38.	III	Core Practical	Practical-4	3	3	Environmental Biology Economic Zoology	25	75	100
39.	III	Compulsory Project	Paper-10	5	5	Individual / Group Project	25	75	100
40.	III	Internal Elective	Paper-2	3	3	(To choose 1 out of 2) 1. Evolution 2.Microbiology	25	75	100
41.	III	Internal Elective	Paper-3	3	3	(To choose 1 out of 2) 1. Bio Chemistry 2.Applied Entomology	25	75	100
42.	IV	Skill based Subject	Paper-4	3	2	(To choose 1 out of 2) 1.Medical Lab Technology 2.Industrial Fishery Management	25	75	100
43.	V	Extension Activities		0	1		100	0	100
		Sem. Total		30	30		300	600	900
					140				4300

Part	Subject	Papers	Credit	Total Credits	Marks	Total Marks
Part I	Languages	4	4	16	100	400
Part II	Communicative English & English	4	4	16	100	400
Part III	Allied (Odd Semester)	2	3	6	100	200
	Allied (Even Semester)	2	5	10	100	200
	Allied Practical	2	2		100	200
	Electives	3	3	9	100	300
	Core	9	(3-5)	43	100	900
	Core practical	4	(2-3)	11	100	400
	Professional English	2	3	6	100	200
	Compulsory Project (Group/Individual Project)	1	5	5	100	100
Part IV	Environmental Science	1	2	2	100	100
	Soft skill	1	1	1	100	100
	Value Education	1	2	2	100	100
	Lang. & Others /NME	2	2	4	100	200
	Skill Based	4	2	8	100	400
Part V	Extension Activities	1	1	1	100	100
	Total	43		140		4300

SECOND YEAR

SEMESTER III

Core Paper - 3

CELL AND MOLECULAR BIOLOGY

Objectives:

To learn the cytological techniques, the structure and functions of various cellular components.
To understand the integrated activity of the whole cell as in mitosis, meiosis and protein synthesis.
To understand the molecular basis of cell structure DNA structure and functions.

UNIT - I

History of Cell and Molecular Biology - Principles of microscopes light and electron, Cytological techniques - cell fractionation, Homogenization Centrifugation, Isolation of Sub-cellular components. Biochemical techniques - Electrophoresis and their applications. Cell culture techniques and applications.

UNIT - II

Cell - Cell theory, Ultra structure of animal cell - structure, composition and functions - cell components - Plasma Membrane - Endoplasmic reticulum, Ribosomes, Golgi Complex, Lysosomes, Peroxisomes, Centrioles and Mitochondria.

UNIT - III

Cytoplasm - Physical, chemical and biological properties. Nucleus - Ultrastructure, Composition and Function - Chromosomes - Giant chromosomes (Polytene and Lamp brush chromosomes).

UNIT - IV

Cell cycle and cell division - Amitosis, Mitosis and meiosis and their significance. Cancer biology - structure of cancer cell, carcinogenesis. Aging - Cell death and apoptosis.

UNIT - V

Structure and functions of DNA & types of RNA [mRNA, tRNA, rRNA]. Semi conservative replication, mechanism and enzymology of DNA replication. Protein synthesis.

Reference Books:

1. Cohn, N.S., 1979, Elements of Cytology, Freeman Book co., New Delhi.
2. De Robertis, E.D.P. and E.M.F. De Robertis, 1988. Cell and molecular Biology, 8th Edition, International edition Informes Hongkong.
3. Gies, A.C., 1979. Cell Physiology, Saunders co., Philadelphia, London, Toronto.
4. Powar, C.B., 1989. Essentials of Cytology, Himalaya Publishing House, Bombay.
5. Verma, P.S., and V.K. Agarwal, 1995. Cell and Molecular Biology, 8th Edition, S. Chand & Co., New Delhi.
6. Rastogi. S.C. Cell and Molecular Biology, 2008 2nd Edition, New Age International (p) Ltd., New Delhi.
7. G.P. Jayanthi 2009 Molecular Biology, M.J P Publ. Chennai.
8. Philip Sheeler, Donald E. Bianchi, 1987. Cell and Molecular Biology - John Wiley and Sons, Inc, 3rd Edition.
9. M. Prakash, C.K. Arora, 1998 - Microscopical Methods - Anmol Publications Pvt. Ltd., First Edition.

10. M. Prakash, C.K. Arora, 1998 - Laboratory Instrumentation - Anmol Publications Pvt. Ltd. First edition.

Course Outcome: After completion of the course the student will..

CO 1: Acquire knowledge about the history basic techniques in cytology and molecular biology.

CO 2: Get an in depth knowledge about the cell structure.

CO 3: Learn about the cell organelles and their functions.

CO 4: Understand the cell cycle and learn about cancer biology.

CO 5: Learn about the nucleic acid and protein synthesis.

