

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)

Re-accredited (3rd Cycle) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF ZOOLOGY



CBCS With OBE

BACHELOR OF SCIENCE

PROGRAMME CODE - Z

COURSE STRUCTURE

(w.e.f. 2022 – 2023 Batch onwards)

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)

(Re –accredited (3rd cycle) with Grade A⁺ and CGPA 3.51 by NAAC)**DEPARTMENT OF ZOOLOGY – UG**

(with Allied Chemistry and Allied Botany)

CBCS with OBE**COURSE STRUCTURE**

(w.e.f. 2022 – 2023 Batch onwards)

Semester	Part	Course Code	Title of the Course	Teaching hrs (per week)	Duration of Exam (hrs.)	Marks Allotted			Credits
						CIA	SE	Total	
I	I	22OU1TA1	Tamil	6	3	25	75	100	3
	II	22OU2EN1	English	6	3	25	75	100	3
	III	22OUZO11	Core – Invertebrata	4	3	25	75	100	4
	III		Core - Lab in Invertebrata & Chordata	2	-	-	-	-	-
	III	22OUZOGECH1	GEC– Chemistry -I Inorganic, Organic & Physical Chemistry	4	3	25	75	100	4
	III		GEC- Practical-1 Salt analysis	2	-	-	-	-	-
	IV	22OUZOSE11	SEC- Computer Application	2	3	25	75	100	2
	IV	22OUZOSE12	SEC- Dairy Science	2	3	25	75	100	2
	IV	22OUZOID1	IDC – Applied Zoology	2	3	25	75	100	2
II	I	22OU1TA2	Tamil	6	3	25	75	100	3
	II	22OU2EN2	English	6	3	25	75	100	3
	III	22OUZO21	Core – Chordata	4	3	25	75	100	4
	III	22OUZO2P	Core- Lab in Invertebrata & Chordata	2	3	40	60	100	2
	III	22OUZOGECH2	GEC– Chemistry –II Organic, Applied & Analytical Chemistry	4	3	25	75	100	4
	III	22OUZOGECH2P	GEC- Practical-1 Salt analysis	2	3	40	60	100	1
	IV	22OUZOSE21	SEC -Vermitechnology	2	3	25	75	100	2
	IV	22OUZOSE22	SEC - Aqua Culture	2	3	25	75	100	2
	IV	22OUZOID2	IDC - Ornamental Fish Culture	2	3	25	75	100	2
	I	22OU1TA3	Tamil	6	3	25	75	100	3
	II	22OU2EN3	English	6	3	25	75	100	3
	III	22OUZO31	Core – Cell and Molecular Biology	4	3	25	75	100	4
	III		Core - Lab in Cell and	2	-	-	-	-	-

III			Molecular Biology and Developmental Biology						
	III	22OUZOGECH3	GEC– Chemistry -III Industrial Chemistry	4	3	25	75	100	4
	III		GEC- Practical- II Volumetric Analysis	2	-	-	-	-	-
	III	22OUZOGEB03	GEC: Botany –I Plant Diversity- I	4	3	25	75	100	4
	III		GEC : Botany Practical – I Plant Diversity- I & Basics of Botany	2	-	-	-	-	-
IV	I	22OU1TA4	Tamil	6	3	25	75	100	3
	II	22OU2EN4	English	6	3	25	75	100	3
	III	22OUZO41	Core – Developmental Biology	4	3	25	75	100	4
	III	22OUZO4P	Core - Lab in Cell and Molecular Biology and Developmental Biology	2	3	40	60	100	2
	III	22OUZOGECH4	GEC– Chemistry –IV Medicinal, Green & Nano Chemistry	4	3	25	75	100	4
	III	22OUZOGECH4P	GEC- Practical -II Volumetric Analysis	2	3	40	60	100	1
	III	22OUZOGEB04	GEC: Botany –II Basics of Botany	4	3	25	75	100	4
	III	22OUZOGEB04P	GEC: Botany Practical – I Plant Diversity- I & Basics of Botany	2	3	40	60	100	1
V	III	22OUZO51	Core – Genetics	4	3	25	75	100	4
	III		DSEC - I	4	3	25	75	100	4
	III		DSEC - II	4	3	25	75	100	4
	III		Core - Lab in Genetics, Ecology & Evolution and Biochemistry.	4	-	-	-	-	-
	III		Core - Lab in Physiology Microbiology & Immunology and Biotechnology	4	-	-	-	-	-
	III	22OUZOGEB05	GEC: Botany – III Taxonomy of Angiosperms and Plant Pathology	4	3	25	75	100	4
	III		GEC: Botany Practical – II Taxonomy of Angiosperms and Plant Pathology & Applied Botany	2	-	-	-	-	-
	IV	22OUZOSE5	SEC- Biostatistics and Bioinformatics	2	3	25	75	100	2
	IV	22OUAECEV5	AECC - Environmental Studies	2	3	25	75	100	2
VI	III	22OUZO61	Core -Physiology	4	3	25	75	100	4
	III	22OUZO62	Core - Microbiology & Immunology	4	3	25	75	100	4
	III		DSEC – III	4	3	25	75	100	4
	III	22OUZO61P	Core - Lab in Genetics, Ecology & Evolution and Biochemistry.	4	3	40	60	100	7

III	22OUZO62P	Core -Lab in Physiology, Microbiology & Immunology and Biotechnology	4	3	40	60	100	8
III	22OUZOGEB06	GEC: Botany –IV Applied Botany	4	3	25	75	100	4
III	22OUZOGEB06P	GEC: Botany Practical – II Taxonomy of Angiosperms & Plant Pathology and Applied Botany	2	3	40	60	100	1
IV	22OUZOSE6	SEC - Economic Zoology	2	3	25	70	100	2
IV	22OUAECVE6	AECC-Value Education	2	2	25	75	100	2
V	22OU5NS4/ 22OU5PE4	Extension Activities NSS/Physical Education	-	2	-	-	100	1
		Total						140

GEC: Generic Elective Course

SEC : Skill Enhancement Course

DSEC:Discipline Specific Elective Course

AECC: Ability Enhancement Compulsory Course

IDC : Inter Disciplinary Course

DSEC: Discipline Specific Elective Course:

Semester - V (DSEC– I & II – Choose any two)

1. Ecology & Evolution - 22OUZODSE5A
2. Biochemistry 22OUZODSE5B
3. Fisheries Biology - 22OUZODSE5C

Semester- VI (DSEC - III - Choose any one)

1. Biotechnology - 22OUZODSE6A
2. Poultry science - 22OUZODSE6A

NOTE:

The students are permitted to obtain additional credits (Optional)

1. MOOCs / SWAYAM / NPTEL Courses(Online)
2. Project

Year	Semester	Title	Duration of Study	Credit
III	VI	Project title	6 months	1

Compulsory Courses:

Year	Semester	Nature of Course	Course code	Title of the Course	Hours/ Months	Offered to
I	I	Add on Course	22ZOAOC 22ZOAACP	Entrepreneurial bee keeping Lab in Entrepreneurial bee keeping	30 Hrs	I B.Sc., Zoology
II	III & IV	Certificate Course	22ZOC 22ZOCP 22BOC 22BOCP	1.Human Systems & Clinical Chemistry Lab in Human Systems & Clinical Chemistry 2.Horticulture -Propagation of horticulture crops Lab in Methods of propagation techniques	90 Hrs 90 Hrs	II year students of all other disciplines II year students of all other disciplines
III	V	Value Added Course	22ZOVAC 22ZOVACP	Fundamentals of Medical Coding (FOMeC) Lab in Fundamentals of Medical Coding (FOMeC)	30	III B.Sc., Zoology

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	Core	22OUZO51	Genetics	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. Defining and Explaining the basic principles of heredity and the mechanism of inheritance.
2. Explaining the practical application of Genetics
3. Describing the various genetic disorders in Man and Animals.
4. To know about DNA as a genetic material
5. To know about Eugenics: Positive and Negative- Euthenics

Course Content:

Unit – I Mendalian Inheritance – Mendel's experiments(Monohybrid and Dihybrid cross, Back or Test cross) Non Mendalian Inheritance - Interaction of Genes – Complementary genes, supplementary genes, coat colour in mice (multiple Alleles).

