



FATIMA COLLEGE

(Autonomous)

Affiliated to Madurai Kamaraj University
Accredited with 'A++' (CGPA 3.61) by NAAC (Cycle - IV)
Mary Land, Madurai - 625 018, Tamil Nadu

NAME OF THE DEPARTMENT: ZOOLOGY

NAME OF THE PROGRAMME : B.Sc

PROGRAMME CODE : UAZO

ACADEMIC YEAR :2021-2022

VISION OF THE DEPARTMENT

Women Empowerment through Biological Education for the Betterment of Environment and Mankind

MISSION OF THE DEPARTMENT

- To ensure quality education offering skill based program
- To render entrepreneurial training to make students employable
- To create awareness on the conservation of Biodiversity
- To give ultimate insight into the correlation of various branches of biology that has overwhelming applications
- To facilitate Higher education & research (for the advanced learners)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1	Our graduates will be academic, digital and information literates; creative, inquisitive, innovative and desirous for the “more” in all aspects
PEO 2	They will be efficient individual and team performers, exhibiting progress, flexibility, transparency and accountability in their professional work
PEO 3	The graduates will be effective managers of all sorts of real – life and professional circumstances, making ethical decisions, pursuing excellence within the time framework and demonstrating apt leadership skills
PEO 4	They will engage locally and globally ,evincing social and environmental stewardship demonstrating civic responsibilities and employing right skills at the right moment.

GRADUATE ATTRIBUTES (GA)

Fatima College empowers her women graduates holistically.

A Fatimite achieves all-round empowerment by acquiring Social, Professional and Ethical competencies. A graduate would sustain and nurture the following attributes:

I. SOCIAL COMPETENCE	
GA 1	Deep disciplinary expertise with a wide range of academic and digital literacy
GA 2	Hone creativity, passion for innovation and aspire excellence
GA 3	Enthusiasm towards emancipation and empowerment of humanity
GA 4	Potentials of being independent
GA 5	Intellectual competence and inquisitiveness with problem solving abilities befitting the field of research
GA 6	Effectiveness in different forms of communications to be employed in personal and professional environments through varied platforms
GA 7	Communicative competence with civic, professional and cyber dignity and decorum
GA 8	Integrity respecting the diversity and pluralism in societies, cultures and religions
GA 9	All – inclusive skill - sets to interpret, analyse and solve social and environmental issues in diverse environments
GA 10	Self-awareness that would enable them to recognise their uniqueness through continuous self-assessment in order to face and make changes building their strengths and improving on their weaknesses
GA 11	Finesse to co-operate exhibiting team-spirit while working in groups to achieve goals

GA 12	Dexterity in self-management to control their selves in attaining the kind of life that they dream for
GA 13	Resilience to rise up instantly from their intimidating setbacks
GA 14	Virtuosity to use their personal and intellectual autonomy in being life-long learners
GA 15	Digital learning and research attributes
GA 16	Cyber security competence reflecting compassion, care and concern towards the marginalised
GA 17	Rectitude to use digital technology reflecting civic and social responsibilities in local, national and global scenario
II. PROFESSIONAL COMPETENCE	
GA 18	Optimism, flexibility and diligence that would make them professionally competent
GA 19	Prowess to be successful entrepreneurs and employees of trans-national societies
GA 20	Excellence in Local and Global Job Markets
GA 21	Effectiveness in Time Management
GA 22	Efficiency in taking up Initiatives
GA 23	Eagerness to deliver excellent service
GA 24	Managerial Skills to Identify, Commend and tap Potentials
III. ETHICAL COMPETENCE	
GA 25	Integrity and discipline in bringing stability leading a systematic life promoting good human behaviour to build better society

GA 26	Honesty in words and deeds
GA 27	Transparency revealing one's own character as well as self-esteem to lead a genuine and authentic life
GA 28	Social and Environmental Stewardship
GA 29	Readiness to make ethical decisions consistently from the galore of conflicting choices paying heed to their conscience
GA 30	Right life skills at the right moment

PROGRAMME OUTCOMES (PO)

On completion of B.Sc. ZOOLOGY programme, the graduates would be able to

PO 1	Apply acquired scientific knowledge to solve complex issues.
PO 2	Attain Analytical skills to solve complex cultural, societal and environmental issues.
PO 3	Employ latest and updated tools and technologies to analyse complex issue.
PO 4	Demonstrated Professional Ethics that foster community, Nation and Environment Building Initiatives.
PO 5	Apply the knowledge and skill to take up higher education, entrepreneurship and employment in government and private sectors.

PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion of B.Sc. ZOOLOGY programme, the graduates would be able to

PSO 1	Gain comprehensive knowledge in different branches of Zoology–Invertebrata, Chordata, Cell biology, Physiology, Environmental Biology, Biochemistry, Microbiology, Immunology, Embryology, Entomology, Genetics, Molecular Biology, Biotechnology, Biostatistics, Bioinformatics and Evolution.
PSO 2	Acquire technical skills in performing experiments in the field of Microbiology, Cell Biology, Biochemistry, Plant Physiology, Human Physiology, Molecular Biology, Environmental Biology, Developmental Biology, Biostatistics, Immunology, Evolution, Genetics, Clinical Laboratory Techniques, Biotechnology and Bioinformatics.
PSO 3	Develop empathy and instil love towards conserving plants and animals.
PSO 4	Express ideas and concept through seminar and assignments.
PSO 5	Solve the environmental problems by applying the biological principles for minimizing pollutants in air, water and land.
PSO 6	Develop environmental concern towards value of economically important plants, Biodiversity promote Bioremediation, Bio fertilizer and vegetative propagation.
PSO 7	Adopt Good Laboratory Practice, bioethics and biosafety guidelines to ensure minimal use of animals during experiments.

PSO 8	Exhibit the holistic growth by developing subject proficiency, interpersonal skills, and show vertical mobility in taking up PG courses and horizontal mobility by enrolling in B.Ed institution, clinical laboratory course and seek employment in schools, Medical coding and IT companies.
PSO 9	Make them self employed/ Entrepreneur in the field of Sericulture, Vermitechnology, Ornamental fish culture, Dairy farming, Apiculture, Mushroom cultivation and Horticulture.
PSO 10	Use of computers for Power point presentation, Virtual Dissection, analysis of bio- molecules using bioinformatics tools and computing biological data.
PSO 11	Healthy diet pattern for combat life style disorder.

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18**DEPARTMENT OF ZOOLOGY***For those who joined in June 2019 onwards***PROGRAMME CODE: UAZO****PART – I – TAMIL / FRENCH / HINDI- 12 CREDITS****PART – I – TAMIL****Offered by The Research Centre of Tamil**

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CRE DITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	19TL1C1	General Tamil – Ikaala Ilakiyam	5	3	40	60	100
2.	II	19TL2C2	General Tamil - Bakthi Illakiyam	5	3	40	60	100
3.	III	19TL3C3	General Tamil – Kaapiya Illakiyam	5	3	40	60	100
4.	IV	19TL4C4	General Tamil - Sangam Illakiyam	5	3	40	60	100
Total				20	12			

PART – I –FRENCH**Offered by TheDepartment of French**

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CRE DITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	19RL1C1	PART 1 LANGUAGE FRENCH - LE NIVEAU INTRODUCTIF	5	3	40	60	100
2.	II	19RL2C2	PART 1 LANGUAGE	5	3	40	60	100

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CRE DITS	CIA Mks	ESE Mks	TOT. MKs
			FRENCH - LE NIVEAU DÉCOUVERTE					
3.	III	19RL3C3	PART 1 LANGUAGE FRENCH - LE NIVEAU INTERMEDIAIRE	5	3	40	60	100
4.	IV	19RL4C4	PART 1 LANGUAGE FRENCH - LE NIVEAU DE SUIVRE	5	3	40	60	100
Total				20	12			

PART – I – HINDI

Offered by TheDepartment of Hindi

S. NO	SE M.	COURSE CODE	COURSE TITLE	HRS	CRE DITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	19DL1C1	PART 1 LANGUAGE HINDI - Vyakaran aur Karyalyeen Hindi	5	3	40	60	100
2.	II	19DL2C2	PART 1 LANGUAGE HINDI –Srijanatmak Hindi aur Gadhy	5	3	40	60	100
3.	III	19DL3C3	PART 1 LANGUAGE HINDI –Hindi Sahithya Ka Aadhikaal aur Bhakthikaal	5	3	40	60	100
4.	IV	19DL4C4	PART 1 LANGUAGE	5	3	40	60	100

S. NO	SE M.	COURSE CODE	COURSE TITLE	HRS	CRE DITS	CIA Mks	ESE Mks	TOT. MKs
			HINDI –Reetikaleen Hindi Sahithya aur Aadhunik Kaal					
Total				20	12			

PART – II -ENGLISH – 12 CREDITS

Offered by The Research Centre of English

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CRE DITS	CIA Mks	ESE Mks	TOT . MKs
1.	I	19EL1LB	BASIC COMMUNICATIVE ENGLISH	5	3	40	60	100
2.		19EL1LI	INTERMEDIATE COMMUNICATIVE ENGLISH					
3.		19EL1LA	ADVANCED COMMUNICATIVE ENGLISH					
4.	II	19EL2LB	ENGLISH FOR EFFECTIVE COMMUNICATION (BASIC)	5	3	40	60	100
5.		19EL2LI	ENGLISH FOR EMPOWERMENT (INTERMEDIATE)					
6.		19EL2LA	ENGLISH FOR CREATIVE WRITING (ADVANCED)					
7.	III	19EL3LN	ENGLISH FOR THE DIGITAL ERA	5	3	40	60	100

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
8.	IV	19EL4LN	ENGLISH FOR INTEGRATED DEVELOPMENT	5	3	40	60	100
Total				20	12			

PART – III -MAJOR, ALLIED & ELECTIVES – 95 CREDITS

MAJOR CORE COURSES INCLUDING PRACTICALS : 60 CREDITS

S.N O	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
1.	I	19Z1CC1	INVERTEBRATA	5	4	40	60	100
2.		19Z1CC2	CELL BIOLOGY	4	3	40	60	100
3.		19Z1CC3	LAB - INVERTEBRATA & CELL BIOLOGY	3	2	40	60	100
4.	II	19Z2CC4	CHORDATA	5	4	40	60	100
5.		19Z2CC5	GENETICS	4	3	40	60	100
6.		19Z2CC6	LAB - CHORDATA & GENETICS	3	2	40	60	100
7.	III	19Z3CC7	HUMAN PHYSIOLOGY	5	4	40	60	100
8.		19Z3CC8	ENVIRONMENTAL BIOLOGY	4	3	40	60	100
9.		19Z3CC9	LAB - HUMAN PHYSIOLOGY & ENVIRONMENTAL BIOLOGY	3	2	40	60	100
10.	IV	19Z4CC10	MICROBIOLOGY	5	4	40	60	100
11.		19Z4CC11	EVOLUTION	4	3	40	60	100
12.		19Z4CC12	LAB - MICROBIOLOGY & EVOLUTION	3	2	40	60	100

S.N O	SEM.	COURSE CODE	COURSE TITLE	HR S	CRE DITS	CIA Mks	ESE Mks	TOT. Mks
13.	V	19Z5CC13	FUNDAMENTALS OF BIOCHEMISTRY	6	4	40	60	100
14.		19Z5CC14	MOLECULAR BIOLOGY	6	4	40	60	100
15.		19Z5CC15	LAB - BIOCHEMICAL ANALYSIS	4	2	40	60	100
16.		19Z5CC16	LAB - MOLECULAR BIOLOGY	4	2	40	60	100
17.	VI	19Z6CC17	BASIC IMMUNOLOGY	5	4	40	60	100
18.		19Z6CC18	PRINCIPLES OF BIOTECHNOLOGY	5	4	40	60	100
19.		19Z6CC19	LAB - IMMUNOLOGY	3	2	40	60	100
20.		19Z6CC20	LAB - BIOTECHNOLOGY	3	2	40	60	100
Total				84	60			

ALLIEDCOURSES- 20 CREDITS

S.N O	SEM	COURSE CODE	COURSE TITLE	HR S	CREDI T	CIA Mk s	ES E Mk s	TOT · MKs
1.	I	19C1ACZ1	ALLIED CHEMISTRY - I	3	3	40	60	100
2.		19C1ACZ2	LAB IN VOLUMETRIC ANALYSIS	2	2	40	60	100
3.	II	19C2ACZ3	ALLIED CHEMISTRY - II	3	3	40	60	100
4.		19C2ACZ4	LAB IN QUALITATIVE	2	2	40	60	100

S.N O	SEM .	COURSE CODE	COURSE TITLE	HR S	CREDI T	CIA Mk s	ES E Mk s	TOT · MKs
			ORGANIC ANALYSIS					
5.	III	19Z3AC Q1	PLANT DIVERSITY & PATHOLOGY	3	3	40	60	100
6.		19Z3ACQ2	LAB - PLANT DIVERSITY & PATHOLOGY	2	2	40	60	100
7.	IV	19Z4AC Q3	DEVELOPMENTAL BOTANY & PLANT BREEDING	3	3	40	60	100
8.		19Z4ACQ4	LAB - DEVELOPMENTAL BOTANY & PLANT BREEDING	2	2	40	60	100
Total				20	20			

ELECTIVES-15 CREDITS

S.N o	SEM	COURSECODE	COURSE TITLE	HR S	CREDI T	CIA Mk s	ES E Mk s	TOT · Mks
1.	V	19Z5ME1/ 19Z5ME2	BIOSTATISTICS / ANIMAL BEHAVIOUR	5	5	40	60	100
2.	VI	19Z6ME3 / 19Z6ME4	EMBRYOLOGY / CLINICAL LABORATORY TECHNIQUES	5	5	40	60	100
3.		19Z6ME5 / 19Z6ME6	BIOINFORMATICS / ENTOMOLOGY	5	5	40	60	100

S.No	SEM	COURSE CODE	COURSE TITLE	HR S	CREDITS	CIA Mks	ES E Mks	TOT . Mks
Total				15	15			

PART – IV – 20 CREDITS

- VALUE EDUCATION
- ENVIRONMENTAL AWARENESS
- NON MAJOR ELECTIVE
- SKILL BASED COURSES

S. No	SEM.	COURSE CODE	COURSE TITLE	HR S	CREDITS	CIA Mks	ESE Mks	TOT. Mks
1.	I	21G1VE1	Personal Values	1	1	40	60	100
2.		19Z1NME	Non-Major Elective – Maternity and Child Health (Offered to other major Students)	2	2	40	60	100
3.	II	21G2VE2	Values for Life	1	1	40	60	100
4.		19Z2NME	Non-Major Elective – Maternity and Child Health (Offered to other major Students)	2	2	40	60	100
5.	III	19G3EE1	Environmental Education	1	1	40	60	100
6.		19Z3SB1	Vermitechnology	2	2	40	60	100
7.	IV	19G4EE2	Gender Studies	1	1	40	60	100
8.		19Z4SB2	Mushroom Cultivation	2	2	40	60	100
9.	V	19Z5SB3	Ornamental Fish Culture	2	2	40	60	100
10.		19Z5SB4	Sericulture	2	2	40	60	100

S. No	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
11.	VI	19Z6SB5	Apiculture	2	2	40	60	100
12.		19Z6SB6	Dairy Farming	2	2	40	60	100
TOTAL				20	20			

PART - V - 1 CREDIT**OFF-CLASS PROGRAMMES - ALL PART-V****SHIFT - I**

S. No	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	TOT. Mks
1.	I - IV	21A4PED	Physical Education	30/ SEM	1	100
2.		21A4NSS	NSS			
3.		21A4NCC	NCC			
4.		21A4WEC	Women Empowerment Cell			
5.		21A4ACUF	AICUF			

OFF-CLASS PROGRAMMES**ADD-ON COURSES**

COURSE CODE	COURSE TITLE	HRS	CREDITS	SEMESTER IN WHICH THE COURSE IS OFFERED	CIA Mks	ESE Mks	TOTAL Mks
21UAD1CA	COMPUTER APPLICATIONS(offere	40	2	I&II	40	60	100

COURSE CODE	COURSE TITLE	HRS .	CRE DITS	SEMESTER IN WHICH THE COURSE IS OFFERED	CIA Mks	ESE Mks	TOTAL Mks
	d by the department of PGDCA for Shift I)						
21UADFCs	ONLINE SELF LEARNING COURSE- Foundation Course for Science	40	2	II	40	60	100
21UAD3ES	Professional Ethics	15	1	III	40	60	100
21UAD4ES	Personality Development	15	1	IV	40	60	100
21UAD5ES	Family Life Education	15	1	V	40	60	100
21UAD6ES	Life Skills	15	1	VI	40	60	100
19UAD5HR	HUMAN RIGHTS	15	2	V	100	-	100
21UAD6RS	OUTREACH PROGRAMME- Reach Out to Society through Action ROSA	100	3	V & VI	100	-	100
21UAD6PR	PROJECT	30	4	VI	40	60	100
21UAD6RC	READING CULTURE	10/ Semester	1	II-VI	-	-	-
TOTAL			20				

EXTRA CREDIT COURSES

COURSE CODE	COURSE	HR S.	CREDIT S	SEMESTER IN WHICH THE COURSE IS OFFERED	CIA MK S	ESE MK S	TOTAL MARK S
21Z2SL1	SELF LEARNING COURSES for ADVANCED LEARNERS SingleCell ProteinCulture	-	2	II	40	60	100
	MOOC COURSES / International Certified online Courses (Department Specific Courses/any other courses) * Students can opt other than the listed course from UGC-SWAYAM UGC / CEC	-	Minimum 2 Credits	I – VI	-	-	

OFF CLASS PROGRAMMES

19UGVACZ1 - Value Added Certificate Course (Herbalism in Health Care)

**21UGVACZ1 – Skill – Embedded Value Added Certificate Course
(Lifestock Farming)**

I B.Sc.Zoology**SEMESTER –I***For those who joined in 2019 onwards*

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
UAZO	19Z1CC1	Invertebrata	Lecture	5	4

COURSE DESCRIPTION

This is an introductory taxonomy course to the Zoology Program which organizes the distribution of animals according to common characteristic features charted out by Linnaeus, all animals are classified into seven categories: kingdom, phylum, class, order, family, genus and species along with the type study.