SKILL BASED SUBJECT-1

PAPER -1

(to choose one out of 2)

A. VERMICULTURE

Objectives:

To acquire knowledge about biofertilizer

To impart training on Earthworm culture technology

To create knowledge on Self - Employment opportunity

UNIT - I

Earthworm types - Morphological and Anatomical characteristics. Biology of *Lampito maruitti*.

UNIT - II

Vermicompost process - Types of Vermicomposting materials. Monoculture and polyculture techniques, factors affecting vermicomposting - pH, Moisture, temperature etc.

UNIT - III

Vermicomposting methods - Small scale and large scale pit method, heap method, Wind row method and bin method. Vermiwash.

UNIT - IV

Vermicomposting: General procedure in Homes. Maintenance of vermicomposting beds. Harvesting the worms. Earthworm Predators, parasites and pathogens.

UNIT - V

Nutrients availability - Application of Vermicomposting in Agriculture and Horticultural practices. Advantages of Vermicompost and marketing.

Reference Books:

1. Edwards, C.A., and Bother, B. 1996: Biology of Earthworms - Chapman Hall Publ. Co., London.
2. Ismail, S.A. 1997: Vermitechnology - the Biology of Earthworms - Orient Longman Publ. - India.
3. Ranganathan, L.S. 2006: Vermibiotechnology from soil health to Human health - Agrobios - India.
4. Talashikar, S.C. 2008: Earthworms in Agriculture - Agrobios - India
5. Gupta, P.K. 2008: Vermicomposting for sustainable agriculture [2nd edition] - Agrobios - India.
6. EIRI Board, 2015: Handbook of Biofertilizers and Vermiculture, New Delhi, India.
7. NIIR Board: The complete technology book on Biofertilizers and organic farming New Delhi, India.
8. Mary Violet Christy, A. 2008: Vermitechnology - MJP Publishers, Chennai , India.
9. Rajeev Prathap Singh. 2012: Organic Fertilizers: Types, Production and Environmental Impact Nova Science Inc. New York.

10. Keshav Singh, 2014: A textbook on Vermicompost, Vermiwash and Biopesticide. Biotech Books, Astral International, New Delhi, India.

Course Outcome: After completion of the course the student will ..

CO 1: Learn about the characteristics and biology of earthworm.

CO 2: Get an in depth knowledge about the culture techniques.

CO 3: Understand about the methods of composting.

CO 4: Learn the factors for proper maintenance of the vermicomposting beds.

CO 5: Learn about the application and marketing of the compost.

**SKILL BASED SUBJECT-1
PAPER -1**

B. SINGLE CELL PROTEIN CULTURE

Objectives:

To have knowledge and importance of **Single cell protein (SCP)** culture techniques.
To emphasize the importance of integrating new knowledge of Food Biotechnology.
To update the technological innovations of Microbial organisms and its applications in Nutrition.

Course Outcome: After completion of the course the student will ..

CO 1: Acquire knowledge about the scope and organisms used in SCP.
CO 2: Get an in depth knowledge about the Algal SCP.
CO 3: Understand about the culture and extraction of Bacterial SCP.
CO 4: Understand the culture techniques of Fungal SCP.
CO 5: Learn about the application of SCP.

UNIT - I

The scope of food biotechnology - characterization, classification and identification of Microorganisms employed in single cell protein (SCP) cultivation.

UNIT - II

Algal sources of single cell proteins - Culture and extraction of SCP From spirulina Maxima, chlorella species.

UNIT - III

Bacterial sources of single cell proteins - culture and extraction of SCP from Bacillus species and *Methylococcus capsulatus*.

UNIT - IV

Fungal sources of single cell proteins - Culture and extraction from yeasts - Candida species.
Extraction from filamentous fungi - Agaricus species

UNIT - V

General account on the production of SCP from Biomass and Waste Materials. Nutritive values of SCP - Dietary supplements for Human, Cattle and Birds.

Reference Books:

1. Arumugam, N. 2006: Microbiology, Saras Publ. Nagercoil - India.
2. Kumarasan, V. 2001: Biotechnology, Saras Publ Nagercoil - india.
3. Agarwal, A.K. and Parihar, P.2006: Industrial microbiology - student edition - India.
4. Dubey, R.C and Maheswari, D.K. 2005: A Text Book of Microbiology - S. Chand & co., New Delhi.

5. Rao, A.S. 1997: Introduction to Microbiology - prentice - Hall, New Delhi, New Delhi- India.
6. Sullia, S.B. and Shantharam, S.2005: General Microbiology, Oxford IBH - Publ.. New Delhi - India.
7. Krishnan, A. 2005: Students Dictionary of Microbiology - Student edition - India.
8. Dubey R.C. 2013.- A textbook of Biotechnology, S.Chand and Company Pvt. Ltd. New Delhi.
9. Israel Goldberg, 1985: Single Cell Protein Springer , New York.
10. Steven R. Tannenbaum and Daniel I-chyau Wang, 1975: Single Cell Protein - II-M I T press, London

Course Outcome: After completion of the course the student will ..