Unit – II Linkage in Drosophila – Morgan's experiments, theories of linkage, factors affecting linkage, Crossing over, Types, mechanisms, Cytological evidence for crossing over, Significance of Crossing over, factors affecting crossing over. Mapping of Chromosomes, Sex-linked inheritance in Man(colour blindness and Haemophilia), Sex determination in man and cytoplasmic inheritance.

Unit – III Fine structure of the gene – Definition, operon concept, genetic code, Mutation-Molecular basis of mutation – Gene mutation, chromosomal abberations – Euploidy , Polyploidy - Mutagens.

Unit – IV B re eding-inbreeding, Out breeding – heterosis in Hybrid Vigour, Eugenics and Euthenics, Inborn errors of metabolism(Alkaptonuria,Phenyl ketoneuria) and Genetherapy

Unit – V Hardy – Weinberg's Law-gene frequency, genotype frequency and factors affecting gene frequency.DNA as genetic material – Bacterial recombination, conjugation, Transformation, Transduction and Sexduction.

Books for Study:

1. Dalela R.C., and Verma S.R. ,(1970) *A text book of Genetics*, Jaiprakash Nath and Company, Meerut.

2. Verma P.S. and Agarwal V.K. (2004)– *Genetics*, S.Chand & co. New Delhi.

Books for Reference:

1. Rothwell, N.V. (1979)*Human Genetics* Prentice Hall of India, New Delhi.
2. Weaver, R.F. and Hedrick, P.W. (1997) *Genetics*, W.H.C. Brown Publishers – London.
3. Brown, T.A., (1998) *Genetics – A molecular approach*, Champion Hall, London.
4. Gupta P.K., (2000)*Genetics*, Rastogi Publications, Meerut.

Web Resources / E.Books:

- [https://annamalaiuniversity.ac.in/studport/download/agri/gen/resources/GPB%20214%20Principles%20of%20Genetics%20and%20Cytogenetics%20\(2+1\)%20Online%20study%20material.pdf](https://annamalaiuniversity.ac.in/studport/download/agri/gen/resources/GPB%20214%20Principles%20of%20Genetics%20and%20Cytogenetics%20(2+1)%20Online%20study%20material.pdf)
- <https://www.vedantu.com/content-files-downloadable/5b55cf1ee4b036ca41c00d35.pdf>
- <https://www.lcps.org/cms/lib4/VA01000195/Centricity/Domain/4726/2017Genetics%20Class%20Notes.pdf>

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To make students aware of genetic disorders inherited in animals and humans.

Activities to be given: Students are trained to prove laws of Mendel through group activity using checker board.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand the laws of mendel	K1 to K3
CLO2	Study theories of linkage & crossing over and chromosomal mapping	K1 to K3
CLO3	Understand and identify various aberration in chromosomes and mutation.	K1 to K4
CLO4	Analyze the significance of Eugenics and Euthenics	K1 to K3
CLO5	Examine the role of DNA and Significance of Hardy-Weinberg's law	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit – I Mendalian Inheritance – Mendel's experiments(Monohybrid and Dihybrid cross, Back or Test cross) Non Mendalian Inheritance - Interaction of Genes – Complementary genes, supplementary genes, coat colour in Mice (multiple Alleles) and Blood group inheritance in man.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit – II Linkage in Drosophila – Morgan's experiments, theories of linkage, factors affecting linkage, Crossing over, Types, mechanisms, Cytological evidence for crossing over, Significance of Crossing over, factors affecting crossing over. Mapping of Chromosomes, Sex-linked inheritance in Man(colour blindness and Hemophilia), Sex determination in man and cytoplasmic inheritance.	9	Chalk and Talk, OHP quiz, on the spot test
III	Unit – III Fine structure of the gene –operon concept, genetic code, Mutation-Molecular basis of mutation – Gene mutation, chromosomal abberations(Ploidy,Syndromes), mutagens.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Unit – IV B r e e d i n g - i n b r e e d i n g , O u t b r e e d i n g – heterosis in Hybrid Vigour, Eugenics and Euthenics, Inborn errors of metabolism(Alkaptonuria, Phenyl ketoneuria) and Genetherapy.	9	Chalk and Talk, OHP,PPT presentations, quiz,
V	Unit – V Hardy – Weinberg's Law-gene frequency, genotype frequency and factors affecting gene frequency.DNA as genetic material – Bacterial recombination, conjugation, Transformation, Transduction and Sexduction.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designer:
Dr.(Mrs).G.Indira Rani**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	DSEC – I/II	22OUZODSE5A	Ecology & Evolution	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To gain knowledge about the Abiotic factors.
2. To acquire knowledge on animal population and wild life.
3. To understand the principles and applications of experimental biology and understanding animal behaviour.
4. To enable the students understand the origin of life, diversity of animal life in earth and the mechanism of their evolution
5. To understand micro evolution and geological time scale .

Course Content:

Unit – I Scope-Branches of Ecology- Biotic factors, Abiotic factor- Concepts of Limiting factor -Biological effects of light on metabolism, mutation and locomotion and movement - Biological effects of temperature on metabolism and reaction rate, Morphology - Ecosystem - types, Dynamics of ecosystem - Food Chain, Food Web - Trophic Levels - energy flow - Ecological Pyramids - Biomass, Number and energy - Pond as a ecosystem - Primary production, Secondary Production - Animal relationships – Symbiosis, Commensalism, Mutualism, Antagonism, predation, parasitism and competition.

Unit – II Population – Definition – Natality, Mortality, Population fluctuation dispersal, Age pyramid, Population estimation – Population equilibrium – Regulation. Community ecology – Types of Communities - characteristics of community. Wild Life resources – Wild life conservation and Management. Stratification – Ecotone – edge effect – Ecological niche – Ecological succession.

Unit – III Pollution – Types (Air Pollution, Water Pollution), their biological effect and control, solid waste disposal and management, Recycling process —Global warming - Ozone layer and its significance, Acid rain, Biomagnification- Environmental Impact Assessment.

Unit –IV Biochemical origin of life, Urey and Miller’s experiment, Geological time scale, Evidences of evolution:-Morphological, Homologous and Analogous structures (example- forelimbs) – vestigial organs (Vermiform appendix, Plica semilunaris) – connecting links. Embryological evidences, Biochemical evidences. Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism- Mimicry - Batesian and Mullerian Mimicry.

Unit – V Fossils : Dating of fossils, Variations , Isolating mechanism: Geographic isolation, Reproductive isolation - Speciation types, mechanism of Allopatric and Sympatric speciation - Human evolution: Organic evolution of man, Cultural and future evolution of man.

Books for Study:

1. Verma, P.S. and Agarwal, V.K., (2002)*Concept of Evolution*, S.Chand and Company Limited, New Delhi,
2. Arumugam, N., (2002) *Organic Evolution*, Saras Publication, Nagercoil.

Books for Reference:

1. Dobzhansky, T.,Ayala, F.J., Stebbins, G.L. and Valentine, J.W., (1977)*Evolution*, W.H.Freeman and Co., San Francisco.
2. Stansfield, W.D., (1977) *The Science of Evolution*, Collier Macmillan, London,
3. Odum, E.P. (1983) *Basic Ecology*, Saunder's College Publishing New York.
4. Minkoff E.C. ,(1983)*Evolutionary biology*, Addison Wesley Publishers.
5. Kotpal, R.L. and N.P.Bali ,(1986) *Concepts of Ecology*, Vishal Publications Delhi.

Web Resources / E.Books:

- <https://ia800104.us.archive.org/31/items/GeneralEcology/General%20Ecology.pdf>
- <https://library.oapen.org/bitstream/id/6042b7a1-34c2-44b6-8953-53ea7a930364/9781466570108.pdf>
- https://tsjok45.wordpress.com/wp-content/uploads/2011/01/evolution_3rd_edition-ridley-book.pdf
- <https://unacademy.com/content/wp-content/uploads/sites/2/2022/10/Evolution-3-min.pdf>

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To make students understand the significance of ecosystem and origin of evolution.