COURSE OBJECTIVES

- To understand fundamental organization of animals at three levels – unicellular-diploblastic and triploblastic and the principles of classification with examples from invertebrates
- To comprehend the patterns of geographic distribution and natural history of animals living in terrestrial and marine ecosystems
- To explore ecological and evolutionary processes responsible for generating and maintaining biological diversity

UNITS:**UNIT – I INTRODUCTION****(15 HRS.)**

Introduction to principles of **classification** & Binomial Nomenclature - Classification of Animal Kingdom - Levels of Organization-grades of Animal architecture, symmetry & Coelom - Origin of Metazoa

Self –study - Binomial Nomenclature**UNIT – II ACOELOMATE& UNICELLULAR ORGANISM –I (15 HRS.)**

Phylum – Protozoa: General characters and classification upto class level - Parasitic protozoans: Types of parasites- Malaria, Amoebiasis, Trypanosomiasis, Leishmaniasis, Trichomoniasis, Toxoplasmosis,

Balantidial dysentery - Nutrition in protozoa: Types of nutrition in *Amoeba*, *Euglena*, *Paramecium*. Acoelomate & Multicellular Organisms-I: Phylum – Porifera: General characters and classification upto class level - Canal system in sponges - Phylum – Coelenterata: General characters and classification upto class level- Polymorphism in Hydrozoa.

Self –study - General characters of Protozoa

UNIT - III ACOELOMATE& MULTICELLULAR ORGANISMS-II (15 HRS.)

Phylum- Platyhelminthes: General characters and classification upto class level. Type study: *Fasciola hepatica*, *Taenia solium* - Pseudocoelomate Organisms: Phylum- Aschelminthes: General characters and classification upto class level, Type study: *Ascaris lumbricoides*, *Wuchereria bancrofti*, *Enterobius vermicularis* - Parasitic Adaptations of human helminth parasites.

Self –study – Morphology of *Taenia solium*

UNIT - IV COELOMATE ORGANISMS –I (15 HRS.)

Phylum – Annelida: Living fossil, General characters and classification upto class level - Excretion in Annelida: Nereis, Earthworm, Leech. Phylum – Arthropoda: General characters and classification upto class level - Metamorphosis in insects: Types and hormonal control, types of larvae, pupae - Mouth parts of Insects in Cockroach, bees, wasps, mosquitoes, housefly, butterflies.

Self –study - General characters of Annelida

UNIT – V COELOMATE ORGANISMS-II (15 HRS.)

Phylum – Mollusca: General characters and classification upto class level - Foot in Mollusca: Amphineura, Scaphopoda, Pelecypoda, Gastropoda, Cephalopoda and modifications of foot. Phylum-Echinodermata: General characters and classification upto class level - Water vascular system - Structure of water vascular system in Asteroidea, Echinoidea, Holothuroidea & Crinoidea and functions.

Self –study - General characters of Echinodermata

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

TEXT BOOKS:

- 1.A *Manual of Zoology* – Vol.I- M. Ekambaranatha Iyer, T.N.Ananthakrishnan-S.Viswanathan (Printers & Publishers)
- 2.Arumugam N., (2012) *A Text book of Invertebrates*, 4th edition, Saras publication, Nagercoil.

REFERENCE BOOKS:

1. Jordan E.L. and Verma P.S., (2001) *Invertebrate Zoology*, S.Chand &Co, New Delhi..
2. Kotpal.R.L., (1998) *Modern Text Book of Zoology Invertebrates*, Rastogi Publications, Meerut.
3. Gardiner M.S., *Biology of Invertebrates*, McGraw Hill Book co, New Delhi.
4. Hyman L.H., (1951) *Invertebrate Series – Vol.I to Vol.IV*, McGraw Hill Book co, Inc. New Delhi.
5. Adam Sedgwick. *A Student Text Book of Zoology – Adam Sedgwick – Vol.1*
6. Parker & Haswell., (1964) *A Text Book of Zoology – Vol.I*, Macmillan & co Ltd, New Delhi.
7. Prasad S.N., (1989) *Invertebrate Zoology*, Vikas publishing House Pvt Ltd, India.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.biodiversitylibrary.org/item/29076#page/5/mode/1up>
2. <https://biodiversityeverywhere.weebly.com/the-animal-kingdom.html>
3. <https://www.toppr.com/guides/biology/diversity-in-living-organisms/animal-kingdom/>
4. <https://intl.siyavula.com/read/science/grade-10-lifesciences/biodiversity-and-classification/09-biodiversity-and-classification-04>
5. <https://sites.google.com/site/abillionlivesintheworld/kingdom-animalia>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION				
1.1	Introduction to principles of classification	3	Chalk & Talk	Black Board

1.2	Binomial Nomenclature	3	Chalk & Talk	Black Board
1.2	Classification of Animal Kingdom -	3	Lecture	PPT & White Board
1.3	Levels of Organization-grades of Animal architecture, symmetry & Coelom -	3	Lecture	PPT & White board
1.4	Origin of Metazoa	3	Chalk & Talk	Black Board
UNIT -2 ACOELOMATE & UNICELLULAR ORGANISM				
2.1	Protozoa: General characters	1	Chalk & Talk	Green Board
2.2	Classification upto class level	2	Chalk & Talk	Black Board
2.3	Parasitic protozoans: Types of parasites- Malaria	1	Chalk & Talk	Black Board
2.4	Amoebiasis, Trypanosomiasis, Leishmaniasis, Trichomoniasis, Toxoplasmosis	1	Chalk & Talk	Black Board
2.5	Nutrition in protozoa	1	Chalk & Talk	Black Board
2.6	Types of nutrition in <i>Amoeba</i> , <i>Euglena</i> , <i>Paramecium</i>	1	Chalk & Talk	Black Board
2.7	Porifera: General characters	1	Lecture	PPT
2.8	Classification upto class level	1	Chalk & Talk	Black Board
2.9	Canal system in sponges	1	Lecture	PPT & White board
2.10	Coelenterata: General characters	2	Lecture	LCD
2.11	Classification upto class level-	1	Chalk & Talk	Black Board
2.12	Polymorphism in Hydrozoa	2	Chalk & Talk	Black Board

UNIT – 3 ACOELOMATE & MULTICELLULAR ORGANISMS-II

3.1	Platyhelminthes: General characters . Type study: <i>Fasciola hepatica</i> , <i>Taenia solium</i>	2	Lecture	PPT
3.2	Classification upto class level.	1	Lecture	PPT & White board
3.3	Type study: <i>Fasciola hepatica</i> , <i>Taenia solium</i>	2	Lecture	LCD
3.4	Phylum- Aschelminthes: General characters	2	Lecture	LCD
3.5	Classification upto class level,	2	Lecture	LCD
3.6	Type study: <i>Ascaris lumbricoides</i> , <i>Wuchereria bancrofti</i> , <i>Enterobius vermicularis</i>	2	Lecture	PPT & White board
3.7	Parasitic Adaptations of human helminth parasites.	2	Lecture	PPT & White board
3.10	Morphology of <i>Taenia solium</i>	2	Discussion	Google classroom

UNIT - 4 COELOMATE ORGANISMS –I

4.1	Annelida:, General characters	3	Chalk & Talk	Black Board
4.2	Classification upto class level	3	Lecture	LCD
4.3	Excretion in Annelida: Nereis	2	Discussion	Google classroom
4.4	Excretion in Earthworm, Leech	3	Lecture	LCD
4.5	Living fossil	2	Lecture	LCD

4.6	Living fossil not prescribed in the syllabus	2	Discussion	Google classroom
UNIT - 5 COELOMATE ORGANISMS-II				
5.1	Mollusca: General characters	2	Chalk & Talk	Black Board
5.2	Classification upto class level	1	Chalk & Talk	Black Board
5.3	Foot in Mollusca: Amphineura, Scaphopoda and modifications of foot	2	Chalk & Talk	Black Board
5.4	Foot in Pelecypoda, Gastropoda, Cephalopoda and modifications of foot.	2	Lecture	LCD
5.5	Echinodermata General characters	2	Chalk & Talk	Black Board
5.6	Classification upto class level	1	Lecture	PPT & White board
5.7	Water vascular system-An introduction	1	Lecture	PPT & White board
5.8	Structure of water vascular system in Asteroidea, Echinoidea and functions	2	Lecture	PPT & White board
5.9	Structure of water vascular system in Holothuroidea & Crinoidea and functions	2	Lecture	LCD

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1	T2	Quiz	Assignment	OBT/PP T				

	10 Mks	10 Mks	5 Mks	5 Mks	5 Mks	35 Mks.	5 Mks.	40Mks	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholasti c	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recall the level of organization of animal kingdom and describe the origin of metazoan	K1	PSO1
CO 2	Elaborate the general characteristics, Classes and general topics of Acoelomate Unicellular and Multicellular Organisms	K1	PSO2 PSO4
CO 3	Determine the general characteristics, Classes and general topics of Coelomate Multicellular Organisms	K1	PSO1, PSO4 & PSO10
CO 4	Analyse the general characteristics, Classes and general topics of Coelomate (Annelida and Arthropoda) Multicellular Organisms	K2	PSO1, PSO2 & PSO4
CO 5	Assess the general characteristics, Classes and general topics of Coelomate (Mollusca and Echinodermata) Multicellular Organisms	K2	PSO1, PSO4

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	3	3	2	3	2	2	2	2	2	2	2	2

CO3	3	2	2	3	2	2	2	2	2	2	2	2
CO4	2	2	2	3	2	2	2	2	2	2	2	2
CO5	2	2	2	3	2	2	2	2	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	3	2	2	2
CO4	3	2	2	2
CO5	3	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. N.Malathi

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

I B.Sc.Zoology**SEMESTER –I***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z1CC2	Cell Biology	Lecture	4	3

COURSE DESCRIPTION

This course deals with the study of structure and functions of the cell.

COURSE OBJECTIVES

- Understand the structures and purposes of basic components of Eukaryotic and Prokaryotic cells.
- To know the fundamental functioning of various organelles and to provide foundation for advanced courses.

UNITS**UNIT -I TECHNIQUES IN CELL BIOLOGY****(12 HRS.)**

Principles of microscopy - Compound microscope, Electron microscope and Phase contrast microscope-**Cell fractionation** – homogenization and differential centrifugation-**Staining** – Types of Stains – Mechanism – metachromasia, mordants and lakes, vital stains – Uses.

Self-Study-Compound microscope
UNIT -II STRUCTURE AND FUNCTIONS OF PLASMA MEMBRANE AND ENDOPLASMIC RETICULUM
(12 HRS.)

General structure and functions of Cell & Cell Organelles-Differences between Prokaryotes and Eukaryotes-Plasma Membrane – Structure, models, specializations and functions-Endoplasmic reticulum-structure and function.

Self-Study-Differences between Prokaryotes and Eukaryotes

UNIT -III STRUCTURE AND FUNCTIONS OF CELL ORGANELLES**(12 HRS.)**

Ribosomes – 70S,80S, Biogenesis of Ribosomes- Golgi Complex – Lysosomes- Centrioles -Mitochondria- Origin, Krebs cycle, Electron Transport System, Oxidative Phosphorylation.

UNIT -IV NUCLEAR COMPONENTS**(12HRS.)** Nucleus- Structure

and function– Nucleolus – Functions of Nucleolus. Chromosomes: Structure and Types – Polytene and lampbrush: Nucleic acids – Structure – Types and Functions of DNA and RNA

Self-study- Functions of Nucleus**UNIT -V CELL CYCLE****(12HRS.)**

Cell division - Cell Cycle – Types of Cell divisions - Mitosis and Meiosis- Cancer-Types, cause, symptoms and development- Oncogenes (Brief note), Cell aging.

TEXT BOOK:

Arumugam,N., (2014). *Cell Biology*, 10th Edition, Saras publication, Nagarcoil, Tamil Nadu.

REFERENCES:

1. Kohn N. S., (1979) *Elements of Cytology*, Freeman Book Co., New Delhi.
2. DeRobertis E.D.P. and DeRobertis. E.M.F., (1988) *Cell and Molecular Biology*, 8th Edition, International Edition, Hong Kong.
3. Geoffery M. Cooper and Hausman R, (2009) *The Cell: A Molecular Approach*, Fifth edition, ASM Press and Sinauer Associates, Inc.
4. Rastogi S.C., (2003). *Cell and Molecular Biology* - Second Edition, New Age International (P) Limited Publishers, Daryaganj, New Delhi.
5. Verma P.S. and Agarwal, V.K., (2008). *Cell Biology, Genetics, Molecular*

Biology, Evolution and Ecology, S. Chand & Company, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)

1. <https://openlab.citytech.cuny.edu/bio-oer/>
2. <https://openlab.citytech.cuny.edu/bio-oer/cell-division/>
3. <https://www.oercommons.org/courseware/lesson/17487/overview>
4. <https://biology.oer.hawaii.edu/biology171/chapter/the-cell-cycle/>
5. <https://www2.le.ac.uk/projects/oer/oers/genetics/oers/The%20cell%20cycle/The%20cell%20cycle-TRF.pdf>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT - 1 TECHNIQUES IN CELL BIOLOGY				
1.1	Principles of microscopy - Compound microscope, Electron microscope and Phase contrast microscope	3	Chalk & Talk	Black Board
1.2	Cell fractionation – homogenization and differential centrifugation	3	Chalk & Talk	LCD
1.3	Staining – Types of Stains	2	Lecture	PPT & White board
1.4	Mechanism – Metachromasia, Mordants and lakes	2	Lecture	Smart Board
1.5	Vital stains – Uses	2	Lecture	Black Board
UNIT - 2 STRUCTURE AND FUNCTIONS OF PLASMA MEMBRANE AND ENDOPLASMIC RETICULUM				
2.1	General structure and functions of Cell & Cell Organelles	3	Lecture	Black Board

2.2	Differences between Prokaryotes and Eukaryotes	3	Chalk & Talk	Black Board
2.3	Plasma Membrane – Structure, models, specializations and functions	3	Chalk & Talk	Black Board
2.4	Endoplasmic reticulum-structure and function.	3	Lecture	Black Board
UNIT - 3 STRUCTURE AND FUNCTIONS OF CELL ORGANELLES				
3.1	Ribosomes – 70S,80S	2	Chalk & Talk	Black Board
3.2	Biogenesis of Ribosomes	1	Chalk & Talk	LCD
3.3	Golgi Complex – Lysosomes-Centrioles -Mitochondria- Origin	4	Lecture	PPT & White board
3.4	Krebs cycle, Electron Transport System	3	Lecture	Black Board
3.5	Oxidative Phosphorylation	2	Lecture	Black Board
UNIT - 4 NUCLEAR COMPONENTS				
4.1	Nucleus- Structure and function	2	Lecture	Black Board
4.2	Nucleolus- Functions of Nucleolus	3	Chalk & Talk	Black Board
4.3	Chromosomes: Structure and Types- Polytene and lampbrush	3	Chalk & Talk	Black Board
4.4	Nucleic acids- Structure- Types and Functions of DNA and RNA	4	Lecture	Black Board
UNIT - 5 CELL CYCLE				
5.1	Cell division - Cell Cycle – Types of Cell divisions - Mitosis and Meiosis	4	Lecture	Black Board

5.2	Cancer-Types, cause, symptoms and development	4	Chalk & Talk	Black Board
5.3	Oncogenes (Brief note)	2	Chalk & Talk	Black Board
5.4	Cell aging.	2	Lecture	BlackBoard

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks				
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

COURSE OUTCOMES

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the techniques involved in Cytology	K1	PSO1, PSO2, PSO4 & PSO8
CO 2	Outline the structural organization of plasma membrane and endoplasmic reticulum.	K2	PSO1, PSO2, PSO4, PSO8
CO 3	Determine the structural and functional significance of Ribosomes, Golgi Complex, Lysosomes, centrioles and Mitochondria.	K3	PSO1, PSO2, PSO4 & PSO8
CO 4	Analyze the structural organization and functional significance of nucleus and nucleic acids.	K3	PSO1, PSO2, PSO4 & PSO8
CO 5	Correlate the dynamics of cell division with cancer invasion	K4	PSO1, PSO2, PSO4, PSO8

[illegible]

C03	2	2	2	2	2	2	2	2	2	2	2	2
C04	3	2	2	2	2	2	2	2	2	2	2	2
C05	2	2	1	2	2	2	2	2	2	2	2	2
C06	2	2	1	2	2	2	2	2	2	2	2	2
C07	2	2	2	2	2	2	2	2	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
C01	2	2	3	1
C02	3	2	2	2
C03	3	2	2	2
C04	3	2	2	2
C05	3	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. X. Devanya Rosaline

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

I B.Sc.Zoology SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAZO	19Z1CC3	Lab- Invertebrata & Cell Biology	Practical	3	2

COURSE DESCRIPTION

This Course aims to develop Identify the salient features of Invertebrates and preparation and use of Microscopic Slides.