- CO 1: Acquire knowledge about the scope and organisms used in SCP.
- CO 2: Get an in depth knowledge about the Algal SCP.
- CO 3: Understand about the culture and extraction of Bacterial SCP.
- CO 4: Understand the culture techniques of Fungal SCP.
- CO 5: Learn about the application of SCP.

NON-MAJOR ELECTIVE

PAPER -1

(to choose one out of 2)

A. PUBLIC HEALTH AND HYGINE

Course Objectives

1. To impart awareness on public health, Hygiene and diseases.
- 2 To educate and emphasize on preventive measures of diseases.
3. To create knowledge on Health Education.

UNIT - I

Scope of Public Health and Hygiene - Nutrition and health - classification of foods - Balanced Diet - malnutrition - Kwashirkor, Marasmus, Obesity, Anaemias, - Vitamin deficiencies. Nutritional requirements of special groups.

UNIT - II

Environment and Health Hazards - Causes and effects of Environmental degradation -pollution and associated health Hazards - Health problems due to industrializations - Hospital waste management.

UNIT - III

Communicable diseases and their control measures such as Cholera, Hepatatis, Measles, Polio, Chikungunya, Rabies, Plauge, Leprosy and AIDS.

UNIT - IV

Non - communicable diseases and their preventive measures such as Cancer, Chronic kidney diseases, Chronic respiratory diseases, Hypertension, Coronary Heart Diseases, Stroke, Diabetes, and Obesity. Alcoholism and drug dependence.

UNIT - V

Health Education and Health programmes in India - WHO programmes - government and voluntary Organizations and their health service - Precautions first Aid and awareness on sporadic diseases.

Text Books

Unit-1: Park and Park, 1995: Text book of preventive and social medicine - Banarsidas Bhanot Publ. jodhpur- India.

Unit-2: Verma, S. 1998: Medical zoology, Rastogi Publ.- Meerut- India

Unit-3: Singh, H.s. and Rastogi, P. 2009: Parasitology, Rastogi Publ. India.

Unit-4: Dubey, R.C and Maheswari, D.K. 2007: Text Book of Microbiology - S. Chand & co. Publ. New Delhi- India.

Unit-5: Park and Park, 1995: Text book of preventive and social medicine - Banarsidas Bhanot Publ. jodhpur- India.

Course Out Comes (five outcomes for each units should be mentioned)

1. After studied unit-1, the student will be able to understand Scope of Public Health and Hygiene - Nutrition and health - classification of foods.
2. After studied unit-2, the student will be able to understand Environment and Health Hazards
3. After studied unit-3, the student will be able to understand Communicable diseases and their control measures
4. After studied unit-4, To acquire the knowledge about Non - communicable diseases and their preventive measures
5. After studied unit-5, the student to acquire the knowledge Health Education and Health programmes in India and WHO programmes

NON-MAJOR ELECTIVE

PAPER -1

B. POULTRY FARMING

Objective: To understand the poultry industry based on the past, present and emphasis of future growth. To study the statistical data and various functions involved in poultry industry.

UNIT - I

PROSPECTS OF POULTRY INDUSTRY

Introduction - definition of poultry - broiler, layer and breeder - common terms related to poultry - development of poultry industry in India. Past and present scenario of poultry industry - domestication of poultry. Role of government/private agencies in poultry development. Importance of broiler and layer production under Indian scenario - poultry population and other poultry related statistics, per capita meat and egg availability in India.

UNIT - II

POULTRY PRODUCTION SYSTEMS, HOUSING, AUTOMATION AND EQUIPMENTS

Selection of site and location of poultry farm - importance of poultry housing and equipment. Principles of housing - location of poultry houses - basic principles of construction. System of rearing - backyard system, semi-intensive system, intensive system - cage, deep litter and slat system, floor space, watering and feeding space requirements for different age groups and rearing conditions. Advantages and disadvantages. Rearing of Turkeys, Ducks, Japanese Quails, Guinea fowls and Geese for meat and egg production.

UNIT - III

FOOD AND FEEDING OF POULTRY FARMING

Feed ingredients, processing of feed - forms of feed - mash, pellet and crumble feed preparation and feeding methods. Feeding chicks, growers, layers, broiler and breeders - feeding in different seasons - nutritional and metabolic disorders in poultry. Physical and sensory evaluation of feed ingredients - sampling techniques - proximate analysis - poultry feed formulae. Commonly occurring anti nutrients and toxicants in poultry feed ingredients - Mycotoxins and their prevention.

UNIT - IV

INCUBATION AND HATCHERY MANAGEMENT

Layout, design and location of hatchery; Methods of incubation; Physical requirements of incubation - collection, selection, cleaning and sanitation of eggs. Storage of hatching eggs - incubation methods - single and multistage incubators. Hatchery operations - setting, candling, transfer, hatching, pedigree hatching, chicks pull out, grading, packing and chick dispatch - In-ovo and in-hatch vaccinations and medications.