Activities to be given: Students shall be asked to collect specimens within the campus and group them according to their trophic levels.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand the biotic and abiotic factors and the animal relationships.	K1 to K3
CLO2	Learn population ecology and conservation, management of Wildlife.	K1 to K3
CLO3	Apply knowledge of Biological indicators and their roles.	K1 to K4
CLO4	Analyze the evidences of evolution	K1 to K3
CLO5	Examine the factors of isolating mechanisms and Human Evolution.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	. Unit – I Scope-Branched of Ecology- Biotic factors, Abiotic factor- Concepts of Limiting factor -Biological effects of light on metabolism, mutation and locomotion and movement - Biological effects of temperature on metabolism and reaction rate, Morphology - Ecosystem - types, Dynamics of ecosystem - Food Chain, Food Web - Trophic Levels - energy flow - Ecological Pyramids - Biomass, Number and energy - Pond as a ecosystem - Primary production, Secondary Production - Animal relationships – Symbiosis, Commensalism, Mutualism, Antagonism, predation, parasitism and competition.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit – II Population – Definition – Natality, Mortality, Population fluctuation dispersal, Age pyramid, Population estimation – Population equilibrium – Regulation. Community ecology – Types of Communities - characteristics of community. Wild Life resources – Wild life conservation and Management. Stratification – Ecotone – edge effect – Ecological niche – Ecological succession.	9	Chalk and Talk, OHP quiz, on the spot test

III	Unit – III Pollution – Types(Air Pollution, Water Pollution), their biological effect and control,solid waste disposal and management, Recycling process —Global warming - Ozone layer and its significance , Acid rain, Biomagnification- Environmental Impact Assessment.	15	Chalk and Talk, PPT, group discussion , OHP andYou tube Links
IV	Unit –IV Biochemical origin of life, Urey and Miller’s experiment, Geological time scale, Evidences of evolution:-Morphological, Homologous and Analogous structures (example-forelimbs) – vestigial organs (Vermiform appendix, Plica semilunaris) – connecting links. Embryological evidences, Biochemical evidences. Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism-Mimicry - Batesian and Mullerian Mimicry.	9	Chalk and Talk, OHP,PPT presentations, quiz,
V	Unit – V Fossils : Dating of fossils, Variations ,Isolating mechanism: Geographic isolation, Reproductive isolation - Speciation types, mechanism of Allopatric and Sympatric speciation - Human evolution: Organic evolution of man, Cultural and future evolution of man.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designer: Ms.R.S.Rajalakshmi
Dr.(Mrs).S.Sharmila**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	DSEC	22OUZODSE5B	Biochemistry	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1. Defining and explaining the basic principles of biochemistry and the instruments useful for biological studies.
2. Broadens our understanding of biochemical changes relating to physiological alteration in human body.
3. Understand the chemical aspects of biological processes such as digestion, hormonal action and muscle contraction –relaxation.
4. Application of skills in answering, critically analyzing, interpreting and presenting the results of laboratory investigations.

Course Content:

Unit - I Carbohydrates: classification and biological importance - carbohydrate metabolism – Glycogenesis, Glycolysis, Citric acid cycle and Hexose Monophosphate Shunt.

Unit - II Protein – Structure, classification, Configuration of protein – Primary, Secondary, Tertiary and Quaternary, and biological importance -Transamination, Decarboxylation, Transdeamination, Transmethylation, Urea cycle. Ramachandran Plot.

Unit - III Lipids: Classification and structure of cholesterol- β -oxidation of fatty acids - Biological importance of lipids–biosynthesis of fattyacids.

Unit - IV Enzymes: classification, physico-chemical nature and mechanism of enzyme action, factors affecting enzyme activity - Applications of enzymes and coenzymes.

Unit – V Separation techniques – Paper Chromatography ,PAGE, Centrifugation, Analytical techniques –PH meter, Electrophoresis, Colorimeter, Spectrophotometer.

Books for Study:

- 1.L.Veerakumari., (2004) *Biochemistry* ,MJP Publishers, Chennai.
- 2.Satyanarayana. U and Chakrapani .U , (2020)*Biochemistry*, 5th Edition, Elsevier Health Sciences, India.

Books for Reference:

1. Robert,K. Murray Daryl.K. Granner., (1988) *Harper's Biochemistry*, Peter A. Mayes & Victor W.Rodwell pRetice –Hall International.
2. Lehninger, Nelson& Cox , (2004) *Principles of Biochemistry*, CBS Publishers & Distributers, Delhi, CBS ISBN 81-239-0295-6 .
3. Lubert stryer.,(2015)*Biochemistry* ,W.H.Freeman and company, New York.
4. Power.C.B & Chatwal G.R .,(2017)*Biochemistry* , 5th edition ,Himalaya Publishing House.

Web Resources / E.Books:

- <https://annamalaiuniversity.ac.in/studport/download/agri/soilsci/resources/SAC%20124%20of%20fundamentals%20of%20biochemistry%20lecture%20notes.pdf>
- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMB1102.pdf
- <https://pharmabookbank.wordpress.com/wpcontent/uploads/2019/03/6.1.biochemistry.pdf>

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To make students develop skills in various biochemical techniques

Activities to be given: Collection and presentation of biologically important biomolecules.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand the basic organization of Carbohydrates	K1 to K3
CLO2	Identify the Structural organization of Protein molecules.	K1 to K3
CLO3	Apply the knowledge of Lipid synthesis and its oxidation in human cells.	K1 to K4
CLO4	Analyze the mechanism of enzymes action and factors affecting its activity.	K1 to K3
CLO5	Examine the importance of Bioinstrumentation.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level

2- Intermediate Level

3- Advanced Level

LESSON PLAN: TOTAL HOURS (60Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit - I Carbohydrates: classification and biological importance - carbohydrate metabolism – Glycogenesis, Glycolysis, Citric acid cycle and Hexose Monophosphate Shunt.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit - II Protein – Structure, classification, Configuration of protein – Primary, Secondary, Tertiary and Quaternary, and biological importance - Transamination, Decarboxylation, Transdeamination, Transmethylation, Urea cycle. Ramachandran Plot.	9	Chalk and Talk, OHP quiz, on the spot test
III	Unit - III Lipids: Classification and structure of cholesterol- β -oxidation of fatty acids - Biological importance of lipids–biosynthesis of fattyacids.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Unit - IV Enzymes: classification, physico-chemical nature and mechanism of enzyme action, factors affecting enzyme activity - Applications of enzymes and coenzymes	9	Chalk and Talk, OHP,PPT presentations, quiz,
V	Unit – V Separation techniques – Paper Chromatography ,PAGE, Centrifugation, Analytical techniques –PH meter, Electrophoresis, Colorimeter, Spectrophotometer.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

Course Designer: Dr.(Mrs).M.A.Soniya

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	DSEC	22OUZODSE5C	Fisheries Biology	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	✓

Course Objectives:

1. Understand the Role of Fisheries
2. Apply Knowledge of Reproductive Techniques
3. Analyze Molluscan and Prawn Fisheries
4. Diagnose and Address Fish Diseases
5. Explore Fish Products and Aquaria Management

Course Content:

Unit – I Introduction – Importance of fisheries – Economic value of common South Indian fishes – catla , Tilapia -Nutrition and feeding habits and feeding adaptations.-Native & Invasive fish species.

Unit – II Tagging of fishes.- Reproduction in fishes-Induced breeding - hypophysation Ecological factors influencing spawning in carps.

Unit – III Edible molluscan fisheries - Pearl fishery in India.Fisheries management –prawn fishery , Constrains for fisheries -Sewage fed fisheries.

Unit – IV Marine Fisheries & Inland fisheries. Protozoan disease white spot disease-, worm disease -ligulosis, crustacean disease-argulosis and non parasitic disease-soft shell syndrome.