COURSE OBJECTIVES

To study the diversity of animals and to understand the fundamental organization of cells.

INVERTEBRATA

1. Laboratory Biosafety guidelines and Regulations of Animal Ethics.
2. Examination of Pond water for Protists.
3. Mounting of Body setae of Earthworm.
4. Mounting of Mouth parts of Honey bee.

SPOTTERS

Amoeba, AsconSponge, ObeliaColony, *Taeniasolium*, *Ascaris* (Male & Female), *Nereis*, *Peripatus*, *Limulus*, Octopus, Starfish (Oral & Aboral view)

CELL BIOLOGY

1. Microscopic observation of squamous epithelial cells.

2. Microscopic observation of Cells of Onion bulb.
3. Preparation and identification of Barr body in squamous epithelial cells from buccal cavity.
4. Preparation and identification of mitotic stages in Onion root tip.
5. Isolation of DNA from Onion bulb/ Goat Spleen. (Demonstration).

SPOTTERS

1. Compound Microscope
2. Stages of Meiosis
3. Cellular organelles – Mitochondria, Endoplasmic reticulum, Golgi complex, Nucleus

REFERENCES:

1. Rajan S., Christy, S.R., (2011) *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015) *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008) *Techniques in Life Sciences*, 1st ed., Himalaya Publishing House Pvt. Ltd., Mumbai.
4. Dutta A., (2009) *Experimental Biology Lab Manual*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.biodiversitylibrary.org/item/29076#page/5/mode/1up>
2. <https://biodiversityeverywhere.weebly.com/the-animal-kingdom.html>
3. <https://intl.siyavula.com/read/science/grade-10-lifesciences/biodiversity-and-classification/09-biodiversity-and-classification-04>
4. <https://sites.google.com/site/abillionlivesintheworld/kingdom-animalia>
5. <https://www.oercommons.org/courseware/lesson/17487/overview>
6. <https://biology.oer.hawaii.edu/biology171/chapter/the-cell-cycle/>
7. <https://www2.le.ac.uk/projects/oer/oers/genetics/oers/The%20cell%20cycle/The%20cell%20cycle-TRF.pdf>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
INVERTEBRATA				
1.1	Laboratory Biosafety guidelines and Regulations of Animal Ethics.	1	Lecture	PPT
1.2	Examination of Pond water for Protists.	1	Chalk & Talk	LCD
1.3	Mounting of Body setae of Earthworm.	4	Lecture cum Demonstration	Practice
1.4	Mounting of Mouth parts of Honey bee.	4	Lecture cum Demonstration	Practice
1.5	SPOTTERS <i>Amoeba</i> , <i>Ascon</i> Sponge, <i>Obelia</i> Colony, <i>Taenia solium</i> , <i>Ascaris</i> (Male & Female), <i>Nereis</i> , <i>Peripatus</i> , <i>Limulus</i> , Octopus, Starfish (Oral & Aboral view)	2	Lecture	Specimen
CELL BIOLOGY				
2.1	Microscopic observation of squamous epithelial cells.	1	Lecture cum Demonstration	Green Board Charts
2.2	Microscopic observation of Cells of Onion bulb.	2	Lecture cum Demonstration	Practice
2.3	Preparation and identification of Barr body in squamous epithelial cells from Buccal cavity.	4	Lecture cum Demonstration	Practice
2.4	Preparation and identification of mitotic stages in Onion root tip	6	Lecture cum Demonstration	Practice
2.5	Isolation of DNA from	2	Lecture	Demonstration

	Onion bulb/ Goat Spleen.).			
2.6	SPOTTERS Compound Microscope Stages of Meiosis Cellular organelles – Mitochondria, Endoplasmic reticulum, Golgi complex, Nucleus	2	Lecture	Specimen

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESS ED
CO 1	Recognizes the levels of organization among Invertebrates.	K1	PSO1& PSO2
CO 2	Illustrate the Skill of Dissection of Organisms	K2	PSO3
CO 3	Recalls the Structure and Functions of Cellular Organelles.	K2	PSO5

CO 4	Summarize the unique features of different Phyla among Invertebrates.	K2	PSO1&PSO2
CO 5	Demonstrate skill of handling Microscopes.	K2	PSO1&PSO2

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	2	2	2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	3	2	2	2	2	2	2	2
CO4	3	2	2	2	2	2	2	2	2	2	2	2
CO5	2	3	2	2	2	2	2	2	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	3	2	2
CO2	2	2	3	2
CO3	2	2	2	2
CO4	2	2	2	3
CO5	2	3	2	2

Note: ♦ Strongly Correlated – 3


♦ Moderately Correlated – 2

♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. Antony Amala Jayaseeli

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

IB.Sc. Zoology**SEMESTER –I****(Offered to other major students)*****For those who joined in 2019 onwards***

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WE K	CREDIT S
UAZO	19Z1NME	Maternity and Child Health	Lecture	2	2

COURSE DESCRIPTION

This course intends to create awareness on women health problems and solutions and common problems and antenatal care during pregnancy. It aims to educate on public health, personal hygiene, and nutrition for children and pregnant mother.

COURSE OBJECTIVES

To understand the physiology of human reproductive system and to be aware of the significance of **personal health, hygiene and Family Planning** methods

UNITS**UNIT –I REPRODUCTIVE SYSTEM AND WOMEN HEALTH (6 HRS.)**

Human male reproductive system - Female reproductive system - Menstrual Cycle – Women Health Problems: endometriosis, cervical cancer, Polycystic Ovary Syndrome (PCOS), Uterine Fibroids, Premenstrual Syndrome (PMS), Post-natal depression (PND), Menopause.

UNIT –II PREGNANCY (6 HRS.)

Care during pregnancy - Warning signals of pregnancy - Major and minor problems of pregnancy, preventive measures. Family planning methods (Temporary and permanent methods)

UNIT –III NUTRITION AND IMMUNIZATION**(6 HRS.)**

Significance of breast-feeding - **Supplementary food** for the pregnant and lactating mother, children from age 0-5 - Immunization schedule for children and mother.

UNIT –IV DISEASES**(6 HRS.)**

Causative agent, symptoms, diagnosis, treatment and prevention of six killer diseases of children: Whooping Cough, Tetanus, Diphtheria, TB, Measles, and Polio. Infantile diarrhoea and control measures - Oral Rehydration Therapy (ORT).

UNIT –V HEALTH AND HYGIENE**(6 HRS.)**

Personal health and hygiene – Urinary Tract Infection - Sexually Transmitted Diseases – Mode of Transmission, symptoms and prevention of Syphilis, Gonorrhoea and AIDS.

REFERENCES:

1. Park J.E., Park K., (1991). *Park's Text book of preventive & social medicine*, 13th edition, M/S Banasidas, Bhanot Publishers, Jabalpur.
2. Werner D, Thuman C and Jane M (1992). *Where there is no doctor – A health care handbook*, 2nd ed., Hesperian Health Guides, US.
3. Kumaresan, V., Sorna Raj R., *Public Health and Hygiene*. Saras Publication, India.
4. Documentaries from Gandhigram and TINIP Centre
5. Guest Lectures from Family Planning Association of India

DIGITAL OPEN EDUCATIONAL RESOURCES

1. www.healthline.com
2. www.medlineplus.gov
3. <https://www.cdc.gov/vaccines/schedules/index.html>
4. <https://www.who.int/health-topics/vaccines-and-immunization>
5. <https://www.mayoclinic.org/diseases-conditions/sexually-transmitted-diseases-stds/symptoms-causes/syc-20351240>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 REPRODUCTIVE SYSTEM AND WOMEN HEALTH				
1.1	Human male reproductive system	1	Chalk & Talk	Black Board
1.2	Female reproductive system & Menstrual Cycle	2	Chalk & Talk	LCD
1.3	Endometriosis, cervical cancer,	1	Lecture	PPT & White board
1.4	Polycystic Ovary Syndrome (PCOS), Uterine Fibroids,	1	Lecture	Smart Board
1.5	Premenstrual Syndrome (PMS), Post-natal depression (PND), Menopause.	1	Lecture	Black Board
UNIT -2 PREGNANCY				
2.1	Care during pregnancy	1	Discussion	Black Board
2.2	Warning signals of pregnancy	1	Chalk & Talk	LCD
2.3	Major and minor problems of pregnancy, preventive measures	2	Lecture	PPT & White board
2.4	Family planning methods (Temporary and permanent methods)	2	Lecture	Smart Board
UNIT -3 NUTRITION AND IMMUNIZATION				
3.1	Significance of breast-feeding	3	Chalk & Talk	Black Board

3.2	Supplementary food for the pregnant	2	Chalk &Talk	LCD
3.3	Supplementary food for the lactating mother	5	Lecture	PPT & White board
3.4	Supplementary food for the children from age 0-5	2	Lecture	Smart Board
3.5	Immunization schedule for children and mother	2	Lecture	Black Board
UNIT -4 DISEASES				
4.1	Causative agent, symptoms, diagnosis, treatment and prevention of six killer diseases of children: Whooping Cough, Tetanus, Diphtheria, TB, Measles, and Polio	4	Chalk & Talk	Black Board
4.2	Infantile diarrhoea and control measures	1	Chalk & Talk	LCD
4.3	Oral Rehydration Therapy (ORT).	1	Lecture	PPT & White board
UNIT - 5HEALTH AND HYGIENE				
5.1	Personal health and hygiene	2	Chalk & Talk	Black Board
5.2	Urinary Tract Infection	1	Chalk & Talk	LCD
5.3	Sexually Transmitted Diseases – Mode of Transmission, symptoms and prevention of Syphilis, Gonorrhoea and AIDS.	3	Lecture	PPT & White board

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks.	OBT/PP T 5 Mks.	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2*	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC	NON - SCHOLASTIC	MARKS
------------	------------------	-------

C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO1	Recall the reproductive systems and women health problems.	K1	PSO1, PSO4 & PSO11
CO2	Discuss the care taken during pregnancy and family planning methods	K2	PSO1, PSO4 & PSO10
CO3	Select the nutrition and immunization pattern for pregnant woman and children	K3	PSO1, PSO4 & PSO 11
CO4	Describe the causes, symptoms, diagnosis and treatment of six killer diseases	K2	PSO1, PSO4 & PSO 10
CO5	Analyze the causes, symptoms, diagnosis and treatment of urinary tract infection and sexually transmitted diseases	K4	PSO1, PSO4 & PSO10

Mapping of COs with PSOs

[illegible]

CO4	3	2	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	2	2	2	2	2	2	2	3	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	2	2	2	2
CO3	2	2	2	2
CO4	2	2	1	2
CO5	2	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. J. Asnet Mary

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

I B.Sc. Zoology**SEMESTER –II***For those who joined in 2019 onwards*

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/W EEK	CREDI TS
UAZO	19Z2CC4	Chordata	Lecture	5	4

COURSE DESCRIPTION

This course imparts knowledge on the salient features, classification and uniqueness of the Classes of Phylum Chordata.

COURSE OBJECTIVES

To understand the fundamental organization of Chordates and their diversity.

UNITS**UNIT I: PHYLUM CHORDATA****[15 HRS]**

General characters & Classification upto Subclasses, Hemichordata; Prochordata - Salient features & Classification; General characters & Classification of Agnatha; Origin of Chordata

UNIT II: CLASS: PISCES & CLASS: AMPHIBIA**[15 HRS]**

General characters & Classification of Class Pisces upto subclass level; Accessory Respiratory Organs in Fishes; Economic importance of fishes - General characters & Classification of Class Amphibia upto subclass level; Parental Care in Amphibians; Terrestrialization of Amphibians

UNIT III: CLASS: REPTILIA & CLASS: AVES**[15 HRS]**

General characters & Classification of Class Reptilia and Class Aves up to subclass level; Golden Age of Reptiles; Poisonous Snakes of South India; Flight Adaptation of birds; Migration of birds; Beaks in Birds

UNIT IV: CLASS: MAMMALIA**[15 HRS]**

General characters & Classification up to subclass level; Dentition in Mammals; Aquatic Mammals and their Adaptions; Adaptive Radiation of Mammals

UNIT V - COMPARATIVE STUDIES**[15 HRS]**

Protochordates – Comparison of Digestive System; Excretory System and Nervous System; Vertebrates – Comparison of Receptors Organs; Circulatory System and Urinogenital System

TEXT BOOK:

Thangamani, A., Prasanna Kumar, S., Narayanan, L.M., Arumugam, N., 2013. *A Text Book of Chordates*. 6th Edition. Saras Publication, Nagercoil.

REFERENCE BOOKS:

1. Ekambaranatha Ayyar M. and Ananthakrishnan, T.N. 1981, *A manual of Zoology, Part-II (Chordate)*, Viswanathan (Printers and Publishers) Pvt. Ltd, Chennai
2. Jordan E.L and Verma P.S 2006. *Chordate Zoology*, S.Chand & Co Ltd, NewDelhi.
3. Prasad S.N 2005 .*Vertebrate Zoology*, Kitab Mahal Private Ltd, Allahabad-3.
4. Vishwanath 1967. *A Text Book of Zoology*, Volume II [Chordates] S.Chand & Co. Madras.
5. Newman. H.H 1987. *The Phylum Chordata*, Satish Book Enterprise, Motikala.
6. Young J. Z. *The Life of Vertebrates*. Oxford University Press, New York, ed. 2, 1962.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://louis.oercommons.org/courseware/lesson/746/overview>
2. <https://www.oercommons.org/courseware/module/15083/student/?task=2>
3. <https://animaldiversity.org/accounts/Vertebrata/>
4. https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biol

[ogy/Book%3A_General_Biology_\(Boundless\)/29%3A_Vertebrates/29.1%3A_Chordates/29.1D%3A_Characteristics_of_Vertebrates](http://www.pmfias.com/classification-vertebrata-phylum-chordata/)

5. <https://www.pmfias.com/classification-vertebrata-phylum-chordata/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 Phylum Chordata				
1.1	General characters & Classification of Chordata upto Subclasses	4	Chalk & Talk	PPT
1.2	Hemichordata & Prochordata - Salient features & Classification	2	Chalk & Talk	LCD
1.3	General characters & Classification of Agnatha	4	Lecture	PPT
1.4	Origin of Chordata	2	Lecture	PPT
UNIT -2 CLASS: PISCES & CLASS: AMPHIBIA				
2.1	General characters & Classification of Class Pisces upto subclass level	3	Chalk & Talk	Green Board Charts
2.2	Accessory Respiratory Organs in Fishes	2	Lecture	Green Board
2.3	Economic importance of fishes	2	Lecture	Black Board
2.4	General characters & Classification of Class Amphibia upto subclass level	3	Chalk & Talk	Black Board
2.5	Parental Care in Amphibians	2	Lecture	LCD

2.6	Terrestrialization of Amphibians	2	Lecture	LCD
UNIT -3 CLASS: REPTILIA & CLASS: AVES				
3.1	General characters & Classification of Class Reptilia and Class Aves up to subclass level	5	Lecture	LCD
3.2	Golden Age of Reptiles; Poisonous Snakes of South India	2	Lecture	LCD
3.3	Flight Adaptation of birds; Migration of birds; Beaks in Birds	5	Lecture	LCD
UNIT -4 CLASS: MAMMALIA				
4.1	General characters & Classification up to subclass level	4	Lecture	LCD
4.2	Dentition in Mammals; Aquatic Mammals and their Adaptions	4	Lecture	LCD
4.3	Adaptive Radiation of Mammals	2	Lecture	LCD
UNIT -5 COMPARATIVE STUDIES				
5.1	Protochordates – Comparision of Digestive System; Excretory System and Nervous System	6	Lecture	LCD
5.2	Vertebrates – Comparision of Receptors Organs; Circulatory System and Urinogenital System	6	Lecture	LCD

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks	T2 10 Mks	Quiz 5 Mks	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recall the levels of organization among Chordates.	K1	PSO1
CO 2	Bring out the general characters and Classification of Chordates.	K1	PSO3
CO 3	Distinguish between the Classes of Chordates.	K2	PSO4
CO 4	Identify the Systematic Position of Animals.	K3	PSO4
CO 5	Evaluate the unique features of each Class of Chordates.	K5	PSO5

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	2	2	3	2	2	2	2	2	2	2	2	2
CO3	2	2	2	3	2	2	2	2	2	2	2	2

CO4	2	2	2	3	2	2	2	2	2	2	2	2
CO5	2	2	2	2	3	2	2	2	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	3	2	2	2
CO3	2	2	2	3
CO4	2	3	2	2
CO5	2	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

1. Dr. Antony Amala Jayaseeli

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

I B.Sc. Zoology**SEMESTER -II***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z2CC5	Genetics	Lecture	4	3

COURSE DESCRIPTION

This course concerned with the study of genes, genetic variation, and heredity in organisms.

COURSE OBJECTIVES

- Enable to understand the organization, function of genes and genetic components which are the basis of life continuum.
- Learn the concepts of sex linked and cytoplasmic inheritance.
- Explain genetic anomalies caused by changes in chromosome structure and number.