UNIT - V

ENVIRONMENT, POULTRY PRODUCTION AND DISEASES

Climatic differentiation for avian production: micro & macro climate - temperature, temperature zones, air - composition, speed and movement, relative humidity and light. Climatic factors affecting poultry production in housed conditions. Definition of disease, Classification of poultry diseases - Viral, Bacterial, Fungal and Parasitic. Nutritional deficiency diseases.

Text Books

Bell D. Donald and Weaver D. William Jr., 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt. Ltd., Noida.

Colin G. Scanes., 2015. Sturkie's Avian Physiology. 6th Edition. Academic Press, Elsevier Inc., New York.

Hurd M. Louis, 2003. Modern Poultry Farming. 1st Edition. International Book Distributing Company, Lucknow

Leeson S., & Summers J. D., 2001. Scott's Nutrition of the Chicken. 4th Edition. University Books, Canada.

Mahajan Naresh, 2015. Poultry Nutrition and Management. 1st Edition. Anmol Publications Pvt. Ltd., New Delhi.

Mountney J. George and Parkhurst R. Carmen, 2001. Poultry Products Technology. 1st Edition. The Harworth Press Inc., USA.

Narahari D., and Kumararaj R., 2008. Handbook of Applied Broiler Production. 1st Edition. Poultry Punch Publication (I) Pvt. Ltd., New Delhi, India.

Prasab Sushil, 2012. Handbook of Poultry Production. 1st Edition. Enkay Publishing House, New Delhi.

Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution Co., Lucknow, India.

Saif., Y. M., et al., 2013. Diseases of Poultry. 12th Edition. Blackwell Publishing, USA.

Sathapathy S., Singh M. K., and Joshi S. K., 2015. A Handbook on Anatomy & Physiology of Domestic Animals and Birds. Sathish Serial Publishing House, New Delhi, India.

Susan E. Aiello and Michael a. Moses, 2014. Merck Veterinary Manual. 11th Edition. Merck Vet Manual.

Taylor W. Lewts, 2003. Fertility and Hatchability of Chicken & Turkey Eggs. 1st Edition. International book Distributing Co., Lucknow, India.

Vegad J. L., 2004. Poultry Diseases: a guide for farmers and poultry professionals. 2nd Edition. International Book Distributing Co., Lucknow, UP.

References

1. Ensminger. M. E., 2015. Poultry Science. 3rd Edition. International Book Distribution Co., Lucknow, India.
2. Bell D. Donald and Weaver D. William Jr., 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt. Ltd., Noida.
3. Singh, R. A., 2011. Poultry Production. 3rd Edition. Kalyani Publishers, New Delhi.
1. Sreenivasaiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi
2. Jull A. Morley, 2007. Successful Poultry Management. 2nd Edition. Biotech Books, New Delhi.
3. Jadhav N. V., and Siddique M. F., 2007. Handbook of Poultry Production and Management. 2nd Edition. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi.
1. Bell D. Donald and Weaver D. William Jr., 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt. Ltd., Noida.
2. Wiseman. J, and Garnsworthy. P. C., 1999. Recent Development in Poultry Nutrition.
3. Titus Harry. W, and Fritz James. C, 1971. The Scientific Feeding of Chickens. 5th Edition.
1. Sreenivasaiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi
2. Rajini Asha R., 2011. Simply....Poultry Science. 1st Edition. Alfa Publications, New Delhi.
3. Suguna Management System: Standard Operating Manual - Feed Lab, 2012. Suguna Foods Pvt. Ltd.
4. Sreenivasaiah., P. V., 2006. Scientific Poultry Production-A unique encyclopedia. International Book Distributing Co., Lucknow, India.
1. Sreenivasaiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi
2. Jadhav N. V., and Siddique M. F., 2007. Handbook of Poultry Production and Management. 2nd Edition. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi.
1. Sreenivasaiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi
2. Thyagarajan. D., 2011. Diseases of Poultry. 1st Edition. Satish Serial Publishing House, New Delhi, India.
3. Narahari D., and Kumararaj R., 2008. Handbook of applied Broiler Production. 1st Edition. Poultry Punch Publication (I) Pvt. Ltd., New Delhi.

Course Outcome

- 1) The Students will have a Knowledge about the Prospects Of Poultry Industry
- 2) The Students will have a Knowledge about the poultry production systems, housing, automation and equipments
- 3) The Students will have a Knowledge about the food and feeding of poultry farming
- 4) The Students will have a Knowledge about the incubation and hatchery management
- 5) The Students will have a Knowledge about the environment, poultry production and diseases

SEMESTER IV

Core Paper - 4 GENETICS AND BIOTECHNOLOGY

Course Objectives

Unit - 1: (50 to 100 contents)

- Develop and understanding of genetic interactions, discuss about the supplementary genes complementary genes.
- Enable to understand the difference between dominance and epistasis.
- To acquire the knowledge of lethal genes and genic interactions.