Unit – V Home Aquaria, Ornamental fishes – gold fish & black molly , By products of fishes-body oil , liver oil, fish glue, Isinglass & fish manure- Fish preservation and processing – Fish in relation to Public Health.

Book for Study:

R. Santhanam , Fisheries Science, Daya Publishing House 2013

Books for Reference:

1. Chandy, M. *Fishes*– National book trust, India 1970
2. Norman, J.R. *A history of Fishes*– Earnest Benn Ltd, London. 1975.
3. Marshall, N.B. *The life of Fishes*– Weidnefeld & Nicholson, London. 1965
4. S.R. Munro. *Marine and Fresh water fishes of Ceylon*, 2017.
5. Jhingran V.G. *Fish and Fisheries of India*– Hindustan Publishing Corp. Delhi. 1991

Web Resources / E.Books:

- <https://www.bhumipublishing.com/wp-content/uploads/2022/04/Fish-Biology.pdf>
- http://ledhyane.lecture.ub.ac.id/files/2015/09/HartReynolds_2002-HandbookOfFishBiologyAndFisheriesVol1.pdf
- <https://sciencecollegenanded.org/assets/pdf/e-content/Text%20Book%20of%20Fishery%20Science2022.pdf>

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To make students develop skills in Fish Biology.

Activities to be given: Construct an aquarium and take care of its maintainence.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand the Role of Fisheries	K1 to K3
CLO2	Apply Knowledge of Reproductive Techniques	K1 to K3
CLO3	Analyze Molluscan and Prawn Fisheries	K1 to K4
CLO4	Diagnose and Address Fish Diseases	K1 to K3
CLO5	Explore Fish Products and Aquaria Management	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Introduction – Importance of fisheries – Economic value of common South Indian fishes – catla , Tilapia -Nutrition and feeding habits and feeding adaptations.-Native & Invasive fish species.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Tagging of fishes.- Reproduction in fishes-Induced breeding - hypophysation Ecological factors influencing spawning in carps.	9	Chalk and Talk, OHP quiz, on the spot test
III	Edible molluscan fisheries - Pearl fishery in India.Fisheries management –prawn fishery , Constrains for fisheries -Sewage fed fisheries.	15	Chalk and Talk, PPT, group discussion , OHP andYou tube Links
IV	Marine Fisheries & Inland fisheries. Protozoan disease white spot disease-, worm disease -ligulosis, crustacean disease-argulosis and non parasitic disease-soft shell syndrome.	9	Chalk and Talk, OHP,PPT presentations, quiz,
V	Home Aquaria, Ornamental fishes – gold fish & black molly , By products of fishes-body oil , liver oil, fish glue, Isinglass & fish manure- Fish preservation and processing – Fish in relation to Public Health.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designer:
Dr.(Mrs).M.A.Soniya**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	SEC	22OUZOSE5	Biostatistics and Bioinformatics	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objective:

1. Understanding the basic principles and applications of Biophysics, Biostatistics and Bioinformatics.
2. Make students expose to preparation of Genomic data.
3. Train students to learn measures of central tendencies.
4. Elevate the skills and hands on training in Comparison of sequences by FASTA and BLAST methods

Course Content:

Unit – I. Data Collection – Sources of Primary and secondary data – Classification and Tabulation, Organization of data: Individual, discrete frequency series – Types of variables – Derived variables.

Unit – II Diagrammatic Representation of Data – Bar diagram, Pie diagram, Graphical Representation of Data -Histogram, Frequency polygon, Frequency Curve.

Unit – III Measurement of Central tendency – Mean, Median and Mode , Correlation, ANOVA-One Way ANOVA.

Unit – IV Internet concepts, Bioinformatics a multidisciplinary approach, Scope and applications of Bioinformatics. Biological databases- Nucleic acid databases (Genbank, DDBJ and EMBL) Protein databases - primary, secondary, Specialized databases-TIGR, Structural databases –PDB

Unit – V Sequence similarity search (FASTA and BLAST). Significance of E-value. Introduction to ORF and primer designing. Multiple sequence alignment (CLUSTAL W), conserved domain search (Motif). Phylogenetic analysis- phylogenetic tree construction.

Books for Study:

1. Ardert T., (2002)*Information Technology*, Pitman Publishers.
2. Gurumani, N., (2004) *Introduction to Biostatistics*, M.J.P. Publishers, Delhi.

Books for Reference:

1. Khan A.S, & Khanum A., (2004) *Fundamental of Biostatistics*, Ukaas publishers, Hyderabad.
2. Arumugam N, (2005) *Biostatistics and Computer application*, Saras publications.
3. Gupta S.P, (2006) *Statistical methods*, Sulthan chand & Sons.New Delhi.
4. Prasad,S., .(2009) *Elements of Biostatistics*, Rastogi publications, Meerut, ISBN 81 : 7133-885-2.

Web Resources / E.Books:

- https://www.unilus.ac.zm/lms/e-books/books/Basic_Sciences/Behavioural%20sciences%20and%20public%20health/Fundamentals%20of%20Biostatistics%20%287th%20Edition%29.pdf

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To elevate the skills and hands on training in Biostatistics and Bioinformatics

Activities to be given: Provision of Worksheets

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand the scope of Biophysics.	K1 to K3
CLO2	Identify the type of variables and collection of data.	K1 to K3
CLO3	Apply the knowledge representation of collected data and prepare various diagrams	K1 to K4
CLO4	Analyze the significance Measurement of Central tendency	K1 to K3
CLO5	Examine and download genome sequences of several organisms from GENBANK, EMBL and other sources.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit – I. Data Collection – Sources of Primary and secondary data – Classification and Tabulation, Organization of data: Individual, discrete frequency series – Types of variables – Derived variables.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit – II Diagrammatic Representation of Data – Bar diagram, Pie diagram, Graphical Representation of Data -Histogram, Frequency polygon, Frequency Curve.	9	Chalk and Talk, OHP quiz, on the spot test
III	Unit – III Measurement of Central tendency – Mean, Median and Mode ,Correlation,ANOVA-One Way ANOVA.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Internet concepts, Bioinformatics a multidisciplinary approach, Scope and applications of Bioinformatics. Biological databases- Nucleic acid databases (Genbank, DDBJ and EMBL) Protein databases - primary, secondary, Specialized databases-TIGR, Structural databases –PDB	9	Chalk and Talk, OHP,PPT presentations, quiz,
V	Sequence similarity search (FASTA and BLAST). Significance of E-value. Introduction to ORF and primer designing. Multiple sequence alignment (CLUSTAL W), conserved domain search (Motif). Phylogenetic analysis- phylogenetic tree construction	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designer:
Dr.(Mrs).S.Sharmila**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	Core	22OUZO61	Physiology	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1. Explaining various aspects of physiological activities of animals with special reference to humans.
2. Describing osmotic and osmotic regulation, thermo regulation and biological rhythm of different animal groups.
3. Illustrating different kinds of food, their structure, function and metabolism.
4. Dealing with various physiological functions in mammals. It also gives an account of the metabolic/biochemical pathways and the probable impact of environment on them.

Course Content:

Unit – I Nutrition – Nutrients – Digestion and absorption of carbohydrates, proteins and lipids, Role of gastro intestinal hormones in digestion. **Respiration** – Respiratory pigments – Types, Properties and function, Exchange and transport of gases, Respiratory quotient.

Unit – II Circulation – Composition and Functions of blood, Types of heart, Cardiac cycle, cardiac rhythm, Pace maker, Origin of heart beat and its regulation, ECG, Blood pressure, Theories of blood clotting, **Excretion** – Classification of animals based on excretory products, Ornithine cycle, mechanism of urine formation and hormonal control.

Unit – III Osmoregulation – Osmo-iono-regulation in freshwater, marine and migratory fishes. **Thermoregulation** – Acclimation, Acclimatisation, heat death, cold death, physiology of hibernation and aestivation, Biological rhythm – Types, examples and adaptive significance.