UNIT -I INTRODUCTION TO GENETICS**(12HRS.)**

History of Genetics, General areas of Genetics (Classical, Molecular & Evolutionary), Basis of Mendelian Inheritance and Mendelian laws, Interaction of Gene - Complementary Factors, Supplementary Factor, Simple Mendelian traits in man- Genic interaction-Complementary, Supplementary and Duplicate genes-Epistasis-Dominant and Recessive.

Self-Study-Basis of Mendelian Inheritance**UNIT -II MULTIPLE GENE INHERITANCE, LINKAGE AND CROSSING OVER****(12 HRS.)**

Multiple gene inheritance: Skin colour in man, Colour of wheat Kernel, Eye colour in Drosophila, Coat colour in cattle, Height in man. **Blood Groups** and their inheritance in Human - Linkage and Crossing over – Drosophila -

Morgan's experiments - Complete and Incomplete linkage, Linkage groups, Crossing over types, Mechanisms - Cytological evidence for Crossing over.

Self-Study-Blood Group

UNIT -III SEX DETERMINATION AND SEX LINKED INHERITANCE (12 HRS.)

Sex Determination in Man - Sex Linked Inheritance- Colour Blindness and Haemophilia in Man - Types of Sex linked inheritance - Sex influenced and Sex limited genes. Non Disjunction and Gynandromorphs. Cytoplasmic inheritance - Maternal effect on *Limnaea* (Shell Coiling), Kappa Particles in *Paramecium*.

Self-Study-Sex determination in Man

UNIT -IV MUTATION AND CHROMOSOMAL ABERRATIONS (12 HRS.)

Gene mutation -Types. Mutagens - Mechanisms, Mode of action. Chromosomal Aberrations - Polyploidy, Aneuploidy and mixoploidy. Syndromes- Down's, Turner, Klinefelter.

UNIT -V KARYOTYPING AND GENETIC COUNSELLING (12 HRS.)

Karyotype-**preparation of karyotype** and spectral karyotype technique, Idiogram. Eugenics: Definition, Negative and Positive. Euthenics: Definition and methods- Outbreeding-Euphenics-Genetic counselling: Aim, purpose, family pedigree and preventive measures.

TEXT BOOK:

Meyyan R, (2009). Genetics, Saras publication, 3rd Edition, Kanyakumari, Tamil Nadu.

REFERENCES:

1. Verma, P.S. and P.K. Agarwal, (2009) *Genetics*, 10th edition, S.Chand and Co., New Delhi.
2. James D. and Watson, (2008). *Molecular Biology of the Gene*, W. A. Benjamin Publishers, California.

3. William.S and Klug, (2009). *Essentials of Genetics*, 7th edition, Benjamin Cummings Publisher, New York.
4. Gardner, Simmond and Snustad, (2006). *Principles of Genetics*, John Wiley & Sons, 8th edition, New York.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)

1. <https://www.oercommons.org/courses/genetics-8>
2. <https://www.oercommons.org/courseware/lesson/17513/overview>
3. [https://bio.libretexts.org/Bookshelves/Biotechnology/Bio-OER_\(CUNY\)/07%3A_Cell_Division/7.04%3A_Chromosomes_and_Karyotypes](https://bio.libretexts.org/Bookshelves/Biotechnology/Bio-OER_(CUNY)/07%3A_Cell_Division/7.04%3A_Chromosomes_and_Karyotypes)
4. <https://openlab.citytech.cuny.edu/bio-oer/cell-division/chromosomes-and-karyotypes/2/>
5. <https://louis.oercommons.org/courseware/lesson/660/overview>
6. <https://vivaopen.oercommons.org/courseware/lesson/495/overview>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO GENETICS				
1.1	History of Genetics	1	Chalk & Talk	Black Board
1.2	General areas of Genetics (Classical, Molecular & Evolutionary)	2	Chalk & Talk	LCD
1.3	Basis of Mendelian Inheritance and Mendelian laws	2	Lecture	PPT & White board
1.4	Interaction of Gene -	2	Lecture	Black

	Complementary Factors, Supplementary Factor			Board
1.5	Simple Mendelian traits in man	1	Lecture	Black Board
1.6	Genic interaction- Complementary, Supplementary and Duplicate genes	2	Lecture	Black Board
1.7	Epistasis-Dominant and Recessive	2	Lecture	Black Board
UNIT – 2 MULTIPLE GENE INHERITANCE, LINKAGE AND CROSSING OVER				
2.1	Multiple gene inheritance: Skin colour in man, Colour of wheat Kernel	2	Lecture	Black Board
2.2	Eye colour in Drosophila, Coat colour in cattle, Height in man	2	Chalk & Talk	Black Board
2.3	Blood Groups and their inheritance in Human	2	Chalk & Talk	Black Board
2.4	Linkage and Crossing over – Drosophila – Morgan's experiments	2	Lecture	Black Board
2.5	Complete and Incomplete linkage, Linkage groups	2	Chalk & Talk	Black Board
2.6	Crossing over types,	2	Lecture	Black

	Mechanisms - Cytological evidence for Crossing over.			Board
UNIT – 3 SEX DETERMINATION AND SEX LINKED INHERITANCE				
3.1	Sex Determination in Man	1	Chalk & Talk	Black Board
3.2	Sex Linked Inheritance- Colour Blindness and Haemophilia in Man	3	Lecture	PPT & White board
3.3	Types of Sex linked inheritance - Sex influenced and Sex limited genes.	3	Chalk & Talk	LCD
3.4	Non Disjunction and Gynandromorphs.	2	Lecture	PPT & White board
3.5	Cytoplasmic inheritance - Maternal effect on <i>Limnaea</i> (Shell Coiling), Kappa Particles in <i>Paramecium</i> .	3	Lecture	Black Board
UNIT – 4 MUTATION AND CHROMOSOMAL ABERRATIONS				
4.1	Gene mutation –Types	2	Lecture	Black Board
4.2	Mutagens – Mechanisms, Mode of action	3	Chalk & Talk	Black Board
4.3	Chromosomal Aberrations –	3	Chalk	Black Board

	Polyploidy, Aneuploidy and mixoploidy		&Talk	
4.4	Syndromes- Down's, Turner, Klienfelter.	4	Lecture	Black Board
UNIT – 5 KARYOTYPING AND GENETIC COUNSELLING				
5.1	Karyotype-preparation of karyotype and spectral karyotype technique, Idiogram.	4	Lecture	Black Board
5.2	Eugenics: Definition, Negative and Positive.	2	Chalk & Talk	Black Board
5.3	Euthenics: Definition and methods- Outbreeding	2	Chalk & Talk	Black Board
5.4	Euphenics	1	Lecture	Black Board
5.5	Genetic counselling: Aim, purpose, family pedigree and preventive measures	3	Chalk & Talk	Black Board

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1	T2	Quiz	Assignment	OBT/PP T				

	10 Mks	10 Mks	5 Mks	5 Mks	5 Mks	35 Mks.	5 Mks.	40Mks	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholasti c	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total

5	10	15	5	5	40	60	100
---	----	----	---	---	----	----	-----

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recall the Mendelian laws and highlight the different types of genetic interactions.	K1	PSO1, PSO2, PSO4 & PSO8
CO 2	Illustrate the multiple gene inheritance and the mechanism of Linkage and crossing over.	K2	PSO1, PSO2 PSO4 PSO8
CO 3	Determine the concept of sex determination and the patterns of inheritance.	K3	PSO1, PSO2, PSO4 & PSO8
CO 4	Correlate the types of mutations with chromosomal abnormalities	K3	PSO1, PSO2 PSO4 & PSO8
CO 5	Infer the concepts in genetics to improve the livelihood.	K4	PSO1, PSO2, PSO4, PSO8

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	3	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	2	3	2	2	2	2
CO3	3	3	2	3	2	2	2	3	2	2	2	2

C04	3	3	2	3	2	2	2	3	2	2	2	2
C05	3	3	2	3	2	2	2	3	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
C01	3	2	2	2
C02	3	2	2	2
C03	3	2	2	2
C04	3	2	2	2
C05	3	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. X. Devanya Rosaline

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

I B.Sc. Zoology**SEMESTER –II***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WE EK	CREDIT S
UGZO	19Z2CC6	Lab - Chordata & Genetics	Practical	3	2

COURSE DESCRIPTION

Focuses on understanding the uniqueness of Chordates and genetic inheritance of characters in Man

COURSE OBJECTIVES

To study the diversity of animals and to understand the fundamental organization of Genetic materials.

CHORDATA

1. Mounting of Ctenoid / Placoid scale.
2. Dissection of Frog Viscera using virtual dissection software.
3. Visit to Coastal area.
4. Study of different types of feathers of Birds.

SPOTTERS

Prochordata – *Amphioxus* (entire); Chordata – *Anguilla* (Eel), *Narcine*, *Shark*, *Toad* (*Bufo*), *Hyla*, *Ichthyophis*, *Cobra*, *Viper*, *Enhydrina*, *Chamaeleon*, *Draco*, *Chelone*, *Echidna*, *Manis*, *Bat*.

GENETICS

1. Preparation and identification of Salivary gland Polytene Chromosomes from *Chironomus* larva.
2. Observation of Simple Mendelian Traits in the class
3. Ishihara Test - Test for Colour blindness.
4. Pedigree analysis – a study of mode of inheritance in man

SPOTTERS

1. ABO **Blood Grouping**
2. Rh Factor & Erythroblastosis foetalis
3. Syndromes - Down syndrome, Turner syndrome & Klinefelter syndrome.

REFERENCE BOOKS:

1. Rajan S., Christy, S.R., (2011) *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015) *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008) *Techniques in Life Sciences*, 1st ed., Himalaya Publishing House Pvt. Ltd., Mumbai.
4. Dutta A., (2009) *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.biodiversitylibrary.org/item/29076#page/5/mode/1up>
2. <https://biodiversityeverywhere.weebly.com/the-animal-kingdom.html>
3. <https://intl.siyavula.com/read/science/grade-10-lifesciences/biodiversity-and-classification/09-biodiversity-and-classification-04>
4. <https://sites.google.com/site/abillionlivesintheworld/kingdom-animalia>
5. <https://www.oercommons.org/courseware/lesson/17487/overview>
6. <https://biology.oer.hawaii.edu/biology171/chapter/the-cell-cycle/>
7. <https://www2.le.ac.uk/projects/oer/oers/genetics/oers/The%20cell%20cycle/The%20cell%20cycle-TRF.pdf>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
CHORDATA				
1.1	Mounting of Ctenoid / Placoid scale.	4	Lecture cum Demonstration	Practice

1.2	Dissection of Frog Viscera using virtual dissection software.	1	Lecture cum Demonstration	LCD
1.3	Visit to Coastal area.	3	Onsite Visit	
1.4	Study of different types of feathers of Birds.	3	Lecture	Feathers
1.5	SPOTTERS Prochordata – Amphioxus (entire); Chordata – Anguilla (Eel), Narcine, Shark, Toad (Bufo), Hyla, <i>Ichthyophis</i> , Cobra, Viper, Enhydrina, Chamaeleon, Draco, Chelone, Echidna, Manis, Bat.	2	Lecture	Specimen
GENETICS				
2.1	Preparation and identification of Salivary gland Polytene Chromosomes from <i>Chironomus</i> larva.	5	Lecture cum Demonstration	Practice
2.2	Observation of Simple Mendelian Traits in the class	1	Lecture	LCD
2.3	Ishihara Test - Test for Colour blindness.	1	Lecture	LCD
2.4	Pedigree analysis – a study of mode of inheritance in man	1	Lecture	LCD
2.5	SPOTTERS 1.ABO Blood Grouping	3	Chalk & Talk	Green Board

	2.Rh Factor & Erthroblastosisfoetalis Syndromes - Down syndrome, Turner syndrome & syndrome.			
--	--	--	--	--

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recognizesthe levels of organization among Chordates.	K1	PSO1& PSO2
CO 2	Classify Chordates upto class level.	K2	PSO3
CO 3	Distinguish the Mendelian Traits as Dominant and Recessive.	K3	PSO5
CO 4	Develops the skill of dissecting organisms and displaying.	K3	PSO1& PSO2

CO 5	Interprets the Pedigrees.	K2	PSO1& PSO2
-------------	---------------------------	-----------	------------

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	2	2	3	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	3	2	2	2	2	2	2	2
CO4	2	3	2	2	2	2	2	2	2	2	2	2
CO5	2	3	2	2	2	2	2	2	2	2	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	2	3	2	2
CO3	2	2	2	3
CO4	2	2	3	2
CO5	3	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

1. Dr. Antony Amala Jayaseeli Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc.Zoology

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z3CC7	Human Physiology	Lecture	5	4

COURSE DESCRIPTION

The course focuses on the complex organization of different organ systems and their functions.

COURSE OBJECTIVES

- To understand the structure and functions of digestive, respiratory, circulatory, urinogenital, neuromuscular system and sense organs.
- To introduce the physiological concepts of Homeostasis and control mechanisms.
- Learning in depth about the structure and functions of various Endocrine glands

UNITS

UNIT – I DIGESTIVE SYSTEM

(15 HRS.)

Structure and Functions of digestive system - Buccal glands, Gastric, Intestinal glands, Liver and their functions - Mechanical and chemical digestion of food: Buccal, Gastric and Intestinal digestion - Important digestive enzymes for CHO, Protein, lipids- Absorption of minerals, and vitamins - Hormonal control of secretion of enzymes in gastrointestinal tract. Symptoms and causes of - Peptic ulcer, Gastroparesis, Constipation, Irritable Bowel Syndrome (IBD) Hemorrhoids.

Self Study - Structure and Functions of digestive system

UNIT –II RESPIRATORY SYSTEM AND CIRCULATORY SYSTEM (15 HRS.)

Histology of trachea and lung - Respiration and Respiratory Muscles- Respiratory pigment- Pulmonary Respiration – Mechanism of Respiration- Transport of O₂- Oxygen dissociation curve and Bohr effect-Transport of CO₂ –Chloride Shift - carbon monoxide poisoning - Rate & Control of Respiration- BMR, RQ, Anoxia and Hypoxia (Definitions only) - Respiratory disorder - Cyanosis, Apnoea, Asthma, Pneumonia. Composition of Blood – Plasma and Corpuscles- Blood clotting Structure and functions of human heart - **Haemodynamic principle**--Cardiac Cycle.Symptoms and causes of - Stroke - Coronary heart disease - Hypertension - Myocardial infarction.

Self Study - Respiratory pigment**UNIT –III UROGENITAL SYSTEM (15 HRS.)**

Renal function – Mechanisms of urine formation – Hormonal Control-Urinary bladder – Regulation of water balance - Regulation of acid-base balance- Micturition – Dialysis.

Female Reproductive system and Functions of female sex organs: - Role of Hormones in pregnancy and parturition. Symptoms and causes of - Haematuria, Urinary tract infection, Hypospadias, Interstitial cystitis, Endometriosis.

Self Study - Renal function**UNIT –IV NEUROMUSCULAR SYSTEM (15 HRS.)**

Structure of skeletal, non-striated and cardiac muscles- Structure and Properties of muscle – Skeletal, Non-striated & Cardiac-Physiology of skeletal muscle contraction-Electro kinematic theory and Sliding Filament theory. Muscular disorder - Muscular dystrophy, Fibromyalgia

Structure and functions of Neuron- Reflex Action-Reflex Arc-Chemical co-ordination- Synaptic Transmission.Symptoms and causes of- Alzheimer's diseases.

Self Study - Structure and functions of Neuron

UNIT –V HORMONES AND SENSE ORGANS**(15 HRS.)**

Endocrine glands and their secretions – Structure and Functions of Pituitary, Thyroid, Parathyroid, Pancreas- islets of langerhans, Adrenal glands and. b). Sense organ – Eye – Anatomy & Physiology of Vision – Myopic retinopathy and Glaucoma. Ear –Structure and Functions – Cholesteatoma - Crohn's disease.