Unit - 2: (50 to 100 contents)

- To understand the linkage and crossing over.
- To know about the cytological evidences.
- To understand the alterations of chromosome number arise during mitosis and meiosis.
- To understand the gene structure, expression and regulation.

Unit - 3: (50 to 100 contents)

- To understand how mutation can affect gene dosage and function.
- To understand the animal breeding mechanisms.
- To learn about the population structure interms of genetics variations.
- To evaluating the principles to describe genetic profiles of populations.

Unit - 4: (50 to 100 contents)

- To determining the applicability of different kind of cloning vectors.
- To understand recombinant DNA technology.

Unit - 5: (50 to 100 contents)

- To understand the major trends in genetic analysis.
- To understand the genetic research in technology and society

UNIT – I

Introduction to genetics – Basis of Mendelian Inheritance and Mendelian Laws

–Genetic Interaction of Genes – Non-Epistatic Interaction, Epistasis, Meotic drive,

Segregation, distortion and Selfish genes. Multiple Alleles – Blood Groups and their

Inheritance in Human, Tissue Typing.

UNIT – II

Linkage and crossing over – Drosophila – Morgan’s Experiments - Cytological Evidence for Crossing Over. Sex determining mechanisms-Genetical, Metabolical, and Environmental. Sex determination in human beings - Cytoplasmic Inheritance–, Fine Structure of Gene – Cistron – Recon, Muton – Gene Regulation – Operon concept – Lac Operon.

UNIT – III

Gene Mutation-Types of mutation-Physical and Chemical mutagens, DNA Repair. Applied Genetics – Animal Breeding – Heterosis, Inbreeding, Out breeding, Out Crossing, Hybrid Vigour. Population Genetics: Hardy weinberg Law –Genetic Polymorphism.

UNIT – IV

Definition – Scope and applications – Molecular tools for gene cloning experiments. Cloning vectors, [plasmids, pBr322, Phage vector, Cosmids and phagemids]. Techniques of Genetic Engineering _ recombinant DNA Technology and gene Cloning in prokaryotes [cDNA and Genomic Library].

UNIT – V

Transgenic plants and animals – DNA finger printing – gene therapy – biosensors – biochips - Application of Recombinant DNA technology in Medicine & Agriculture –Legal and Ethical issues in Biotechnology.

Text Books

UNIT - I: Verma, P.S. and V.K. Agarwal, 1995 Genectis, 8th edition, S. Chand & Co, New Delhi - 110 055.580pp.

Verma, P.S. and V.K. Agarwal, 2009.9th edition, S. Chand & Co, New Delhi.

S.C. Rastogi Biotechnology, Principles and Applications 2007 Narosa Publishing house, Pvt.Ltd.

Verma.P.S and Agarwal.V.K (2004) Genetics, S.Chand & Co., New Delhi .

Dalela.R.C and Verma.S.R (1970) A Textbook of Genetics,Jaiprakash Nath and Company., Meerut.

Gunther S. Stent, 1986. Molecular Genetics.Macmillan Publishing Co Inc. 773pp.

Higgins II, Best GJ and Jones J [1996] Biotechnology - Principles and application Black well scientific Publication Oxford London.

Gupta P.K. Elements of Biotechnology [2001] Rastogi publication, Meerut.

Dubey 2006 Text Book of Biotechnology S. Chand & co. New Delhi.

Gardener. 1991. Principles of Genetics. 8th edition.John wiley& sons Inc. New York. Chichester,Brisbane, Toronto, Singapore.

Monroe. W. Strick Berger 2004 Genetics.Printice Hall of India New Delhi.

Kumar H. D.1998 A text book of Biotechnology, affiliated East West pvt. Ltd., New Delhi.

Nicholls. 2002 Genetic Engineering, Cambridge University Press. UK.

S. Gladis Helen Hepsyba and CR. Hemalatha 2009 Basic Bioinformatics MJP Publ. Chennai.

Vijayaraman, Chellammal K.S and Manikkili.P 1998.UyiriyaeThozhilnutpam. Chimeeraa, Trichy.

Course Out Comes (five outcomes for each units should be mentioned)

1. After studied unit-1, the student will be able to study effectively, and enable to understand the difference between dominance and epistasis, to enable the students understand types of blood groups in humans.

2. After studied unit-2, the student will be able to describe gene linkage and explain the genetic anomalies caused by changes in chromosome number and structure. To understand the fine structure of genes and gene regulations.

3. After studied unit-3, the student will be able explain DNA mutation and repair mechanisms and different kinds of mutagens and kinds of mutagens. To understand the animal breeding techniques, population structure and genetic polymorphisms.

4. After studied unit-4, the student will be able to determine the applicability of difference kinds of cloning vectors, techniques of genetic engineering, illustrating the use of genomic libraries in gene detection and characterization.

5. After studied unit-5, the student will be able to analyse the function of applied genetic research in technology, nature and society, understanding the applications of rDNA technology, and identifying the ethical issues related to gene manipulation.