Unit – IV Nerve Physiology – Types of neuron, conduction of nerve impulse along a nerve

fibre, Synapses, Synaptic transmission of impulse, Neurotransmitters, **Muscle physiology** – Types of Muscles, Ultrastructure and properties, muscle proteins, Theories of muscle contraction, Isotonic and Isometric contraction.

Unit – V Endocrine glands – Structure, secretions and functions of Pituitary, Thyroid, Parathyroid Adrenal, Islets of Langerhans and Gonads.

Books for Study:

1. Verma P.S., Tyagi B.S. and Agarwal V.K., (1995) *Animal Physiology*, S.Chand & Co, New Delhi.

Books for Reference:

1. Philip H Mitchell., (1948) *Textbook of General Physiology*, 4th Edition, Mc Graw-Hill Company, Fourth Edition New York, Toronto. London. Cat.log.No.55-9548.
2. Hoar, S.William., (1966) *General Comparative Physiology* - Printice Hall of India Pvt. Ltd. New Delhi, ISBN-0-87692-337-6.
3. Ernest Baldwin., (1970) *An Introduction to Comparative Bio – Chemistry*, Cambridge University Press.
4. Byron A. Schottelius, Dorothy D. Schottelius., (1973) *Textbook of Physiology*, V. Mosby Company; 17th Revised edition.
5. Rastogi. S.C., (1977) *Essentials of Animal Physiology* –Wiley Eastern Ltd.

Web Resources / E.Books:

- <https://www.teachmint.com/tfile/studymaterial/bsc/zoology/animalphysiologypdf/a7981d9a-f2c9-4518-bcc1-998a42163670>
- http://ndl.ethernet.edu.et/bitstream/123456789/79506/16/%5BS.C._Rastogi%5D_Essentials_of_Animal_Physiology%2C_4t%28BookSee.org%29.pdf
- <https://www.youtube.com/watch?v=EhnRhFLyOg>

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To create awareness on human physiology and metabolism.

Activities to be given: Collection of clinical results(RBC ,WBC,Lipid profile,Serum calcium,ESR,etc) and presentation in groups.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand the importance of nutrients in human body.	K1 to K3
CLO2	Identify the different types of blood cells and its significance in circulatory physiology	K1 to K3
CLO3	Apply the knowledge of osmoregulatory mechanism in fishes and the process of thermoregulation.	K1 to K4
CLO4	Analyze the significance of nerve impulse through conduction.	K1 to K3
CLO5	Examine the role of Endocrine glands.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Nutrition – Nutrients – Digestion and absorption of carbohydrates, proteins and lipids, Role of gastro intestinal hormones in digestion. Respiration – Respiratory pigments – Types, Properties and function, Exchange and transport of gases, Respiratory quotient.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Circulation – Composition and Functions of blood, Types of heart, Cardiac cycle, cardiac rhythm, Pace maker, Origin of heart beat and its regulation, ECG, Blood pressure, Theories of blood clotting, Excretion – Classification of animals based on excretory products, Ornithine cycle, mechanism of urine formation and hormonal control.	9	Chalk and Talk, OHP quiz, on the spot test
III	Osmoregulation – Osmo-iono-regulation in freshwater, marine and migratory fishes. Thermoregulation – Acclimation, Acclimatisation, heat death, cold death, physiology of hibernation and aestivation, Biological rhythm – Types, examples and adaptive significance.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Nerve Physiology – Types of neuron, conduction of nerve impulse along a nerve fibre, Synapses, Synaptic transmission of impulse, Neurotransmitters, Muscle physiology – Types of Muscles, Ultrastructure and properties, muscle proteins, Theories of muscle contraction, Isotonic and Isometric contraction.	9	Chalk and Talk, OHP, PPT presentations, quiz,
V	Endocrine glands – Structure, secretions and functions of Pituitary, Thyroid, Parathyroid Adrenal, Islets of langerhans and Gonads.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designer:
Ms.R.S.Rajalakshmi**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	Core	22OUZO62	Microbiology & Immunology	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1. To understand the basic principles and applications of microbiology and immunology
2. To deal with characteristics, properties and biological significance of the biomolecules of life.
3. To learn the regulation of different metabolic processes in microorganisms.
4. To understand the body's defense mechanism against disease.
5. To interpret the organs of the immune system and immune response mechanisms.

Course Content:

Unit – I Introduction to Microbiology -The history and scope of Microbiology – Classification of Microorganisms : Classification based on Robert H. Whittaker (Five Kingdom system). Outline classification for bacteria as per the second edition of Bergey's Manual of Systematic Bacteriology and Classification of Fungi (Alexopoulos and Mims). Bacterial growth curves, Bacterial media-complex and selective media. Bacterial staining techniques- Control of microbes- Sterilization, disinfection, antiseptic, tyndallisation, pasteurization: Physical- dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Chemical methods. Pure culture methods (streak plate, spread plate, Pour plate, stab culture, slant culture).

Unit – II Food Microbiology- Types of food-Food spoilage: spoilage of Milk & Milk products. Spoilage of beer & wine, Spoilage of vegetables, fruits, meat & canned food. Physical preservation methods: Asepsis, filtration & centrifugation, high & low temperature & Pasteurization, desiccation, radiation, anaerobiosis, canning and controlled atmosphere. Chemical preservation methods: Salt, Sugar, organic acid

(Benzoic acid, Sorbic acid, propionates, acetic acid & lactic acid), nitrates, nitrites, sulfur dioxide, ethylene dioxide, propylene oxide, wood smoke and antibiotics. Food poisoning: *Aspergillus flavus* & *Clostridium botulinum*. Probiotics and prebiotics – Benefits & applications.

Unit – III Role of microorganisms in Biogeochemical cycles– Nitrogen Cycle and Phosphorus Cycle - Role of microorganisms in soil fertility- Rhizobium, Blue Green Algae (BGA) Biofertilizer, Azotobacter.

Unit – IV History of Immunology: Contributions of Edward Jenner –Louis Pasteur – Elie Metchnikoff. Types of immunity: Innate-anatomic, physiologic, phagocytic, and inflammatory–Acquired or Adaptive – specificity – diversity- Immunologic memory–self/nonself recognition. Ontogeny of Lymphoid organs – Myeloid Lineage and Lymphoid Lineage. Primary and secondary Lymphoid organs – Thymus, Bone marrow, Spleen, lymph node- Specific and nonspecific immunity – B cells, T cells and sub cells - Immune response- humoral immune response & cell mediated immune response.

Unit – V Structure and properties of antigen. Antigen – antibody reaction (precipitation & agglutination).Transplantation- MHC, HLA typing, Hypersensitivity reactions – Type I- anaphylactic reactions, Type II – cytotoxic reactions, Type III – immune complex reactions, Type IV – delayed type hypersensitivity reactions.

Books for Study:

1. Ananthanarayanan,R.&C.K.JayaramPanicker,.(1990)*TextBook of Microbiology*, Orient Longman.
2. Chakravarthy A.K.,(1996) *Immunology*, Tata Mc Graw, New Delhi.

Books for Reference:

1. Frobisher Martni ., (1946)*Fundamentals of Microbiology* ,. W.B. Saunders and Co, London.
2. John W.Kimball.,(1986) *Introduction to Immunology*, Macmillan Publishing Company .
3. Chakravarthy, A.K., .(1993)*Immunology*, Tata McGraw Hill Publishing Company, New Delhi.
4. Pelczar, M.J., E.C.S. Chan and N.R. Kreig. .(2009)*Microbiology*, 5th edition. McGrawHill. Book Co. Singapore.
5. Tortora, G.J., Funke, B.R. and Case, C.L. (2009) *Microbiology: An Introduction*. 9th edition, Pearson Education, Singapore.

Web Resources / E.Books:

- <https://instruct.uwo.ca/biology/090b/1290b%201-7.pdf>
- https://dspmuranchi.ac.in/pdf/Blog/General_MicrobiologyCSP_Proof012417.PDF
- https://faculty.ksu.edu.sa/sites/default/files/140_mbio-final_notes.pdf

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To make students aware of the various diseases caused by viruses, bacteria, protozoa and fungi and its preventive measures.