Self Study - Sense organ - Eye - Ear general function**REFERENCES:****TEXT BOOK:**

1. Vijaya D.J., (2001). *Prep Manual For Undergraduates Physiology*. 2nd edition, Churchill Livingstone, New Delhi.

REFERENCES:

1. Kashyap. V., (2019). *A text book of Animal Physiology and Biochemistry*. Kedar Nath Ram Nath, Meerut.
2. Silverthorn D.U., (2016). *Human Physiology an Integrated Approach*. 6th edition, Pearson Education Services, Pvt. Limited.
3. Suresh R., (2012). *Essentials of Human physiology*. Regional Institute of Medical Sciences, Imphal, Manipur.
4. Sherwood L., (2009). *Principles of Human Physiology*. 3rd edition, Cengage Learning India private Limited, New Delhi.
5. Sarada S., & Madhavan K. K., (2004). *Textbook of Human Physiology*, Revised by H.D. Singh, 6th edition, S. Chand and Company Ltd., New Delhi,
6. Parker S., (1996). *Human Body-Eyewitness Science Book*, Dorling Kindersley Ltd., London,
7. Das P.K., (1995). *Hand-Book of Human Physiology*, 1st edition. Current Books International, Calcutta,
8. Vidya R., (1993). *Handbook of Human Physiology*, 7th edition, Jaypee Brothers Medical Publishers Pvt. Ltd.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.oercommons.org/courses/anatomy-and-physiology-4/view>

2. <https://www.oercommons.org/courses/anatomy-and-physiology-i/view>
3. <https://www.youtube.com/watch?v=X3TARootFfM>
4. <https://openstax.org/books/biology-2e/pages/34-1-digestive-systems>
5. <https://openstax.org/books/anatomy-and-physiology/pages/10-5-types-of-muscle-fibers>
6. <https://openstax.org/books/anatomy-and-physiology/pages/17-1-an-overview-of-the-endocrine-system>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 DIGESTIVE SYSTEM				
1.1	Structure and Functions of digestive system	1	Discussion	Black Board
1.2	Buccal glands, Gastric glands and their functions	2	Chalk & Talk	LCD
1.3	Intestinal glands, Liver and their functions	3	Lecture	PPT & White board
1.4	Mechanical and chemical digestion of food: Buccal, Gastric & Intestinal digestion	2	Lecture	Black Board
1.5	Important digestive enzymes for CHO, Protein, lipids.	2	Lecture	LCD
1.6	Absorption of minerals, and vitamins.	1	Discussion	Google classroom
1.7	Hormonal control of secretion of enzymes in gastrointestinal tract	2	Chalk& Talk	Black Board
1.8	Symptoms and causes of - Peptic ulcer, Gastroparesis, Constipation,	1	Lecture	Black Board
1.9	Symptoms and causes of	1	Lecture	PPT

	Irritable Bowel Syndrome (IBD) Hemorrhoids			
UNIT -2 RESPIRATORY SYSTEM AND CIRCULATORY SYSTEM				
2.1	Histology of trachea and lung.	1	Lecture	Green Board Charts
2.2	Respiration and Respiratory muscles-Respiratory pigment.	2	Discussion	Green Board
2.3	Pulmonary Respiration.	1	Lecture	PPT & White board
2.4	Mechanism of Respiration-Transport of O ₂ - Oxygen dissociation curve and Bohr effect.	1	Chalk& Talk	Black Board
2.5	Transport of CO ₂ -Chloride Shift - carbon monoxide poisoning	1	Discussion	Google classroom
2.6	Rate & Control of Respiration-BMR, RQ, Anoxia and Hypoxia (Definitions only).	1	Chalk& Talk	Black Board
2.7	Respiratory disorder - Cyanosis, Apnoea, Asthma & Pneumonia.	1	Discussion	Google classroom
2.8	Composition of Blood – Plasma and Corpuscles.	2	Chalk& Talk	Black Board
2.9	Blood clotting.	1	Chalk& Talk	LCD
2.10	Structure and functions of human heart.	1	Lecture	PPT & White board
2.11	Haemodynamic principle-Cardiac Cycle.	1	Chalk& Talk	Black Board
2.12	Symptoms and causes of - Stroke - Coronary heart disease	1	Lecture	PPT & White board
2.13	Symptoms and causes of	1	Lecture	PPT & White

	Hypertension - Myocardial infarction			board
UNIT -3 UROGENITAL SYSTEM				
3.1	Renal function	1	Discussion	Black Board
3.2	Mechanisms of urine formation	1	Chalk & Talk	LCD
3.3	Hormonal control	2	Lecture	PPT &
3.4	Urinary bladder Micturition – Dialysis.	1	Lecture	LCD
3.5	Regulation of water balance - Regulation of acid-base balance-	2	Lecture	Black Board
3.6	Urinary bladder, Micturition – Dialysis.	1	Discussion	Google classroom
3.7	Female Reproductive system	2	Chalk & Talk	PPT
3.8	Functions of female sex organs	1	Discussion	Black Board
3.9	Role of Hormones in pregnancy and parturition.	1	Lecture	Black Board
3.10	Symptoms and causes of – Haematuria & Urinary tract infection,	2	Lecture	LCD
3.11	Symptoms and causes of - Hypospadias, Interstitial cystitis, & Endometriosis.	1	Lecture	Black Board
UNIT -4 NEUROMUSCULAR SYSTEM				
4.1	Structure of skeletal, non-striated and cardiac muscles	1	Lecture	Green Board Charts

4.2	Structure and Properties of muscle – Skeletal, Non-striated & Cardiac	2	Chalk & Talk	Green Board
4.3	Physiology of skeletal muscle contraction	2	Chalk & Talk	Black Board
4.4	Electro kinematic theory and Sliding Filament theory.	2	Chalk & Talk	LCD
4.5	Muscular disorder - Muscular dystrophy, Fibromyalgia	2	Lecture	Black Board
4.6	Structure and functions of Neuron	1	Discussion	Green Board
4.7	Reflex Action-Reflex Arc	1	Chalk & Talk	PPT
4.8	Chemical co-ordination- Synaptic Transmission.	2	Chalk & Talk	LCD
4.9	Symptoms and causes of- Alzheimer's diseases	2	Lecture	Black Board
UNIT -5 HORMONES AND SENSE ORGANS				
5.1	Endocrine glands and their secretions.	1	Chalk & Talk	Black Board
5.2	Structure and Functions of Pituitary.	2	Chalk & Talk	LCD
5.3	Structure and functions of Thyroid & Parathyroid.	4	Lecture	PPT & White board
5.4	Structure & functions of Pancreas- islets of langerhans,	1	Lecture	Black Board
5.5	Structure and functions of Adrenal glands	1	Lecture	Black Board
5.6	Sense organ – Eye – Anatomy & Subtopics	1	Discussion	Google classroom
5.7	Physiology of Vision – Myopic	2	Chalk	LCD

	retinopathy and Glaucoma.		&Talk	
5.8	General functions of eye and ear	1	Discussion	Black Board
5.9	Cholesteatoma & Crohn's disease.	2	Discussion	PPT

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Associate the basic components and functions of the digestive system and their diseases.	K2	PSO1, PSO4, PSO8 & PSO11
CO 2	Organise structure and functions of the respiratory and circulatory system and their diseases.	K3	PSO1, PSO4, PSO10
CO 3	Recognize the organs and functions of urinogenital system and their disease.	K3	PSO1, PSO10
CO 4	Identify the organs, theories and functions of neuromuscular system and their diseases.	K1	PSO1, PSO8, PSO10
CO 5	Analyze the structure and functions of Endocrine glands and sense organs and their disorder	K2	PSO4, PSO 8, PSO10

Mapping COs Consistency with PSOs

CO/P	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO1	PSO1	PSO1
------	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------

SO	1	2	3	4	5	6	7	8	9	0	1	2
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	3	2	2	3	2	2	2	2	2	2	2	2
CO3	3	2	2	2	2	2	2	2	2	3	2	2
CO4	3	2	2	2	2	2	2	3	2	2	2	2
CO5	2	2	2	3	2	2	2	3	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	1	2	2
CO2	2	2	2	2
CO3	2	2	2	2
CO4	2	1	2	2
CO5	3	1	2	2


Note: ♦ Strongly Correlated – 3
♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:

Dr. Sr. Biji Cyriac

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology**SEMESTER – III***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/ WEEK	CREDIT S
UAZO	19Z3CC8	Environmental Biology	Lecture	4	3

COURSE DESCRIPTION

Review of ecological concepts to the understanding of Environmental biology.

COURSE OBJECTIVES

Appreciation of relationships between Environmental biology and other disciplines within Environmental biology.

UNIT – I ECOSYSTEM**(12HRS.)**

Definition, structure and types of ecosystem. Dynamics of ecosystem: Energy, primary production, food chain, food web, trophic level, ecological pyramids. Brief account of Pond, River, Marine, Forest, Grassland, Desert ecosystem.

Self-study _ food chain, food web, Brief account of Pond ecosystem

UNIT – II POPULATION ECOLOGY**(12HRS.)**

Characteristics of population: Density, Natality, Mortality, Age distribution, Population growth - survivorship curve, biotic potential, dispersal and dispersion of population, Regulation, Population interactions: Neutralism, symbiosis, antibiosis, parasitism, predation, competition – Gause's principle.

UNIT – III COMMUNITY & NATURAL RESOURCES**(12 HRS.)**

Characteristics of community: Structure, concept, stratification, ecotone & Edge effect, Ecological Niche, Ecological Succession: process – theory –

types, patterns. Natural resources: Types, Soil resources: Profile, soil erosion and management.

UNIT –IV BIODIVERSITY (12HRS.)

Biodiversity: Definition, types: Genetic, species, ecosystem – bio-geographical classification of India – value of biodiversity – threats – endangered – endemic – hotspots – conservation of biodiversity – types, wildlife conservation, biosphere reserves. Brief account on remote Sensing: types and applications.

UNIT –V ENVIRONMENTAL POLLUTION (12 HRS.)

Definition, Causes, effects and control measures of Air, Water, Soil, Noise, and Nuclear pollution. Case studies: Bhopal episode, stone leprosy, Minamata disease, Chernobyl episode – **Role of an individual in prevention of pollution** – Environmental Protection Act- Salient features

Self Study _ Case studies: Bhopal episode, stone leprosy, Minamata disease, Chernobyl episode – Role of an individual in prevention of pollution

TEXT BOOK:

1. Arumugam N., (2014). *Concepts of Ecology*.Saras Publication.Nagercoil.
- 2.Asthanks D.K., & Asthana. M.A., (2009).*TextBook of Environmental Studies*. S. Chand & Company Ltd.
- 3.Krishnamurthy K.V., (2007). *An Advanced Textbook on Biodiversity*.4th Edition, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.

REFERENCES

1. Odum E.P.,& Barrett G.W., (2009). *Fundamentals of Ecology*.5th Edition, Binding House, New Delhi.
2. Rans S.V.S., (2007). *Essentials of ecology and Environmental Science*. 3rd Edition, Prentice-Hall of India Private Limited, New Delhi.

3. Cunningham W.P., & Cunningham M.A., (2008). *Environmental Science- a global concern*. 10th Edition McGraw Hill International, Boston.
4. Chatterji A.K., (2005). *Introduction to Environmental Biotechnology*. Prentice-Hall of India Private Limited, New Delhi.
5. Anand S.B., (2005). *An Introduction to Environmental Management*. Himalaya Publishing House, Mumbai.
6. Ignacimuthu S.J., (2012). *Environmental Studies*. MJP Publishers, Chennai.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)

1. <https://guides.lib.vt.edu/oer/plants>
2. <https://www.oercommons.org/courses/environmental-biology/view>
3. <https://www.oercommons.org/browse?f.search=Ecology>
4. <https://open.umn.edu/opentextbooks/textbooks/introduction-to-environmental-science-2nd-edition>
5. <https://www.nationalgeographic.org/encyclopedia/ecosystem/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 ECOSYSTEM				
1.1	Definition, structure of ecosystem.	2	Chalk & Talk	Black Board
1.2	Dynamics of ecosystem: Energy, primary production, food chain, food web,	2	Chalk & Talk	Black Board
1.3	trophic level, ecological pyramids.	2	Lecture	PPT
1.4	Brief account of Pond, River ecosystems	2	Chalk & Talk	Black Board
1.5	Marine, Forest	2	Lecture	PPT

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.6	Grassland, Desert ecosystem	2	Lecture	PPT
UNIT -2 POPULATION ECOLOGY				
2.1	Characteristics of population: Density, Natality, Mortality	2	Lecture	LCD
2.2	Age distribution, Population growth - survivorship curve, biotic potential	2	Chalk & Talk	Green Board
2.3	dispersal and dispersion of population, Regulation	2	Lecture	PPT
2.4	Population interactions: Neutralism, symbiosis	2	Chalk & Talk	Black Board
2.5	antibiosis, parasitism	2	Lecture	PPT
2.6	predation, competition Gause's principle	2	Chalk & Talk	Green Board
UNIT - 3 COMMUNITY & NATURAL RESOURCES				
3.1	Characteristics of community: Structure, concept, stratification	2	Chalk & Talk	Green Board
3.2	Ecotone, Edge effect, Ecological Niche	2	Lecture	PPT
3.3	Ecological Succession: process – theory – types	2	Chalk & Talk	Green Board
3.4	Ecological Succession - patterns.	2	Lecture	PPT
3.5	Natural resources: Types	2	Chalk & Talk	Green Board
3.6	Soil resources: Profile, soil erosion and management.	2	Chalk & Talk	Black Board
UNIT -4 BIODIVERSITY				
4.1	Biodiversity: Definition, types:	2	Chalk	Green

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	Genetic, species, ecosystem		&Talk	Board
4.2	bio-geographical classification of India – value of biodiversity	2	Chalk & Talk	Green Board
4.3	threats – endangered – endemic – hotspots	2	Lecture	PPT
4.4	– conservation of biodiversity – types,	2	Chalk & Talk	Black Board
4.5	wildlife conservation, biosphere reserves.	2	Lecture	PPT
4.6	Brief account on remote Sensing: types and applications.	2	Chalk &Talk	Green Board
UNIT -5 ENVIRONMENTAL POLLUTION				
5.1	Definition, Causes, effects and control measures of Air, Water pollution	3	Chalk & Talk	Green Board
5.2	Definition, Causes, effects and control measures Soil,Noise,	3	Lecture	PPT
5.3	Definition, Causes, effects and control measures Nuclear pollution	2	Chalk & Talk	Black Board
5.4	Case studies: Bhopal episode, stone leprosy, Minamata disease, Chernobyl episode	3	Lecture	PPT
5.5	Role of an individual in prevention of pollution	1	Chalk & Talk	Green Board
5.6	Environmental Protection Act- Salient features	1	Chalk & Talk	Green Board

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks.	OBT/PP T 5 Mks.	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Paraphrase the structure & functions of Ecosystems	K2	PSO1, PSO2 & PSO3
CO 2	Identify the characteristics of a population and their interactions	K3	PSO1 & PSO2
CO 3	Categorize community characteristics & value natural resources.	K4	PSO2, PSO3, PSO5 & PSO6
CO 4	Recognize the importance of Biodiversity and its conservation	K1	PSO2, PSO3 & PSO6
CO 5	Show the consequences of Human actions on global environment	K2	PSO2 & PSO5

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11
CO1	3	3	3	3	3	3	2	3	1	2	2
CO2	3	3	3	3	3	3	2	3	1	2	2
CO3	3	3	3	3	3	3	2	3	1	2	2

CO4	3	3	3	3	3	3	3	3	1	2	2
CO5	3	3	1	3	3	3	2	3	1	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
 ♦ Weakly Correlated -**1**

COURSE DESIGNER:
Dr. V. Bharathy

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
 & Name**

II B.Sc. Zoology**SEMESTER – III***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z3CC9	Lab - Human Physiology & Environmental Biology	Practical	3	2

COURSE DESCRIPTION

The course focuses on the interactions between organisms and the environment, and the consequences of these interactions in natural populations, communities and ecosystems through experimental approach

COURSE OBJECTIVES

- To gain skills in analyzing the clinical and environmental samples and to learn basic techniques in human physiology and environmental biology
- To understand the functioning of organisms at the molecular, cellular, organ and organism level.

HUMAN PHYSIOLOGY

1. Effect of pH and Temperature on salivary amylase activity in man
2. Preparation of haemin and haemochromogen Crystals
3. Test for proteins - Qualitative analysis of proteins – Ninhydrin and Biuret
4. Analysis of blood Sugar and Urea
5. Analysis of Urine Sugar and Albumin
6. Qualitative analysis of urea, ammonia and creatinine
7. Estimation of Uric Acid
8. Spotters - ECG, BMI Chart

9. Spotters - Hormonal disorders – Gigantism, Cretinism, Diabetes & Goitre

ENVIRONMENTAL BIOLOGY

1. Estimation of Dissolved O_2 and CO_2 in given water samples
 2. Measure pH of different water samples using pH meter, pH paper and indicator solution.
 3. Model preparation of food chain, food web in different ecosystem
4. Spotters - *Mysis*, *Lucifer*, *Calanus* and *Zoea*

REFERENCES:

1. Rajan S., Christy, S.R., (2011). *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015). *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008). *Techniques in Life Sciences*, 1st edition., Himalaya Publishing House Pvt. Ltd., Mumbai.
4. Dutta A., (2009). *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6825871/>
2. <https://www.youtube.com/watch?v=kwRgNNI6xrM>
3. <https://www.youtube.com/watch?v=frtl5ZoeNQ>
4. <https://www.youtube.com/watch?v=frtl5ZoeNQ&t=286s>
5. <https://www.youtube.com/watch?v=OsdhNtNNNds>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 HUMAN PHYSIOLOGY				
1.1	Effect of pH and Temperature on salivary amylase activity	3	Demonstration & hands on	Human saliva

	in man		training	
1.2	Preparation of haemin and haemochromogen Crystals	3	Demonstration & hands on training	Human Blood
1.3	Test for proteins - Qualitative analysis of proteins - Ninhydrin and Biuret	3	Demonstration & hands on training	Protein Sample
1.4	Analysis of blood Sugar and Urea	3	Demonstration & hands on training	Human Blood
1.5	Analysis of Urine Sugar and Albumin	3	Demonstration & hands on training	Urine sample
1.6	Qualitative analysis of urea, ammonia and creatinine	3	Demonstration & hands on training	
1.7	Estimation of Uric Acid	3	Demonstration & hands on training	
1.8	Spotters - ECG, BMI Chart	3	Discussion	Spotters
1.9	Spotters - Hormonal disorders - Gigantism, Cretinism, Diabetes & Goitre	3	Discussion	Spotters
UNIT -2 ENVIRONMENTAL BIOLOGY				
2.1	Estimation of Dissolved O ₂ and CO ₂ in given water samples	3	Demonstration & hands on training	Green Board Charts
2.2	Measure pH of different water samples using pH meter, pH paper and indicator solution.	3	Demonstration & hands on training	Green Board
2.3	Model preparation of food chain, food web in different	3	Model	

	ecosystem			
2.4	Spotters - <i>Mysis</i> , <i>Lucifer</i> , <i>Calanus</i> and <i>Zoea</i>	3	Discussion	Preserved slides