SKILL BASED SUBJECT

PAPER - 2

(to choose one out of 2)

A. SERICULTURE

OBJECTIVES

To develop sericulture is a need based curriculum, infuse sound knowledge about the silkworm, their economic importance and diseases and to disseminate Sericulture as a need.

UNIT - I

ECONOMIC IMPORTANCE AND SILKWORM BIOLOGY

Introduction to Sericulture - Origin and history of Sericulture - Silk road, spread of Sericulture to Europe, South Korea, Japan, India and other countries. Sericulture map of India and World: Components of Sericulture. Types of silkworms, their food plants - Silk producing species - their distribution - *Bombyx mori* - life cycle - organization of larvae, pupae and moth - structure of the silk gland. Prospectus of Sericulture in India: Sericulture industry in different states, Employment generation in sericulture-Role of women in sericulture employment, potential in mulberry and non-mulberry sericulture.

UNIT - II

MORICULTURE

Silk production: Importance of soils with reference to mulberry cultivation; soil analysis - soil sampling, soil pH, organic carbon and NPK level. Mulberry and non-mulberry cocoon and yarn - Mulberry species: Classification, distribution and common varieties used in Sericulture in India. Requirement for Mulberry Cultivation - methods of cultivation and preparation - Harvest - Transport and preservation of leaves. Feeding and nutrition - specificity of diet - Factors of nutrition - Diet and growth. Pest and diseases. Vegetative morphology : Characters of root, stem, bud and leaf. Reproductive morphology: Male and female reproductive organs, pollination, fertilization and development of seed, structure of seed and fruit. Leaf storage - Leaf yield: Mulberry management and Economics.

UNIT - III

SILKWORM REPRODUCTION AND GENETICS

Reproduction - Growth and Development of silkworms - Physiology of molting in different varieties (Uni, bi and multivoltine) - factors affecting Growth and Development = Endocrinology of reproduction and development. Genetics - mutation breeding and development of new strains. Mendelism and quantitative genetics - Silkworm heredity and environment - Inheritance and Sex determination.

UNIT - IV

PATHOGENIC DISEASES AND PEST

Pathology: Basic concepts of silkworm diseases - Viral, bacterial, Protozoan, and Fungal Diseases diseases (Etiology, Structure, Symptoms, lesions and Pathogenesis) - control mechanisms. Pests of mulberry (Classification, Biology, Nature of damage and control measures) - Uzi fly menace. Prospects of sericulture, Biology of silkworm (Nutrition, Genetics, Endocrinology, Reproduction, Pest and Diseases).

UNIT - V

SILKWORM REARING AND SILK REELING

Rearing operations - Selection and construction of rearing house Incubation - Hatching - brooding, Harvesting and storage of cocoons: Harvesting, preservation, assessment, storage - Transportation: Cocoons, record maintenance, cost of cocoon production, leaf-cocoon ratio. Disinfectants and feeding appliances - Reeling techniques - lacing skinning. Re-reeling etc.

Reference Books

1. Ganga, G. and Sulochana Chetty, J. 1997. An Introduction to Sericulture. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Ganga, G. 2003. Comprehensive Sericulture Vol-II: Silkworm Rearing and Silk Reeling. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Hisao Aruga. 1994. Principles of Sericulture (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Veda, K., Nagai, I. and Horikomi, M. 1997. Silkworm Rearing (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Otsuki, R. and Sato, S. 1997. Silkworm Egg Production (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Eikichi Hiratsuka. 1999. Silkworm Breeding (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Mahadevappa, D., Halliyal, V.G., Shankar, D.G. and Bhandiwad, R., 2000. Mulberry Silk Reeling Technology Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
8. Soo-Ho Lim, Young-Taek Kim, Sang-Poong Lee. 1990. Sericulture Training Manual - Published by FAO - USA. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
9. Wu Pang-Chuan and Chen Da-Chuang. 1994. Silkworm Rearing - Published by FAO - USA. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
10. Lu Yup-Lian and Liu-Fu-an. 1991. Silkworm Diseases - Published by FAO - USA. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Course Outcome

The Students will have a Knowledge about the economic importance and silkworm biology
The Students will have a Knowledge about the moriculture
The Students will have a Knowledge about the silkworm reproduction and genetics
The Students will have a Knowledge about the pathogenic diseases and pest
The Students will have a Knowledge about the silkworm rearing and silk reeling

SKILL BASED SUBJECT

PAPER - 2

B. APICULTURE

Objectives:

To acquire knowledge of honey bees and their social values. Entrepreneur motivation for practicing apiculture as cottage industry.