Activities to be given: Students shall be asked to examine the characterization of microbes – Inoculation, Incubation, Isolation, Inspection(Observation) and Identification.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Focus on the study of viruses,bacteria,protozoa and fungi and its preventive measures.	K1 to K3
CLO2	Apply the knowledge to understand the significance of dairy and soil micro organisms for the betterment of human kind.	K1 to K3
CLO3	Understand the pathogenicity of viruses,bacteria,protozoa and fungi and its prevention.	K1 to K4
CLO4	Examine the concept of immunization, immunoglobulins and lymphoid organs.	K1 to K3
CLO5	Understand the various immune techniques, immune responses.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Introduction to Microbiology -The history and scope of Microbiology – Classification of Microorganisms : Classification based on Robert H. Whittaker (Five Kingdom system). Outline classification for bacteria as per the second edition of Bergey’s Manual of Systematic Bacteriology and Classification of Fungi (Alexopoulos and Mims). Bacterial growth curves, Bacterial media-complex and selective media. Bacterial staining techniques- Control of microbes- Sterilization, disinfection, antiseptic, tyndallisation, pasteurization: Physical- dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Chemical methods. Pure culture methods (streak plate, spread plate, Pour plate, stab culture, slant culture).	12	Chalk and Talk, PPT, quiz, on the spot test
II	Food Microbiology - Types of food-Food spoilage: spoilage of Milk & Milk products. Spoilage of beer & wine, Spoilage of vegetables, fruits, meat & canned food. Physical preservation methods: Asepsis, filtration & centrifugation, high & low temperature & Pasteurization, desiccation, radiation, anaerobiosis, canning and controlled atmosphere. Chemical preservation methods: Salt, Sugar, organic acid (Benzoic acid, Sorbic acid, propionates, acetic acid & lactic acid), nitrates, nitrites, sulfur dioxide, ethylene dioxide, propylene oxide, wood smoke and antibiotics. Food poisoning: <i>Aspergillus flavus</i> & <i>Clostridium botulinum</i> . Probiotics and prebiotics – Benefits & applications.	9	Chalk and Talk, OHP quiz, on the spot test
III	Role of microorganisms in Biogeochemical cycles – Nitrogen Cycle and Phosphorus Cycle - Role of microorganisms in soil fertility- Rhizobium, Blue Green Algae (BGA) Biofertilizer, Azotobacter.	9	Chalk and Talk, PPT, group discussion
IV	History of Immunology : Contributions of Edward Jenner –Louis Pasteur – Elie Metchnikoff. Types of immunity: Innate-anatomic, physiologic, phagocytic, and inflammatory–Acquired or Adaptive – specificity – diversity- Immunologic memory– self/nonself recognition. Ontogeny of Lymphoid organs – Myeloid Lineage and Lymphoid Lineage. Primary and secondary Lymphoid organs – Thymus, Bone marrow, Spleen, lymph	15	Chalk and Talk, OHP,PPT presentations, quiz,

	node- Specific and nonspecific immunity – B cells, T cells and sub cells - Immune response- humoral immune response & cell mediated immune response.		
V	Structure and properties of antigen. Antigen- antibody reaction (precipitation& agglutination).Transplantation- MHC, HLA typing, Hypersensitivity reactions – Type I- anaphylactic reactions, Type II – cytotoxic reactions, Type III – immune complex reactions, Type IV – delayed type hypersensitivity reactions.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designers: Dr.(Mrs).M.A.Soniya
Dr.(Mrs).S.Sharmila**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	DSEC	22OUZODSE6A	Biotechnology	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1. Enable understanding of biodiversity as resources that could yield products useful to man.
2. Enables understanding of Principle behind techniques involved in Biotechnology.
3. Imparts awareness on Intellectual property rights and safety issues involved in handling of transgenic organisms.
4. Understand the significance of renewable energy
5. Learn to construct the gene banks

Course Content:

Unit – I Introduction -Origin and Definition – Scope and Importance of Biotechnology – Biotechnology in India – GATT, IPR, TRIPS – recombinant DNA technology – Genetic Engineering – Restriction Enzymes – Gene cloning – Cloning Vectors – Plasmids, Phages, Cosmids — Electroporation and Microinjection, Microarray.

Unit – II Animal Biotechnology-Animal tissue culture – In vitro fertilization – embryo transfer in man – Transgenic animals - Fish, Biotechnology and medicine – Hybridoma Technology– Mab – hormone production – Viral Vaccines – Edible and designer Vaccines, interferons – Gene Therapy.

Unit – III Plant Biotechnology-Plant tissue culture – Protoplast culture – Disease resistant Plants – Stress tolerant plants – Ti-Plasmids – Nif genes – genetically transformed Plants – Terminator gene technology – Plant vectors – Phytoremediation.

Unit – IV Industrial Biotechnology- Bioreactors – Fermentation process – Microbial Enzymes and their application — Biogas Plant structure – Biogas Production – Biofertilizers – Bioinsecticides — GMOs

Unit-V Environmental Biotechnology -Renewable Energy – Energy and Fuel using Micro organisms – Biomass production through forestry – Gene Banks – Species conservation – Bioremediation – Bio-leaching.

Books for Study:

1. R.C. Dubey. ,(1993)*Biotechnology*, S. Chand Publishing.
2. U. Satyanarayanan. , (2017) *Biotechnology*, Wiley; Fifth edition .

Books for Reference:

1. Dharmalingam. K.,(1990)*Biotechnology: principles, Practices and Prospects,Biology Education*. 7(3): 152-156. ISBN 0970-5961.
2. Alcamo. LD ., (1996) *DNA Technology – The Awesome Skill*. WCB Dubuque IA. ISBN 0-697.- 21248-3.
3. Singh,B.D.,(1998)*Biotechnology*, Kalyani publishers, New Delhi, ISBN 81 - 7096-735.
4. Gupta. P.K., (1999)*Elements of Biotechnology*, Rastogi publication, Meerut, ISBN 81-7133-412-1 Nuzhat Ahmed, Fouad M. Qureshi Obaid Y.Khan.
5. Nuzhat Ahmed, et al.(2001) *Industrial and Environmenal Biotechnology*, Garland Science; 1st edition.
6. Dubey. R.C., (2004)*Text Book Biotechnology*. S.Chand & Co.Ltd.

Web Resources / E.Books:

- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBB2103.pdf
- <https://archive.nptel.ac.in/content/storage2/courses/102103045/download/mod1.pdf>
- [https://annamalaiuniversity.ac.in/studport/download/agri/gen/resources/GPB%20316%20PLANT%20BIOTECHNOLOGY%20\(2+1\)%20%20Online%20Study%20Material.pdf](https://annamalaiuniversity.ac.in/studport/download/agri/gen/resources/GPB%20316%20PLANT%20BIOTECHNOLOGY%20(2+1)%20%20Online%20Study%20Material.pdf)

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To make students aware of applications of biotechnology in the field of agriculture, medicine and industries.