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Associate the effect of pH and temperature on salivary amylase activity in man.	K1	PSO1, PSO2 PSO3
CO 2	Infer the qualitative analysis and estimation of biomolecules.	K1	PSO2, PSO7
CO 3	Compare the preparation of haemin and haemochromogen crystals.	K2	PSO2, PSO5, PSO6
CO 4	Determine the amount of dissolved oxygen and carbon dioxide in the given water samples.	K2	PSO2, PSO7

CO 5	Prepare the models for food chain and food web in different ecosystem and identification of spotters.	K2	PSO2, PSO7
-------------	---	-----------	------------

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10	PSO11	PSO12
CO1	3	3	3	2	2	2	2	2	2	2	2	2
CO2	2	3	2	2	2	2	3	2	2	2	2	2
CO3	2	2	2	2	3	3	2	2	2	2	2	2
CO4	2	3	2	2	2	2	3	2	2	2	2	2
CO5	2	3	2	2	2	2	3	2	2	2	2	2

Mapping of COs with POs

CO/PSO	PO1	PO2	PO3	PO4
CO1	2	3	2	2
CO2	2	3	2	2
CO3	3	3	3	2
CO4	3	3	3	2
CO5	3	3	3	2


Note: ♦ Strongly Correlated – 3
 ♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:

Dr. Sr. Biji Cyriac

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology**SEMESTER – III***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WE K	CREDIT S
UAZO	19Z3ACQ1	Plant Diversity & Pathology	Lecture	3	3

COURSE DESCRIPTION

To understand the structure & life cycle of Plant groups

COURSE OBJECTIVES

To gain knowledge on Algae, Fungi, Plant diseases and to understand the usage of economically important locally available plants

UNIT –I ALGAE & FUNGI**(9 HRS.)**

General Characters of Algae – Type study - Structure and life history of *Sargassum* – Economic importance of Algae; General characters of Fungi - Type study - Structure and life history of *Puccinia*- Economic importance of Fungi

Self-study- Economic importance of Fungi**UNIT –II LICHENS & PLANT PATHOLOGY****(9 HRS.)**

General Characters of Lichens – Type study - Structure and Reproduction of *Usnea*-Economic importance of Lichens - Causative Organism, Symptoms and Control Measures of the following diseases: Viral disease-Bunchy Top of Banana; Bacterial disease-Citrus Canker; Fungal disease - Tikka disease of Groundnut

Self-study- Economic importance of Lichens

UNIT –III BRYOPHYTES, PTERIDOPHYTES & GYMNOSPERMS (9 HRS.)

General characters of Bryophytes, Pteridophytes and Gymnosperms - Type study - Structure and life history of *Anthoceros*, Structure and life history of *Lycopodium* and Structure and life history of *Cycas* (Development of sex organs need not be studied)

UNIT –IV TAXONOMY OF ANGIOSPERMS (9 HRS.)

Units of classification, Binomial Nomenclature - Bentham and Hooker's classification with reference to the following families Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Poaceae

Self-study- Binomial Nomenclature**UNIT –V ECONOMIC BOTANY (9 HRS.)**

Brief study of the following economic products with special reference to the botanical name, family and morphology of the useful part and its uses

Cereals	- Paddy
Pulses	- Black gram
Fruits	- Mango
Beverages	- Coffee
Narcotics	- Tobacco
Spices and condiments	- Cinnamon
Fibers	- Cotton
Latex	- Rubber
Wood	- Teak wood
Biodiesel	- <i>Jatropha</i>

Self-study- Cereals - Paddy, Wood-Teak wood

TEXT BOOKS:

1. Narayanaswamy R.V. & Rao K.N. *Outlines of Botany*. S. Viswanathan (Printers and Publishers) Pvt. Ltd., Madras (1984).
2. Kumarasen.V & Ragland. A. *Taxonomy of Angiosperm*. Saras Publication, Nagercoil (2004).
3. Pandey B.P. *A text Book of Botany*. Chand and Company Ltd. Ramnagar, New Delhi (2000).

4. Pandey, B.P. *Taxonomy of Angiosperm*. Chand and Company Ltd. Ramnagar, New Delhi (2007).
5. Verma, V. *A Text Book of Economic Botany*. Ane Books Pvt. Ltd. New Delhi (2009).

REFERENCES

1. Pandey B.P., *Economic Botany*. S. Chand and Company Ltd., New Delhi (1999).
2. Vashista, B.R., *Algae*. 8th Edition, S. Chand and Company Ltd., New Delhi (2000).
3. Pandey, B.P., *Bryophyta*. 4th Edition, S. Chand and Company Ltd. New Delhi (2000).
4. Vashista, B.R., *Fungi*. 11th Edition, S. Chand and Company Ltd. New Delhi (2000).
5. Vashishta B.R., *Pteridophyta*. S. Chand and Company Ltd. New Delhi (2010).
6. Vashishta. B.R., *Gymnosperms*. S. Chand and Company Ltd. New Delhi (2010).
7. Lawrence, G.H.M., *Taxonomy of Vascular Plants*. Scientific Publishers India. (2012)

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)

1. [https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Botany_Lab_Manual_\(Morrow\)/02%3A_Introduction_to_Ecology](https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Botany_Lab_Manual_(Morrow)/02%3A_Introduction_to_Ecology)
2. <https://www.medicinalplants-pharmacognosy.com/>
3. <https://courses.lumenlearning.com/boundless-biology/chapter/angiosperms/>
4. <https://courses.lumenlearning.com/boundless-biology/chapter/gymnosperms/>
5. <https://courses.lumenlearning.com/boundless-biology/chapter/importance-of-fungi-in-human-life/>
6. <https://openstax.org/books/concepts-biology/pages/14-3-seed-plants-gymnosperms>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 PLANT ANATOMY				
1.1	General Characters of Algae	1	Chalk & Talk	Black Board
1.2	Type study - Structure and life history of <i>Sargassum</i>	2	Lecture	PPT
1.3	Economic importance of Algae	1	Chalk & Talk	LCD
1.4	General characters of Fungi	2	Lecture	PPT & White board
1.5	Type study - Structure and life history of <i>Puccinia</i>	2	Lecture	Smart Board
1.6	Economic importance of Fungi	1	Lecture	Black Board
UNIT -2 LICHENS AND PLANT PATHOLOGY				
2.1	General Characters of Lichens	2	Lecture	Green Board Charts
2.2	Type study - Structure and Reproduction of <i>Usnea</i> -	3	Chalk & Talk	Green Board
2.3	Economic importance of Lichens	1	Chalk & Talk	Black Board
2.4	Causative Organism, Symptoms and Control Measures of the following diseases: Viral disease- Bunchy Top of Banana	1	Lecture	PPT

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.5	Bacterial disease-Citrus Canker	1	Chalk & Talk	LCD
2.6	Fungal disease - Tikka disease of Groundnut	1	Chalk & Talk	Black Board
UNIT -3 BRYOPHYTES, PTERIDOPHYTES & GYMNOSPERMS				
3.1	General characters of Bryophytes	1	Lecture	PPT
3.2	Pteridophytes	1	Chalk & Talk	LCD
3.3	Gymnosperms	1	Lecture	PPT
3.4	Type study - Structure and life history of <i>Anthoceros</i>	2	Chalk & Talk	LCD
3.5	Structure and life history of <i>Lycopodium</i>	2	Lecture	PPT & White board
3.6	Structure and life history of <i>Cycas</i> (Development of sex organs need not be studied)	2	Lecture	PPT
UNIT -4 TAXONOMY OF ANGIOSPERMS				
4.1	Units of classification, Binomial Nomenclature	1	Discussion	Black Board
4.2	Bentham and Hooker's classification	2	Chalk & Talk	Specimen, Black Board
4.3	Rutaceae	1	Chalk & Talk	Specimen, Black Board
4.4	Caesalpiniaceae	1	Chalk & Talk	Specimen, Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.5	Asclepiadaceae	2	Chalk & Talk	Specimen, Black Board
4.6	Euphorbiaceae	1	Chalk & Talk	Specimen, Black Board
4.7	Poaceae	1	Chalk & Talk	Specimen, Black Board
UNIT -5 ECONOMIC BOTANY				
5.1	Brief study of the following economic products with special reference to the botanical name, family and morphology of the useful part and its uses Cereals- Paddy, Pulses-Blackgram	2	Lecture	Specimen, PPT
5.2	Fruits - Mango Beverages - Coffee	2	Chalk & Talk	Specimen, LCD
5.3	Narcotics Tobacco, Spices and condiments - Cinnamon	2	Lecture	Specimen PPT
5.4	Fibers - Cotton, Latex - Rubber	1	Chalk & Talk	Specimen Specimen
5.5	Wood Teak wood, Biodiesel - <i>Jatropha</i>	2	Chalk & Talk	Specimen

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholasti c Marks	Non Scholasti c Marks C6	CIA Total	% of Assessmen t
	T1 10 Mks .	T2 10 Mks .	Qui z 5 Mks .	Assignmen t 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks .	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholasti c	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total

10	10	5	5	5	5	40	60	100
----	----	---	---	---	---	----	----	-----

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recognize the structure, life cycle and economic importance of Algae & Fungi	K1	PSO2 & PSO3
CO 2	Identify the plant diseases & control methods and Lifecycle & uses of Lichens	K3	PSO1 & PSO3
CO 3	Show general characters & life cycle of Bryophytes, Pteridophytes and Gymnosperms	K2	PSO4, PSO5
CO 4	Classify the Angiosperms & list their uses	K4	PSO5 & PSO 11
CO 5	Relate the plants to their economic uses	K3	PSO3, PSO4 & PSO6

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11
CO1	2	3	3	2	2	2	2	2	2	2	2
CO2	3	2	3	2	2	2	2	2	2	2	2
CO3	2	2	2	3	3	2	2	2	2	2	2
CO4	2	2	2	2	3	2	2	2	2	2	3
CO5	2	2	3	3	2	3	2	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3

Note: ♦ Strongly Correlated – 3
♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:
Dr. V. Bharathy

Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc.Zoology

SEMESTER – III

For those who joined in 2019 onwards

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
UAZO	19Z3ACQ2	Lab –Plant Diversity & Pathology	Practical	2	2

COURSE DESCRIPTION

To understand the structure and function of different plant groups

COURSE OBJECTIVES

To gain knowledge in constructing sections of plant material and to understand them.

EXPERIMENTS

1. Micro preparations, description and identification of Algae (*Nostoc*, *Cladophora*).
2. **Sectioning and identification** of Plant diversity materials wherever applicable (*Sargassum*, *Puccinia*, *Usnea*, *Lycopodium* and *Cycas*)
3. **Identification of Plant diseases**
4. Description of the plants in technical terms belonging to the families prescribed in the syllabus using local flora.
5. Genus, species and family of economically useful plant parts wherever applicable under Economic Botany.
6. Spotters
7. Record Note

TEXT BOOKS

1. Pandey B.P., (2000). *A text Book of Botany*. Chand and Company Ltd. Ram nagar, New Delhi.

2. Gupta P.K., (2000). *Principles of Plant breeding*. John Wiley, New York.
3. Rao M., (2002). *A text Book of Horticulture*. Laxmi Publications, New Delhi.
4. Ragland A & Jeyakumar., (2010). *Plant physiology*. Saras publication, Nagercoil.
5. Kumarasen V., (2009). *Plant breeding*, Saras publication, Nagercoil.

REFERENCES

1. Bendre. A . Practical Botany. Deep and Deep Publications (2009).
2. Pandey. B.P. Modern Practical Botany - Vol.1,2&3. S. Chand publications (2011).
3. Bendre. A & Kumar. A. A Text Book Of Practical Botany 2. Deep and Deep Publications (2002).
4. Vashista, B.R. Algae. 8th Edition, S.Chand and Company Ltd., New Delhi(2000).
5. Pandey, B.P. Bryophyta. 4th Edition, S. Chand and Company Ltd. New Delhi(2000).
6. Vashista, B.R. Fungi. 11th Edition, S. Chand and Company Ltd. New Delhi (2000).
7. Vashishta B.R. Pteridophyta. S. Chand and Company Ltd. New Delhi (2010).
8. Vashishta. B.R. Gymnosperms. S. Chand and Company Ltd. New Delhi (2010).

Digital Open Educational Resources (DOER) :

1. <https://ccconlineed.instructure.com/courses/4543/pages/botany-slash-plant-diversity>
2. [https://bio.libretexts.org/Bookshelves/Botany/Botany_\(Ha_Morrow_and_Algiers\)/Unit_0%3A_Introduction_to_Botany/01%3A_Introduction](https://bio.libretexts.org/Bookshelves/Botany/Botany_(Ha_Morrow_and_Algiers)/Unit_0%3A_Introduction_to_Botany/01%3A_Introduction)
3. <https://science.csu.edu.au/herbarium>
4. <https://openstax.org/books/concepts-biology/pages/14-4-seed-plants-angiosperms>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT – 1 PLANT ANATOMY				
1	Micro preparations, description and identification of Algae (<i>Nostoc</i> , <i>Cladophora</i>).	4	Sectioning	Micro preparations, description and identification of Algae (<i>Nostoc</i> , <i>Cladophora</i>)
2	Sectioning and identification of Plant diversity materials wherever applicable (<i>Sargassum</i> , <i>Puccinia</i> , <i>Usnea</i> , <i>Lycopodium</i> and <i>Cycas</i>)	12	Sectioning	Sectioning and identification of Plant diversity materials wherever applicable (<i>Sargassum</i> , <i>Puccinia</i> , <i>Usnea</i> , <i>Lycopodium</i> and <i>Cycas</i>)
3	Identification of Plant diseases	3	Discussion	Identification of Plant diseases
4	Description of the plants in technical terms belonging to the families prescribed in the syllabus using local flora.	5	Demonstration	Description of the plants in technical terms belonging to the families prescribed in the syllabus using local flora.
5	Genus, species and family of economically useful plant parts wherever applicable under Economic Botany.	2	Discussion	Genus, species and family of economically useful plant parts wherever applicable under

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
				Economic Botany.
7	Spotters	-	Discussion	Spotters

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO1	Construct suitable micro preparations	K1	PSO1, PSO2&PSO7
CO2	Construct sections of given plant materials with illustration and description	K1	PSO2,PSO3&PSO7
CO3	Make use of dissection microscope to display the floral parts of Angiosperms	K2	PSO1,PSO2&PSO7
CO4	Identify specimens and slides from Algae,	K2	PSO2,PSO6&PSO7

	Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms included in the syllabus		
CO5	Identify the economically useful plants	K2	PSO2, PSO6 & PSO7

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11
CO1	3	3	3	3	3	3	3	3	2	2	2
CO2	3	3	3	3	3	3	3	3	2	2	2
CO3	3	3	3	3	3	3	3	3	2	2	2
CO4	3	3	3	3	3	3	3	3	2	2	2
CO5	3	3	3	3	3	3	3	3	3	2	3

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3

Note: ♦ Strongly Correlated – 3

♦ Moderately Correlated – 2

♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. V. Bharathy

Forwarded By



Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc.Zoology

SEMESTER –III

For II B.Sc Chemistry those who joined in 2019 onwards

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WE EK	CREDI TS
UAZO	19C3AC Z1	Animal Diversity, Physiology & Genetics	Lecture	3	3

COURSE DESCRIPTION

This course is designed for the chemistry student which discusses the branch of Zoology that deals with animal diversity, structure and function of various systems, development and inheritance of man.

COURSE OBJECTIVES

- Attain a precise knowledge on the taxonomy, diversity, anatomy and physiology all major animal phyla along with several minor phyla with an emphasis on the unique and specific features of each group.
- Understand the structure and function of digestive, excretory, reproductive and sensory systems
- Inculcate the aspect of how generations inherit and vary.

UNITS

UNIT –I ANIMAL DIVERSITY

(9 HRS.)

Animal Kingdom: General characters OF Invertebrates and Chordata: outline **classification**, organization, symmetry, body cavity. General characters: Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda, Molluscs, Echinodermata, Pisces, Amphibians, Reptiles, Aves and Mammalia.

Self Study- Outline classification of phyla**UNIT –II DIGESTION AND RESPIRATION****(9 HRS.)**

Digestion: Digestive system of human, role of salivary glands, bile and enzymes in digestion of Carbohydrates, Protein and Fat in human. Absorption of Carbohydrates, protein and fat. **Respiration:** External and internal respiration, Structure of Lungs. Mechanism of respiration. Respiratory pigment – Hemoglobin and Hemocyanin. Exchange and transport of gases.

Self Study – Structure of Lungs**UNIT –III CIRCULATION AND EXCRETION****(9 HRS.)**

Circulation: Types –open and closed, Components and functions of Blood, Structure and functions of human heart- origin and conduction of heart beat. **Excretion:** Classification of animals based on excretory products, Structure and functions of Kidney and nephron - Physiology of urine formation.

Self study –Functions of Kidney**UNIT –IV REPRODUCTION& SENSORY RECEPTORS****(9 HRS.)**

Reproduction: Male reproductive system – structure and Function. Female reproductive system – structure and Function - Menstrual cycle. Sensory Receptors: Photoreceptor – Structure and functions of the eye. Phonoreceptor: Structure and functions of ear.