UNIT - I

BASICS OF BEEKEEPING

History - History of bee keeping: Definition, Bee keeping in worldwide, In India. Traditional bee keeping, Modern beekeeping, Urban or backyard beekeeping. Honey bee species and identification - Origin, systematics and distribution; Types of honey bees, Species of honey bees. Bee identification. Social organization of honey bees - Colony life and social organization - Queen, drone, worker. Annual biological cycle of the bee colony. Institute. Biology and classification of honey bee, species of honey bees, Social organization of honey bee colony - Swarming and pheromones

UNIT - II

BEE HIVE

Flora for apiculture - Role of Central Honey Bee Research and Training selection of Bees for apiculture, Method of bee keeping - Indigenous method of extraction of honey. Care and management of honey bee hive. Seasonal management of honey bees: Honey bees on Canola, Spring management of bees, Wintering bees, Apiary management for winter/early spring pollination. Summer management of honey production.

UNIT - III

BEE ENEMIES, DISEASES, PESTICIDE POISONING

Bee enemies and diseases: An introduction, Bee enemies - Wax Moth, Ants, Wasps, Microorganisms, Pests. Diagnosis and Identification. Bacterial, viral, fungal & protozoan diseases: Bacterial disease - American Foulbrood, European Foulbrood, Viral disease - Deformed Wing Virus, Sacbrood Virus, Black Queen Cell Virus, Kashmir Bee Virus, Acute Bee Paralysis Virus; Fungal disease - Chalkbrood, Stonebrood; Protozoan disease - Nosemosis, Nosema cerana - appliances for modern method, Diseases of honey bee and control measures.

UNIT - IV

PRODUCTS OF BEE KEEPING

Bee products - An introduction, honey, pollen, royal jelly, bees wax, propolis & venom, Significance of bee products - Bee products - An introduction, honey, pollen, royal jelly, bees wax, propolis & venom, Marketing of bee products: Definition of marketing, Marketing Honey Comb and Honey, Marketing Pollination Services, Marketing Wax, Marketing Propolis Honey - bee wax bee venom - Honey. Production, chemical composition - Economic importance of Honey bee wax.

UNIT - V

ECONOMICS AND MARKETING

Marketing Pollen, Marketing Royal Jelly, Marketing Bee Venom, Marketing Adult and Larval bees, Costing and Financing the Marketing Activities. Significance of bee products. Recent Efforts - Modern method in employing honey bees for cross pollination in horticultural gardens. Role of Central Honey Bee Research & Training

Reference Books:

M.S. Nalina Sundari 2006, Entomology M.J.P Publications, Chennai

Sardar singh, Bee keeping in India.

Sharma.P.L., & Singh S. Hand Book of Bee Keeping.

Honey - A Comprehensive survey - International Bee Research Association for House - CNRC [England]

Roger. A. Morse, 1990. The ABC & XYZ of Bee culture, 40th ed., A.I Root & Co, Medina, Ohio 44256.516pp 19

Course Outcome

The students will be able to understand the Basics of beekeeping

The students will be able to understand the role of Bee hive

The students will be able to understand the Bee enemies, diseases, pesticide poisoning

The students will be able to understand the Products of bee keeping

The students will be able to understand the Economics and Marketing

PAPER – 2

(to choose one out of 2)

A. BIOFERTILLIZER PRODUCTION

Objectives :

- 1.To impart awareness on Bio fertilizer Technology
- 2.To create knowledge on Environmental degradation.

UNIT - I

Scope of Bio fertilizers - Types of soil - Physical and Chemical composition of Soil. Types of microorganisms in soil.

Course Outcome

To facilitate the students to understand basics of biofertilizers .

They get the knowledge of Introduction to Biofertilizers Scope ,Necessity and Benefits, Types of soil- Physical and Chemical composition of Soil. Types of microorganisms in the soil.

They could understand that Biofertilizers gives supplement to the plants with all nutrients than any fertilizers and do not replace them.

UNIT - II

Production of Bacterial bio fertilizers - Mass production and utilization of different strains of Cyanobacteria. Mass cultivation of Azolla and its utilization.

Course Outcome

They could learn the use of biofertilizers is being emphasized along with chemical fertilizers and organic manures.

They could understands that Biofertilizers are live products (or latent cells of microbes) and require care in storage, transport, application and maintaining field conditions.

They can get the knowledge about Development of integrated management for best results uses both nitrogenous and phosphatic biofertilizers.

They could be aware of Applied to seed/seed material/seedlings/soil/waste matter/crop residues in order to increase the population.

They can accelerate some biochemical processes.

UNIT - III

Isolation and identification of Endophytic nitrogen fixers. Rhizobium and Legume root nodulation and nitrification process.

Course Outcome

To make the students Familiar with culturing techniques, handling of biofertilizer microbes and characteristic attributes such as PGP traits ,Specialized biofertilizer ,bioreactors etc.

They could learn about Microbial scale-up, Bench scale, pilot scale and industrial scale

Biofertilizer Production: Media preparation, sterilization, microbial propagation, mass-scale production, fermentation, formulation ,Preparation of carrier based biofertilizers and field application.

UNIT - IV

Production of Micorrhizal bio fertilizer - Phosphate solubilising microorganisms - VAM - Vesicular Arbuscular Mycorrhizal Fungi and its applications as bio fertilizers.