Activities to be given: students shall be taken on a visit to laboratories that prepare vaccines.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Provide education that leads to comprehensive understanding of the scope, principles and practices of biotechnology.	K1 to K3
CLO2	Apply the knowledge to identify Vaccines, Gene Therapy and tissue culture.	K1 to K3
CLO3	Apply the knowledge Legal Issues regarding Handling of transgenic Plants.	K1 to K4
CLO4	Analyze the significance of genetically significant bacteria.	K1 to K3
CLO5	Meet the challenges of the new areas of the biotechnology industry.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level**2- Intermediate Level****3- Advanced Level**

LESSON PLAN: TOTAL HOURS (60Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Introduction -Origin and Definition – Scope and Importance of Biotechnology – Biotechnology in India – GATT, IPR, TRIPS – recombinant DNA technology – Genetic Engineering – Restriction Enzymes – Gene cloning – Cloning Vectors – Plasmids, Phages, Cosmids — Electroporation and Microinjection, Microarray.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Animal Biotechnology-Animal tissue culture – In vitro fertilization – embryo transfer in man – Transgenic animals - Fish, Biotechnology and medicine – Hybridoma Technology– Mab – hormone production – Viral Vaccines – Edible and designer Vaccines, interferons – Gene Therapy.	9	Chalk and Talk, OHP quiz, on the spot test
III	Plant Biotechnology-Plant tissue culture – Protoplast culture – Disease resistant Plants – Stress tolerant plants – Ti-Plasmids – Nif genes – genetically transformed Plants – Terminator gene technology – Plant vectors – Phytoremediation.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Industrial Biotechnology- Bioreactors – Fermentation process – Microbial Enzymes and their application — Biogas Plant structure – Biogas Production – Biofertilizers – Bioinsecticides — GMOs	9	Chalk and Talk, OHP,PPT presentations, quiz,
V	Environmental Biotechnology -Renewable Energy – Energy and Fuel using Micro organisms – Biomass production through forestry – Gene Banks – Species conservation – Bioremediation – Bio-leaching.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designer:
Dr.(Mrs).G.Indira Rani**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	DSEC	22OUZODSE6B	Poultry Science	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	✓

Course Objectives:

1. Evaluate the suitability and impact of different poultry housing systems on productivity and welfare.
2. Implement effective management practices for optimal growth, health, and productivity of chicks, layers, and broilers.
3. Apply seasonal management strategies to maintain poultry welfare and productivity during extreme weather conditions.
4. Formulate balanced diets and address nutritional imbalances to ensure optimal growth and health of poultry.
5. Develop and implement comprehensive vaccination programs to prevent and control poultry diseases.

Course Content:

Unit –I Poultry industries in India-survey choosing the commercial layers and broilers. Poultry housing- deep litter system, cage rearing., feeders & waterers. Poultry manure Importance of egg .

Unit –II Chick rearing - management of chicks-management of layers-management of broilers. Lighting in poultry

Unit –III Summer management, winter management, debeaking, debeaking apparatus and its significance.

Unit –IV Feeding of chicks, growers and layers. symptoms of excess and deficiency of amino acids, vitamins and minerals, feed formulation and Non – Nutritive Feed additives.

Unit –V Poultry diseases- viral disease, bacterial disease, fungal disease and parasitic diseases .Vaccination programme.

Books for Study:

1. Gnanamani ,M.R., *Modern aspects of commercial Poultry Keeping* ,GIRI Publications, Madurai. 1988.

Books for Reference:

1. Biester,H.E. and Schwarte., *Diseases of Poultry*,Oxford and IBH Publishing Company.1978
2. Naidu,P.M.N.,*Poultry Keeping In India*,Indian Council of Agricultural Research, New Delhi.1973
3. Singh, R.A., *Poultry Production*, Kalyani Publishers, New Delhi.1981

Web Resources / E.Books:

- https://ubblab.weebly.com/uploads/4/7/4/6/47469791/handbook_of_poultry_science_and_technology.pdf
- <https://archive.org/details/in.ernet.dli.2015.89923/page/n17/mode/2up>

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To make students aware of poultry housing systems on productivity and welfare.

Activities to be given: students shall be taken on a visit to Poultry houses .

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Evaluate the suitability and impact of different poultry housing systems on productivity and welfare.	K1 to K3
CLO2	Implement effective management practices for optimal growth, health, and productivity of chicks, layers, and broilers.	K1 to K3
CLO3	Apply seasonal management strategies to maintain poultry welfare and productivity during extreme weather conditions.	K1 to K4
CLO4	Formulate balanced diets and address nutritional imbalances to ensure optimal growth and health of poultry.	K1 to K3
CLO5	Develop and implement comprehensive vaccination programs to prevent and control poultry diseases.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level**2- Intermediate Level****3- Advanced Level****LESSON PLAN: TOTAL HOURS (60Hrs)**

UNIT	DESCRIPTION	Hrs	MODE
I	Poultry industries in India-survey choosing the commercial layers and broilers. Poultry housing-deep litter system, cage rearing., feeders & waterers. Poultry manure Importance of egg .	12	Chalk and Talk, PPT, quiz, on the spot test
II	Chick rearing - management of chicks- management of layers-management of broilers. Lighting in poultry	9	Chalk and Talk, OHP quiz, on the spot test
III	Summer management, winter management, debeaking, debeaking apparatus and its significance.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Feeding of chicks, growers and layers. symptoms of excess and deficiency of amino acids, vitamins and minerals, feed formulation and Non – Nutritive Feed additives.	9	Chalk and Talk, OHP,PPT presentations, quiz,
V	Poultry diseases- viral disease, bacterial disease, fungal disease and parasitic diseases .Vaccination programme.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designer:
Dr.(Mrs).G.Indira Rani**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V & VI	Core - Lab	22OUZO61P	Lab in Genetics, Ecology & Evolution and Biochemistry.	4	7	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1. Enable to understand importance of the Genetics, Ecology, Evolution and Biochemistry.
2. Make them study fresh water ecosystem and its significance.
3. Analyse Vestigial organs in human.
4. Elevate their skills through biochemical techniques.

Course Content:**Genetics**

1. Mendelian verification of Monohybrid ratio by observations in Beads.
2. Mendelian verification of Dihybrid ratio using coin tossing experiment

Spotters:

3. Observation of simple Mendelian Traits in Man.
4. Observation of chromosomal aberrations (Ploidy & Syndromes)
5. Sex-influenced inheritance in Man –Colour Blindness and Haemophilia.

Ecology

6. Estimation of O₂ –Winkler's Method
7. Identification of Planktons
8. Visit of Freshwater Ecosystem-Pond-Report of Flora & Fauna.

Spotters:

9. Usage of Secchi Disc,
10. Hygrometer,
11. Rain gauge .

Evolution: Spotters:

12. Variations – finger prints.
13. Homologous & Analogous organs.
14. Vestigial organs.
15. Connecting link- Archaeopteryx
16. Examples of evolutionary importances- Peripatus & Limulus

Biochemistry

17. Principle and procedure for pH Measurements of various samples using pH meter.
18. Principle & Procedure of Amino acids separations using Paper Chromatography-
Demo only
19. Qualitative tests for protein, carbohydrates & fats.

Books for References:

1. Vikas Pali., (2016)*Practical Handbook of Genetics*, Kalyani Publisher.
2. Soundravally Rajendiran, Pooja Dhiman., (2019)*Biochemistry Practical Manual*.
3. Umavathi Subramaniam.,(2022)*Practical Manual on Environmental Biology and Evolution*, LAP Lambert Academic Publishing .

Web Resources:

1. <https://www.youtube.com/watch?v=Mehz7tCxjSE>
2. <https://www.youtube.com/watch?v=m9XGsEs55Qo>
3. <https://www.youtube.com/watch?v=YQGewIJk-k0>
4. <https://www.youtube.com/watch?v=P3C9qb0fsZE>

Pedagogy

PPT, Group Discussion , Interaction, Quiz, Tutorial And Virtual Labs.