Self Study - Anatomy of Male reproductive and Female reproductive system**Self Study – General function of Ear****UNIT –V MENDELIAN LAWS OF INHERITANCE & ALLELISM****(9 HRS.)**

Mendelian laws –law of Dominance, law of Segregation and Monohybrid cross, law of Independent assortment and Dihybrid Cross. Multiple Alleles – ABO blood grouping. Sex linked inheritance – X linked genes - Colour blindness, Hemophilia; Y linked genes - Sex Influenced genes – Sex limited

genes.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

Syndrome - Down Syndrome – Turner’s Syndrome –Klinefelter’s Syndrome

REFERENCES

1. Arumugam and Mariakuttikan, (2016). *Animal Physiology*, Saras publications, Nagercoil.
2. Meyyan R, (2009). *Genetics*. Saras Publication, 3rd Edition, Kanyakumari.
3. Arumugam N., (2012) *A Text book of Invertebrates*, 4th edition, Saras publication, Nagercoil.
4. Jordan E.L. and Verma P.S., (2001) *Invertebrate Zoology*, S.Chand & Co, New Delhi.
5. Kashyap. V., (2019). *A text book of Animal Physiology and Biochemistry*. Kedar Nath Ram Nath, Meerut.
6. Silverthorn D.U., (2016). *Human Physiology an Integrated Approach*. 6th Edition, Pearson Education Services. Pvt. Limited.
7. Suresh R., (2012). *Essentials of Human physiology*. Regional Institute of Medical Sciences, Imphal, Manipur.
8. Sherwood L., (2009). *Principles of Human Physiology*. 3rd Edition, Cengage Learning India private Limited, New Delhi.
9. Sarada S., & Madhavan K. K., (2004). *Textbook of Human Physiology*, Revised by H.D. Singh, 6th Edition, S. Chand and Company Ltd., New Delhi.
10. Snustad, D.P. and Simmons, M.J., (2009). *Principles of Genetics*, V Edition, John Wiley and Sons Inc.,

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.webmd.com/heart/picture-of-the-heart>
2. <http://www.dnafb.org/1/bio.html>
3. <https://courses.lumenlearning.com/boundless-biology/chapter/laws-of-inheritance/>

4. <https://www.nature.com/scitable/topicpage/gregor-mendel-and-the-principles-of-inheritance-593/>
5. <https://www.jagranjosh.com/general-knowledge/respiratory-system-in-humans-1456486848-1>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 ANIMAL DIVERSITY				
1.1	Animal Kingdom: General characters OF Invertebrates and Chordata	1	Chalk & Talk	Black Board
1.2	Subtopics: Outline classification, organization, symmetry, body cavity.	1	Discussion	Google classroom
1.3	General characters: Protozoa, Porifera and Coelenterata	2	Lecture	PPT & White board
1.4	General characters: Helminthes and Annelida,	1	Lecture	Smart Board
1.5	General characters: Arthropoda and Molluscs,	1	Lecture	Black Board
1.6	General characters: Echinodermata and Pisces,	1	Lecture	Black Board
1.7	General characters: Amphibians and Reptiles	1	Lecture	LCD
1.8	General characters: Aves and Mammalia.	1	Discussion	Black Board

UNIT -2 DIGESTION AND RESPIRATION				
2.1	Digestion: Digestive system of human	1	Lecture	Green Board Charts
2.2	Role of salivary glands, bile and enzymes in digestion of Carbohydrates, Protein and Fat in human.	1	Chalk & Talk	Black Board
2.2	Absorption of Carbohydrates, Protein and Fat.	2	Chalk & Talk	Green Board
2.3	Respiration: External and internal respiration	1	Lecture	Black Board
2.4	Structure of Lungs. Mechanism of respiration,	2	Chalk & Talk	Black Board
2.5	Respiratory pigment – Hemoglobin and Hemocyanin	1	Chalk & Talk	Black Board
2.6	Exchange and transport of gases.	1	Lecture	PPT/LCD
UNIT – 3CIRCULATION AND EXCRETION				
3.1	Circulation: Types –open and closed	1	Chalk & Talk	Black Board
3.3	Components and functions of Blood	1	Chalk & Talk	Black Board
3.4	Structure and functions of human heart	2	Lecture	PPT/LCD
3.5	Origin and conduction of heart beat.	1	Lecture	PPT/LCD
3.6	Excretion: Classification of animals based on excretory products	1	Chalk & Talk	Black Board
3.7	Structure and functions of Kidney and nephron	1	Lecture	PPT/LCD

3.8	Physiology of urine formation	1	Chalk & Talk	Black Board
UNIT – 4 REPRODUCTION & SENSORY RECEPTORS				
4.1	Reproduction	1	Lecture	PPT/LCD
4.2	Male reproductive system – structure and Function.	2	Group Discussion	Smart Board
4.3	Female reproductive system – structure and Function	1	Group Discussion	Smart Board
4.4	Menstrual cycle.	1	Lecture	LCD
4.5	Sensory Receptors: Photoreceptor – Structure and functions of eye.	2	Chalk & Talk	Black Board
4.6	Phonoreceptor: Structure and functions of ear	2	Chalk & Talk	Black Board
UNIT – 5 MENDELIAN LAWS OF INHERITANCE & ALLELISM				
5.1	Mendelian laws – law of Dominance, law of Segregation	2	Chalk & Talk	Black Board
5.2	Monohybrid cross	1	Chalk & Talk	Black Board
5.3	Dihybrid Cross.	1	Lecture	LCD
5.4	Multiple Alleles – ABO blood grouping	2	Chalk & Talk	Green Board
5.5	X linked genes	1	Chalk & Talk	White board
5.6	Y linked genes	1	Lecture	LCD
5.7	Sex Influenced genes – Sex limited genes.	1	Lecture	PPT
UNIT - 6 DYNAMISM				

6.1	Down Syndrome – Turner's Syndrome, Klinefelter's Syndrome		Lecture	LCD
-----	--	--	---------	-----

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks.	OBT/PP T 5 Mks.	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Outline the general characters with of invertebrate and chordata with reference to organization, symmetry, body cavity.	K2	PSO1& PSO4
CO 2	Explain the digestive system, role of enzymes, digestion and absorption of Carbohydrates, Protein and Fat in Man.	K2	PSO1, PSO4 & PSO10
CO 3	Distinguish between internal and external respiration in context to the mode and transport of gas exchange.	K4	PSO1, PSO4 & PSO10
CO 4	Summarize the structure and function of heart, Kidney, eye and ear.	K2	PSO1, PSO4 & PSO10
CO 5	Explain the Mendelian Laws Of Inheritance & Allelism	K2	PSO1, PSO4 & PSO10

Mapping of COs with PSOs

CO/	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO1	PSO1	PSO
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	-----

PSO	1	2	3	4	5	6	7	8	9	0	1	12
CO1	3	2	2	3	2	2	2	2	2	2	2	2
CO2	3	2	2	3	2	2	2	2	2	3	2	2
CO3	3	2	2	3	2	2	2	2	2	3	2	2
CO4	3	2	2	3	2	2	2	2	2	3	2	2
CO5	3	2	2	3	2	2	2	2	2	3	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	1	1
CO2	3	2	1	1
CO3	3	2	1	1
CO4	3	2	1	1
CO5	3	2	1	1

Note: ♦ Strongly Correlated – 3


♦ Moderately Correlated – 2

♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. N. Nagarani

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology**SEMESTER –III**

For II B.Sc Chemistry those who joined in 2019 onwards

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/ WEE K	CREDIT S
UAZO	19C3ACZ2	Lab - Animal Diversity, Physiology &Genetics	Practical	2	2

COURSE DESCRIPTION

Students develop laboratory skills with identification of preserved specimen, manipulation of prepared slides, dissections and display under the microscope

COURSE OBJECTIVES

To study the diversity of animals and to understand the fundamental organization of cells.

INTRODUCTION

1. Laboratory biosafety guidelines and Regulations of Animal Ethics
2. Principle and handling of Compound microscope

ANIMAL DIVERSITY

1. Mounting of Body setae of Earthworm. (Collected from Vermiculture Centres)
2. **SPOTTERS**: Preserved Museum Specimens
3. Invertebrata - *Amoeba*, *Ascaris* (Male & Female), Prawn, Octopus, Starfish (Oral & Aboral view): Chordata – *Anguilla* (Eel), Toad (Bufo), Chamaeleon, Pigeon, Manis

HUMAN PHYSIOLOGY

1. Preparation and observation of blood smear
2. **ABO Blood Grouping**
3. Preparation of Haemin Crystals
4. Qualitative analysis of urea and uric acid in the given sample.
5. Effect of temperature on salivary amylase activity in man
6. **SPOTTERS:** Eye, Ear, Heart

GENETICS

1. Observation of simple Mendelian Traits in the class Population
2. **SPOTTERS:** Drosophila, Mule, Monohybrid cross, Syndrome

REFERENCES

1. Rajan S., Christy, S.R., (2011) *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015) *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008) *Techniques in Life Sciences*, 1st ed., Himalaya Publishing House Pvt. Ltd., Mumbai.
4. Dutta A., (2009) *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.uwlax.edu/biology/zoo-lab/>
2. <http://virtualbiologylab.org/>
3. <https://www.labster.com/simulations/animal-genetics/>
4. <https://libguides.mines.edu/oer/simulationlabs>
5. <https://www.biodiversitylibrary.org/item/29076#page/5/mode/1up>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
ANIMAL DIVERSITY				
1.1	Mounting of Body setae of Earthworm. (Collected from Vermiculture Centers)	2	Hands on Training	Specimen
1.2	Invertebrata - Amoeba, Ascaris (Male & Female), Prawn,	2	Discussion	Museum Specimen
1.3	Octopus, Starfish (Oral & Aboral view)	2	Discussion	Museum Specimen
1.4	Chordata – <i>Anguilla</i> (Eel), Toad (Bufo),	2	Discussion	Museum Specimen
1.5	Chamaeleon, Pigeon, Manis	2	Discussion	Museum Specimen
HUMAN PHYSIOLOGY				
2.1	Preparation and observation of blood smear	1	Hands on Training	Blood Sample
2.2	ABO Blood Grouping	1	Hands on Training	Blood Grouping Kit
2.3	Preparation of Haemin Crystals	2	Hands on Training	Microscope
2.4	Qualitative analysis of urea and uric acid in the given sample.	2	Hands on Training	Specimen

2.5	Effect of temperature on salivary amylase activity in man	2	Hands on Training	Stop Clock, Water bath
2.6	SPOTTERS: Eye, Ear, Heart	2	Discussion	Museum Specimen
GENETICS				
3.1	Observation of simple Mendelian Traits in the class Population	2	Hands on Training/Discussion	Black Board
3.2	SPOTTERS: Drosophila, Mule, Monohybrid cross, Syndrome	2	Discussion	Museum Specimen

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Outline the Laboratory biosafety guidelines and good laboratory practices.	K1	PSO1, PSO2 & PSO7
CO 2	Dissect and mount the Body setae of Earthworm	K4	PSO1, PSO2, PSO4 & PSO7
CO 3	List out the features of the given spotters <i>Amoeba</i> , <i>Taenia solium</i> , <i>Nereis</i> , <i>Amphioxus</i> (entire), <i>Anguilla</i> (Eel), Toad (<i>Bufo</i>), Cobra, Chamaeleon, Pigeon and various Syndromes.	K1	PSO1, PSO7 & PSO8
CO 4	Choose the appropriate qualitative test for the analysis of carbohydrates, proteins, lipids, urea and uric acid in the given sample	K3	PSO2 & PSO4
CO 5	Illustrate the structure of human ear, eye and heart.	K2	PSO1 & PSO4

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1	3	3	2	2	2	2	3	2	2	2	2	2
CO2	3	3	2	2	2	2	2	2	2	2	2	2
CO3	3	3	2	2	2	2	3	2	2	2	2	2

CO4	3	2	2	3	2	2	3	2	2	2	2	2
CO5	2	3	2	3	2	2	2	2	2	2	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	1
CO2	3	2	2	1
CO3	3	2	2	1
CO4	3	2	2	1
CO5	3	2	2	1

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:
Dr. N.Nagarani

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
 & Name**

II B.Sc.Zoology**SEMESTER –III*****For those who joined in 2019 onwards***

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
UAZO	19Z3SB1	Vermitechnology	Lecture	2	2

COURSE DESCRIPTION

This course imparts knowledge on the culture of earthworms and the preparation of vermicompost by recycling the waste through teaching and fieldtrip and eventually motivate the learners to become an entrepreneur

COURSE OBJECTIVES

- To impart the knowledge on the biology of earthworms
- To foster the skills on the preparation of quality vermicompost by recycling the waste
- To understand the prospects and marketing strategies of vermitechnology

UNITS**UNIT- I BIOLOGY OF EARTHWORMS****(6HRS.)**

Biology of earthworms: Morphology, Digestive and reproductive system of earthworms. Lifecycle of Earthworms: *Eudrilus eugenia*, *Eisenia fetida*, *Perionyx excavatus*.

Self –study - : Morphology, Digestive and reproductive system of earthworms

UNIT - II ECOLOGICAL GROUPS**(6HRS.)**

Ecological groups of earthworms: Saprophages, geophages, humus feeders – Epigeic, endogeic, anecic – earthworm burrows, vermicasts, vermiwash. Importance of earthworm in agriculture, fishing, therapeutics and pollution indicators.

UNIT - III VERMICOMPOSTING METHODS

(6HRS.)

Vermicomposting – definition, types: small and large scale, pit method, heap method, windrow method, collection of vermicompost - Raw materials for composting – requirements of vermicomposting - factors affecting vermicomposting: pH, moisture, temperature, nutritional value of feed.

UNIT – IV PROPERTIES OF VERMICOMPOST

(6HRS.)

Physical, chemical and biological properties of vermi-compost. Role of earthworms in composting – vermiculture. Maintenance of composting – Predators of earthworm

UNIT – V ECONOMICS AND PROSPECTS

(6HRS.)

Advantages of vermicomposting – economics of vermiculture – NABARD Nationalized banks supports for vermiculture. **Prospects of vermiculture as self employment venture**

UNIT – VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

REFERENCE BOOKS

1. Sultan A I. *The Earthworm* Bo. Second Revised Edition .Other India Press, Mapusa - 403 507, Goa, 2005.
2. Christy, A.M.V. *Vermitechnology*, MJP publishers, Chennai, 1976.
3. Bhatnagar R.K. & Palta R.K. “*Earthworm Vermiculture and Vermicomposting*”, Kalyani Publishers, Chennai
4. Gupta P.K. *Vermi Composting for Sustainable Agriculture*, AGROBIOS (India), Jodhpur.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://pubmed.ncbi.nlm.nih.gov/21628345/>
2. <https://pubmed.ncbi.nlm.nih.gov/18515003/>
3. https://www.brainkart.com/article/Vermitechnology_39993/
4. <https://technology4agri.wordpress.com/2013/02/12/vermitechnology-an-introuction/>
5. https://agritech.tnau.ac.in/org_farm/orgfarm_vermicompost.html

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 BIOLOGY OF EARTHWORMS				
1.1	Biology of earthworms - Morphology	1	Chalk & Talk	Black Board
1.2	Biology of earthworms- Digestive system	1	Chalk & Talk	Black Board
1.3	Biology of earthworms- reproductive system	1	Lecture	PPT & White board
1.4	Lifecycle of Earthworms: <i>Eugenia eudrilus</i>	1	Chalk & Talk	Black Board
1.5	Lifecycle of Earthworms: <i>Eisenia fetida</i> ,	1	Discussion	Google Classroom
1.6	Lifecycle of Earthworms: <i>Perionyx excavatus</i> .	1	PPT	LCD & White Board
UNIT - 2 ECOLOGICAL GROUPS				
2.1	Ecological groups of earthworms: Saprophages	1	Chalk & Talk	Green Board
2.2	Ecological groups of earthworms: geophages	1	Chalk & Talk	Black Board
2.3	Ecological groups of earthworms: humus feeders	1	Chalk & Talk	Black Board

2.4	Epigeic, endogeic, anecic – earthworm burrows	1	Chalk & Talk	Black Board
2.5	Vermicasts, Vermiwash	1	Lecture	PPT
2.6	Importance of earthworm in agriculture, fishing	1	Lecture	PPT
UNIT - 3 VERMICOMPOSTING METHODS				
3.1	Vermicomposting – definition, types: small and large scale	1	Chalk & Talk	Black Board
3.2	Vermicomposting Types: Pit method, Heap method, Windrow method	1	Lecture	PPT & White board
3.3	Collection of vermicompost	1	Lecture	LCD
3.4	Raw materials for composting	1	Lecture	LCD
3.5	Requirements of vermicomposting & nutritional value of feed	1	Lecture	LCD
3.6	Factors affecting vermicomposting: pH, moisture, temperature	1	Lecture	PPT & White board
UNIT - 4 PROPERTIES OF VERMICOMPOST				
4.1	Physical, properties of vermi-compost	1	Chalk & Talk	Black Board
4.2	Chemical properties of vermi-compost	2	Lecture	LCD
4.3	Biological properties of vermi-compost	1	PPT	LCD & White Board
4.4	Role of earthworms in composting vermiculture	2	Lecture	LCD
4.5	Maintenance of composting	1	Lecture	LCD

4.6	Predators of earthworm	1	Chalk & Talk	Black Board
UNIT - 5 ECONOMICS AND PROSPECTS				
5.1	Advantages of vermicomposting	1	Chalk & Talk	Black Board
5.2	Economics of vermiculture	2	Chalk & Talk	Black Board
5.3	NABARD Nationalized banks supports for vermiculture	1	Chalk & Talk	Black Board
5.4	Prospects of vermiculture as self employment venture	2	Lecture	LCD

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks.	OBT/PP T 5 Mks.	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the different species of earthworm and Elucidate the Biology of earthworms	K1	PSO1, PSO2 & PSO4
CO 2	Classify the ecological group of earthworms and discuss the role of earthworm in diverse applications	K2	PSO2 & PSO4
CO 3	Organise the methods of Vermicomposting and identify factors affecting vermicompost	K3	PSO1& PSO4
CO 4	Analyse the Physical, Chemical and Biological properties and maintenance of Vermicompost	K4	PSO1 & PSO4

CO 5	Examine the economics and prospects of vermiculture as self-employment avenues	K4	PSO6 & PSO9
-------------	--	-----------	-------------

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	3	2	2	2	2	2	2	2	2
CO2	2	2	2	3	2	2	2	2	2	2	2	2
CO3	3	2	2	3	2	2	2	2	2	2	2	2
CO4	3	2	2	3	2	2	2	2	2	2	2	2
CO5	2	2	2	2	2	2	2	2	3	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	2	2	2
CO3	3	2	2	2
CO4	3	3	2	2
CO5	3	2	2	2

Note: ♦ Strongly Correlated – 3
 ♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:
Dr. N. Malathi

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
 & Name**

II B.Sc. Zoology SEMESTER –IV

For those who joined in 2019 onwards

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WE EK	CREDIT S
UAZO	19Z4CC10	Microbiology	Lecture	5	4

COURSE DESCRIPTION

This course deals with the study of microorganisms and its interaction with the environment.