Course Outcome

To promote organic farming in the region through technical capacity building of all stakeholders. Ability to distinguish the types of biofertilizers.

UNIT - V

Use of Composite Bio fertilizers - Methods for enhancing soil fertility. Renewable properties of bio fertilizers. The cost / benefit analysis of production and application of bio fertilizers. .

Text Books:

1. Singh,T. and Purohit,S.S. 2008: Bio fertilizer technology, Agrobio - India
2. Sharma,A.K. 2007 : Bio fertilizer for sustainable Agriculture - Agrobios-India.

Reference Books :

- 1.Pandiyarajan,P. 2008 : Techniques in Agricultural Microbiology- Agrobios-India
2. Purohit, S.S. 2005 : Microbiology - Fundamentals and Applications (6th Edition) Student Edition - Jodhpur - India.
3. Dubey,R.C., and Maheswari, D.K. 2007 : A Text Book of Microbiology - S. Chand & Co., New Delhi, India.

Course Outcome

To make students ready for industry as entrepreneurs.

To improve the professional competencies and upgrade the knowledge and develop technical skills of biofertilizer production

Use of Composite Bio fertilizers with different Methods for enhancing soil fertility.

The Renewable properties of bio fertilizers.

The cost and benefit analysis of production and application of bio fertilizers.

NON-MAJOR ELECTIVE

PAPER – 2

B. AQUARIUM FISH KEEPING

Objectives;

To impart training on Aquarium fish keeping technology.

To create knowledge on self employment opportunity.

UNIT - I

Fish Aquarium - Introduction - Types of aquarium - Importance of aquarium - Accessories of aquarium - Aquarium fabrication- Setting of aquarium.

UNIT - II

Care and maintenance of aquarium - Aquarium water quality and management - Aquarium plants - Food for Aquarium fishes.

UNIT - III

Study of ornamental fishes (Taxonomy general characters, food and feeding and breeding habits)
A. Egg Layers i) Gold fish ii) Zebra fish iii) Koi carp vi) Angel fish v) Gourami B. Live Bearers
i) Guppy ii) Mollies iii) Sword tail iv) Platies - Breeding and rearing of ornamental fishes: i)
Identification of brooders ii) Breeding behaviour iii) Induced breeding iv) Management of water
quality In breeding and rearing of fishes. v) Transportation of ornamental fishes.

UNIT - IV

Disease management of ornamental fishes (Symptoms, life cycle, and control measures) i.
protozoan disease ii. Bacterial disease iii. Crustacean disease iv. Fungal disease and v. Helminth
disease.

UNIT - V

Food and feeding of Aquarium fishes - use of live fish feed organisms. Preparation and
composition of formulated fish feeds- Live fish transport - fish handling, packing and forwarding
techniques - General aquarium maintenance - budget for setting up an aquarium fish as a cottage
industry.

Reference Books:

Jingran V.G., 1991: Fish and fisheries in India - Hindustan Publ. co New Delhi - India.

Shanmugam K. 1992, Fishery Biology and Aqua Culture - Leo Pathipagam - Chennai- India.

Mill Dick, 1993: Aquarium fish, DK Publ.Co,Inc. New York -USA

Yadav. 1995: Fish and fisheries, Daya publ. co., New Delhi - India

Hall, C.B. 2005: Ponds and Fish culture - Agrobios - Jodhpur - India.

Day,F. 1978: Fishes of India Vol. I & II, William Danisan & Sons, India.

Outcomes

The student will be able to understand the basic knowledge of Aquarium fish keeping.

The students will be able to know how to maintain an aquarium .

The student will be able get knowledge about different varieties of ornamental fish.

The student will be able to acquire knowledge about disease management in aquarium fish culture.

The students will acquire knowledge about the feeding techniques of aquarium fishes.

CORE PRACTICAL – II

CELL AND MOLECULAR BIOLOGY, GENETICS AND BIOTECHNOLOGY

CELL AND MOLECULAR BIOLOGY

Cytometry

Compound microscope, camera Lucida, Stage and Ocular Micrometers

Blood Smear Preparation - Differential count of W.B.C.

Total count of RBC using Haemocytometer.

Total count of WBC using Haemocytometer.

Slide Preparation

Mounting of Buccal Epithelium.

Mitosis in onion root tip squash.

Squash preparation of Grass hopper testes.

Study of prepared slides of histology.

Columnar Epithelium, Ciliated epithelium, Glandular Epithelium. Cartilage T.S., Bone T.S., Cardiac Muscle, Striated muscle, Non Striated muscle, Neuron, Male germ cell, Female germ cell.

GENETICS

Squash preparation of Salivary glands of chironomous larva.

Male & Female identification.

Observation of common Mutants of Drosophila.

Human Blood Grouping analysis.

BIOTECHNOLOGY

Study of prepared slides, Models or specimen.

Escherichia coli, Bacteriophage, Plasmid.

Demonstration of P.C.R technique: Southern blot, Electrophoresis.

Visit to Biotechnology lab and Report - compulsory.