LESSON PLAN for practical (Total hours : 60)

Cycle	Description	Staff Name Hrs	Mode
Genetics			
1	Mendelian verification of Monohybrid ratio by observations in Beads.	4	Demo and hands on training
2	Mendelian verification of Dihybrid ratio using coin tossing experiment	4	Demo and hands on training
3	Observation of simple Mendelian Traits in Man.	4	Observations of Pictures
4	Observation of chromosomal aberations (Ploidy & Syndromes) Sex-influenced inheritance in Man –Colour Blindness and Haemophilia.	4	Observations of Pictures
Ecology			
5	Estimation of O ₂ –Winkler’s Method	4	Demo and hands on training
6	Identification of Planktons	2	Demo and hands on training
7	Usage of Secchi Disc, Hygrometer, Rain gauge .	2	Observation of instruments
8	Visit of Freshwater Ecosystem-Pond-Report of Flora & Fauna.		
Evolution			
7	Variations – finger prints. Homologous & Analogous organs. Vestigial organs.	5	Observation of Slides
8	Connecting link- Archaeopteryx Examples of evolutionary importances- Peripatus & Limulus	5	Demo only
Biochemistry			
9	Principle and procedure for pH Measurements of various samples using pH meter.	8	Demo and hands on training
10	Principle & Procedure of Amino acids separations using Paper Chromatography	8	Demo and hands on training
11	Qualitative tests for protein, carbohydrates & fats.	8	Demo and hands on training

**Course Designer:
Dr.(Mrs)M.A.Soniya**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V & VI	Core - Lab	22OUZO62P	Lab in Physiology, Microbiology & Immunology and Biotechnology	4	7	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1. Analyse importance of salivary amylase in digestion, nitrogenous waste products in Pisces, Aves and Mammals.
2. Attain skills through staining techniques and identification of protozoan parasites.
3. Understand the importance of Lymphoid organs.
4. Make them have a know-how on Genomic Library

Course Content:**Animal Physiology**

1. Qualitative analysis of nitrogenous waste products .
2. Effect of Salivary Amylase activity in human saliva in relation to temperature.
3. Effects of temperature on ciliary activity of freshwater mussel. (Virtual Demo)

Spotters :

Sphygmomanometer
Kymograph
Respirometer

Microbiology

4. Hanging drop method
5. Simple staining
6. Gram staining

Spotters :

Autoclave
Hot air Oven
Laminar Air Hood.

Immunology

7. Blood Grouping

Spotters:

Bone marrow

Bursa of fabricius

Spleen

Thymus

Biotechnology

8. Isolation of DNA in Eukaryotic cells (Virtual Demo)

9. PCR (Virtual Demo)

10. Visit to Biotechnology industries.

Spotters :*Pseudomonas putida* ,

pBR 322 ,

Ti plasmid ,

Genomic library (Chart)

Books for References:

1. James G. Cappuccino, Chad T. Welsh.,(2019)*Microbiology: A Laboratory Manual*, 12th Edition.
2. Amit Gupta.,(2019)*Immunology and Animal Biotechnology - a Laboratory Manual*, LAP LAMBERT Academic Publishing.

Web Resources:

1. <https://www.youtube.com/watch?v=BTh34kr5YBA>
2. <https://www.youtube.com/watch?v=sxa46xKfIOY>
3. https://www.youtube.com/watch?app=desktop&v=M_qeE5BsynY&embeds_referring_euri=https%3A%2F%2Fmedicalxpress.com%2F&feature=emb_imp_woyt

Pedagogy

PPT, Group Discussion , Interaction, Quiz, Tutorial And Virtual Labs.

LESSON PLAN for practical (Total hours : 60)

Cycle	Description	Staff Name Hrs	Mode
Animal Physiology			
1	Qualitative analysis of nitrogenous waste products .	4	Demo and hands on training
2	Effect of Salivary Amylase activity in human saliva in relation to temperature.	4	Demo and hands on training
3	Effects of temperature on ciliary activity of freshwater mussel.(Virtual Demo)	4	Demo and hands on training
4	Spotters : Sphygmomanometer, Kymograph, Respirometer.	4	Observation of instruments
Microbiology			
5	Hanging drop method.	5	Demo and hands on training
6	Simple staining	5	Demo and hands on training
	Gram staining	4	Demo and hands on training
	Spotters :Autoclave ,Hot air Oven,Laminar Air Hood.	2	Observation of instruments
Immunology			
7	Blood Grouping	6	Observation of Slides
8	Spotters: Bone marrow, Bursa of fabricius, Spleen and Thymus	4	Demo only
Biotechnology			
9	Isolation of DNA in Eukaryotic cells (Virtual Demo)	3+3	Observation of slides
10	PCR (Virtual Demo)	3+3	Observation of Slides, Specimen
11	Spotters : <i>Pseudomonas putida</i> , pBR 322 , Ti plasmid , Genomic library (Chart)	3+3	Observation of Specimens, Images
12	Visit to Biotechnology industries.		

**Course Designer:
Dr.(Mrs)S.Sharmila**

Department of Zoology					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	SEC	22OUZOSE6	Economic Zoology	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		✓

Course Objectives:

- Developing skill in different applications of Zoology.
- Train to become self-employed entrepreneurs.

Course Content:

Unit –I Sericulture - Introduction to Sericulture – Types of silk worms – Rearing of Mulberry Silkworms-Diseases and enemies of silkworms – uses of silk -central silk board.

Unit –II Apiculture - Introduction to Apiculture – Types of Honey Bee – Bee Keeping – Hives— Economic importance of honey – Bee Keeping industry-By products of Honey Bee.

Unit -III Aquaculture - Qualities of Cultivable fishes – Types of Fish farming. Fish culture – Breeding ponds – nursery ponds – rearing ponds – stocking ponds – Harvesting – Preservation of fishes- Fish feed –Chironomous larva.

Unit – IV Poultry -Commercial layers and broilers. Poultry housing- deep litter system, cage rearing, feeders & waterers. Summer management, winter management. Debeaking, Poultry diseases- viral disease, bacterial disease, fungal disease and parasitic diseases (one each) Vaccination programme.

Unit- V Dairy farming –Breeds of cattles, dairy products, Marketing, Management. Diseases affecting cattle’s (Any four) and mode of prevention.

Book for Study:

1.Arumugam ,N., (2012) *Applied Zoology* , Saras Publications.

Books for Reference:

1. Gnanamani. M.R., .(1988) *Modern aspects of commercial Poultry Science* , GIRI Publications.
2. Jhingran. V.G.,(1997) *Fish and fisheries of India*, Hindustan Publishing Corporation, Delhi.
3. Krishnan. N.T., (2008) *Economic Entomology*, J.J. Publications.

Web Resources / E.Books:

- <https://egov.uok.edu.in/elearning/tutorials/1011020512BR15103CR15Apiculture%20Lac%20culture%20and%20%20sericultureapiculture%20lac%20culture%20and%20%20sericulture%20upload.pdf>
- https://vikramuniv.ac.in/files/wp-content/uploads/B_Sc_Hons_Biotechnology_6_sem_Vermi_By_Dr_Santosh_T_hakur.pdf
- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBT1608.pdf
- <https://www.mrveterinarycollege.edu.in/downloads/files/n5e327ec526cc5.pdf>

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To develop skill and make them entrepreneurs through raising of silkworms, fishes, honeybees, poultry birds and cattles.

Activities to be given: Visit to dairy farm, silkworm rearing units, poultry sheds dairies etc.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand the process of silkworm rearing and their benefits.	K1 to K3
CLO2	Identify the importance of honey bees in pollination and their byproducts.	K1 to K3
CLO3	Apply the knowledge of Aquaculture and make students become entrepreneurs.	K1 to K4
CLO4	Analyze the significance of Commercial layers and broilers in fowls.	K1 to K3
CLO5	Educate the students on the importance of country cows.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level**2- Intermediate Level****3- Advanced Level****LESSON PLAN: TOTAL HOURS (60Hrs)**

UNIT	DESCRIPTION	Hrs	MODE
I	Sericulture - Introduction to Sericulture – Types of silk worms – Rearing of Mulberry Silkworms-Diseases and enemies of silkworms – uses of silk - central silk board.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Apiculture - Introduction to Apiculture – Types of Honey Bee – Bee Keeping – Hives— Economic importance of honey – Bee Keeping industry-By products of Honey Bee.	9	Chalk and Talk, OHP quiz, on the spot test
III	Aquaculture - Qualities of Cultivable fishes – Types of Fish farming. Fish culture – Breeding ponds – nursery ponds – rearing ponds – stocking ponds – Harvesting – Preservation of fishes- Fish feed –Chironomous larva.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Poultry -Commercial layers and broilers. Poultry housing- deep litter system, cage rearing, feeders & waterers. Summer management, winter management. Debeaking, Poultry diseases- viral disease, bacterial disease, fungal disease and parasitic diseases (one each) Vaccination programme.	9	Chalk and Talk, OHP,PPT presentations, quiz,
V	Dairy farming –Breeds of cattles, dairy products, Marketing, Management. Diseases affecting cattle's (Any four) and mode of prevention.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

Course Designer:
Ms.R.S.Rajalakshmi