COURSE OBJECTIVES

- To understand the fundamentals of the world of Microbes, distribution and their application for human welfare.
- To understand the structural similarities and differences among various microorganisms.
- To know various types of Culture media and the techniques for isolation of pure cultures of microbes.
- Comprehend the intricate interaction between viruses and host cells.

UNIT –I INTRODUCTION TO MICROBIOLOGY (15HRS.)

The historical development and scope of Microbiology -Sterilization and disinfections - physical and chemical methods - Culture media – Types - Culture techniques – Batch, Continuous, Synchronous and Fed-batch – Methods of culturing bacteria – Isolation of bacteria by Pure culture techniques - Identification of Bacteria – Staining (Simple & Gram), Phenol red & Lipid hydrolysis Tests and Motility test.

Self-Study-Scope of Microbiology

UNIT –II BACTERIA (15 HRS.)

Outline classification of Bacteria according to Bergey's Manual -Morphology

and Physiology of Bacteria – Nutrition and growth –Bacterial respiration- Bacterial reproduction- Conjugation - Recombination- Economic importance.

Self-Study-Economic importance.

UNIT –III VIRUSES

(15 HRS.)

General properties of Viruses –Structure of viruses- TMV, Adenovirus, Bacteriophages – Shape of viruses (Polyhedral, helical and complex)- Classification and Nomenclature of Viruses - DNA & RNA viruses – Viral Multiplication - Cultivation of Viruses - Types of cultures and assay - Virioids, Virion and Prion (Short notes only)

UNIT –IV MICROBES IN THE ENVIRONMENT

(15 HRS.)

Bacteriology of Water- Microbes in Pond, lake, Sea and domestic water- methods of purification of water: Water potability analysis, determination of sanitary quality- Microbes in air and Measurement of air contamination - Biogeochemical cycles -Nitrogen Cycle, Phosphorus Cycle, Nitrogen fixation - Microbes for alternate source of energy - Hydrogen producing bacteria - *Halobacterium halobium*.

Self-Study-Biogeochemical cycles -Nitrogen Cycle

UNIT –V INDUSTRIAL MICROBIOLOGY

(15 HRS.)

Fermentation technology – Fermentor – Types of fermentor – Production of microbial products through fermentor – Production of Antibiotics (Penicillin, Streptomycin & Tetracyclines), Organic acids (Citric acid & Acetic acid), Solvents (Ethyl alcohol & Glycerol), Yeast (Brewer's and Baker's), Single cell proteins (Bacterial proteins).

TEXT BOOK:

Anandhanarayanan.R and Panicker C.K., (2016).Text book of Microbiology, 8th Edition, Universities Press (India) Private Limited.

REFERENCES:

1. Pelczar, M.J., Chan, E.C.S and Krieig N.R.,(2008). Microbiology, 5th Edition, Tata McGraw Hill Edition. United States.
2. Tortora G.J, Funke B.R and Case C.L., (2009).Microbiology: An Introduction, 11th Edition, United States.
3. Prescott L.M. Harley J.P and Klein D.A., (2010) Microbiology, 8th Edition. New Delhi.
4. Patel A.H. (2008).Industrial microbiology, Macmillan India LTD, Chennai.

Digital Open Educational Resources (DOER) :

1. <https://libguides.wccnet.edu/oer-subjects/microbiology>
2. <https://library.fvtc.edu/Microbiology/OER>
3. <https://www.oercommons.org/browse?f.keyword=microbiology>
4. <http://oer2go.org/mods/en-boundless/www.boundless.com/microbiology/textbooks/boundless-microbiology-textbook/industrial-microbiology-17/index.html>
5. <https://www.merlot.org/merlot/viewMaterial.htm?id=484489821>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO MICROBIOLOGY				
1.1	The historical development and scope of Microbiology	2	Chalk & Talk	Black Board
1.2	Sterilization and disinfections - physical and chemical methods	2	Chalk &Talk	LCD

1.3	Culture media – Types	1	Lecture	PPT & White board
1.4	Culture techniques – Batch, Continuous, Synchronous and Fed-batch	2	Lecture	Smart Board
1.5	Methods of culturing bacteria	2	Lecture	Black Board
1.6	Isolation of bacteria by Pure culture techniques	1	Discussion	Black Board
1.7	Identification of Bacteria	2	Specimen	Microscope
1.8	Staining (Simple & Gram), Phenol red & Lipid hydrolysis Tests and Motility test.	3	Discussion	Black Board
UNIT -2 BACTERIA				
2.1	Outline classification of Bacteria according to Bergey's Manual	2	Lecture	Black Board
2.2	Morphology and Physiology of Bacteria	4	Chalk & Talk	Black Board
2.3	Nutrition and growth	2	Chalk & Talk	Black Board
2.4	Bacterial respiration	3	Lecture	Black Board
2.5	Bacterial reproduction- Conjugation –Recombination	3	Chalk & Talk	Black Board
2.6	Economic importance	1	Lecture	Black Board
UNIT -3 VIRUSES				
3.1	General properties of Viruses	1	Chalk &Talk	Black Board

3.2	Structure of viruses- TMV, Adenovirus, Bacteriophages	3	Chalk & Talk	LCD
3.3	Shape of viruses (Polyhedral, helical and complex)	1	Lecture	PPT & White board
3.4	Classification and Nomenclature of Viruses	3	Lecture	Smart Board
3.5	DNA & RNA viruses	2	Lecture	Black Board
3.6	Viral Multiplication	3	Lecture	Black Board
3.7	Cultivation of Viruses	3	Discussion	Black Board
3.8	Types of cultures and assay	2	Lecture	Black Board
3.9	Viriods, Virion and Prion (Short notes only)	2	Discussion	Black Board
UNIT -4 MICROBES IN THE ENVIRONMENT				
4.1	Bacteriology of Water	1	Lecture	Black Board
4.2	Microbes in Pond, lake, Sea and domestic water	3	Chalk & Talk	Black Board
4.3	Methods of purification of water: Water potability analysis, determination of sanitary quality	3	Chalk & Talk	Black Board
4.4	Microbes in air and Measurement of air contamination	2	Lecture	Black Board
4.5	Biogeochemical cycles -Nitrogen Cycle, Phosphorus Cycle	2	Chalk & Talk	Black Board
4.5	Nitrogen fixation	2	Lecture	Black Board

4.6	Microbes for alternate source of energy - Hydrogen producing bacteria - <i>Halobacterium halobium</i> .	2	Chalk & Talk	Black Board
UNIT -5 INDUSTRIAL MICROBIOLOGY				
5.1	Fermentation technology	1	Lecture	Black Board
5.2	Fermentor – Types of fermentor	2	Chalk & Talk	Black Board
5.3	Production of microbial products through fermentor	2	Chalk & Talk	Black Board
5.4	Production of Antibiotics (Penicillin, Streptomycin & Tetracyclines)	3	Lecture	Black Board
5.5	Organic acids (Citric acid & Acetic acid)	2	Chalk & Talk	Black Board
5.5	Solvents (Ethyl alcohol & Glycerol), Yeast (Brewer's and Baker's)	3	Lecture	Black Board
5.6	Single cell proteins (Bacterial proteins)	2	Chalk & Talk	Black Board

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1	T2	Quiz	Assignment	OBT/PP T				
	10 Mks	10 Mks	5 Mks	5 Mks	5 Mks	35 Mks.	5 Mks.	40Mks	
K1	2	2	-	-	-	4	-	4	10 %

K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S)	PSOs ADDRESSED
-----	-----------------	---	----------------

		TAXONOMY)	
CO 1	Examine the culturing methods and phenotypic identification of microbes	K1	PSO1, PSO2, PSO4 & PSO8
CO 2	Examine the taxonomical classification, reproduction and genetic recombination in bacteria.	K1	PSO1, PSO2 PSO4 PSO8
CO 3	Elaborate the morphologic properties and cultivation of viruses.	K2	PSO1, PSO2 PSO4 & PSO8
CO 4	Determine the role of microbes in the environment.	K3	PSO1, PSO2 PSO4& PSO8
CO 5	Correlate the technology of fermentation with the microbial production industrial products	K4	PSO1, PSO2 PSO4, PSO8

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	3	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	2	3	2	2	2	2
CO3	3	3	2	3	2	2	2	3	2	2	2	2
CO4	3	3	2	3	2	2	2	3	2	2	2	2
CO5	3	3	2	3	2	2	2	3	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	3	2	2	2
CO4	3	2	2	2
CO5	3	2	3	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2

♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. X. Devanya Rosaline

Forwarded By



Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z4CC11	Evolution	Lecture	4	3

COURSE DESCRIPTION

“Nothing in Biology makes sense except in the light of Evolution” – Dobzhansky.

The Course will provide a comprehensive knowledge on the history of evolutionary theories, evidences for evolution, origin of life, natural selection, speciation and human evolution

COURSE OBJECTIVES

- Gain Knowledge on the principles of Evolution.
- Understand the evolution and diversification of fauna of the biosphere since the origin of life.
- Understand the sources of genetic variation and their role in the process of Evolution.
- Inter-relate the role of Isolation, Genetic divergence and Natural Selection in speciation as well as Evolution.

UNITS

UNIT –I EVIDENCES OF EVOLUTION

(12 HRS.)

Origin of life-Chemical origin of life-Oparin concept, Urey and Miller experiment - **Comparative anatomical**, Physiological evidences- Parallel evolution, Homologous structures, Vestigial organs, Convergent evolution- Analogous structures, Atavism, Connecting Links and adaptive radiation and Physiological/ Biochemical **evidences**.

Self Study - Vestigial organs**UNIT -II THEORIES OF EVOLUTION****(12 HRS.)**

Lamarckism- principles of Lamarckism-examples and Criticism of Lamarckism, Darwinism-Natural selection theory and supplementary theories- Sexual selection theory, Artificial selection theory and theory of Pangenesis, Neo Darwinism- experimental evidences-explanation to the objections, Mutation theory of De Vries- salient features, progressive species, Retrogressive species, Degressive species and Inconstant species.

Self Study - Artificial selection theory**UNIT -III MODERN SYNTHETIC THEORY****(12 HRS.)**

Modern synthetic theory-concepts of Modern synthetic theory-Genetic variation- gene pool-gene frequency-Hardy-Weinberg law-factors causing genetic variation-gene mutation-Chromosomal aberration -Hybridization - Recombination-Genetic Drift- operation of Modern synthesis-isolation and natural selection.

Self Study - Natural selection**UNIT -IV NATURAL SELECTION****(12 HRS.)**

Natural selection in action-Types of selection-Directional selection- salient features and examples- industrial Melanism, Stabilizing selection-salient features and examples, Disruptive selection- salient features and examples. Mimicry- definition, Batesian Mimicry- salient features and examples, Mullerian Mimicry- salient features and example.

Self Study - Industrial Melanism**UNIT -V SPECIATION& HUMAN EVOLUTION****(12 HRS.)**

Speciation - Types of speciation-mechanism of speciation- Patterns of speciation- Allopatric, Sympatric, Quantum and Parapatric speciation, Brief account on Geological Time scale, Human evolution- Physical/organic evolution- stages of human evolution - fossils of human evolution, Cultural evolution of man- milestones of cultural evolution.

Self Study - Milestones of cultural evolution

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only)**(HRS.)****TEXT BOOK:**

Arumugam, N.(2019). *Organic Evolution*. 7th edition, Saras Publication, Kanyakumari.

REFERENCE BOOKS:

1. Kocchar, P.L. (2003). *Genetics and Evolution*. 18th edition, Premchand Jain Publishers, New Delhi.
2. Sanjib Chattopadhyay. (2008). *Evolution*. Adaptation and Ethology, second edition, Books & Allied Pvt. Ltd., Kolkata.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <http://evolution.berkeley.edu/evolibrary>
2. <http://www.nature.com/nature/supplements/insights/evolution/index.html>
3. <https://www.yourgenome.org/facts/what-is-evolution#:~:text=In%20biology%2C%20evolution%20is%20the,and%20gradually%20change%20over%20time>.
4. <https://www.nationalgeographic.org/encyclopedia/theory-evolution/>
5. <https://www.nature.com/scitable/knowledge/library/speciation-the-origin-of-new-species-26230527>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 EVIDENCES OF EVOLUTION				
1.1	History of Evolutionary theories	1	Chalk & Talk	Black Board
1.2	Theories of origin of life	1	Chalk &	Black Board

			Talk	
1.3	Biochemical origin of life-Oparin concept	2	Lecture	PPT & White board
1.4	Parallel evolution,	1	Chalk & Talk	Black Board
1.5	Homologous structures,	1	Chalk & Talk	Black Board
1.6	Vestigial organs	1	Discussion	Google classroom
1.7	Convergent evolution & Analogous structures	1	Lecture	PPT
1.8	Atavism & Adaptive radiation	1	Lecture	PPT
1.9	Connecting Links	1	Lecture	LCD
1.10	Biochemical evidences	2	Lecture	PPT & White board
UNIT -2 THEORIES OF EVOLUTION				
2.1	Lamarckism- principles of Lamarckism	1	Chalk & Talk	Green Board
2.2	Lamarckism-examples	2	Chalk & Talk	Black Board
2.3	Criticism of Lamarckism	1	Chalk & Talk	Black Board
2.4	Darwinism-Natural selection theory	1	Chalk & Talk	Black Board
2.5	Supplementary theories- Sexual selection theory	1	Chalk & Talk	Black Board
2.6	Artificial selection theory and theory of Pangenesis	1	Chalk & Talk	Black Board
2.7	Neo Darwinism- experimental evidences	1	Lecture	PPT
2.8	Neo Darwinism-explanation to	1	Chalk &	Black Board

	the objections		Talk	
2.9	Mutation theory of De Vries-salient features	1	Lecture	PPT & White board
2.10	Progressive species, Retrogressive species, Degressive species and Inconstant species.	2	Lecture	LCD
UNIT – 3MODERN SYNTHETIC THEORY				
3.1	Modern synthetic theory	1	Lecture	PPT
3.2	Concepts of Modern synthetic theory- Isolation	1	Lecture	PPT & White board
3.3	Genetic variation– gene pool-gene frequency-Hardy-Weinberg law	2	Lecture	LCD
3.4	Factors causing genetic variation	2	Lecture	LCD
3.5	Gene mutation	1	Lecture	LCD
3.6	Chromosomal aberration	1	Lecture	PPT & White board
3.7	Hybridization	1	Lecture	PPT & White board
3.8	Recombination	1	Lecture	PPT & White board
3.9	Genetic Drift & Founders Principle	1	Lecture	LCD
3.10	Operation of Modern synthesis-Natural selection.	1	Discussion	Google classroom
UNIT -4NATURAL SELECTION				
4.1	Natural selection in action	1	Chalk & Talk	Black Board
4.2	Directional selection- salient	2	Lecture	LCD

	features and examples			
4.3	Industrial Melanism	1	Discussion	Google classroom
4.4	Stabilizing selection-salient features and examples	2	Lecture	LCD
4.5	Disruptive selection- salient features and examples	1	Lecture	LCD
4.6	Mimicry- definition, Introduction	1	Chalk & Talk	Black Board
4.7	Batesian Mimicry- salient features and examples	3	Lecture	LCD
4.8	Mullerian Mimicry- salient features and example	1	Lecture	LCD
UNIT - 5 SPECIATION & HUMAN EVOLUTION				
5.1	Speciation – Types of speciation	1	Chalk & Talk	Black Board
5.2	Mechanism of speciation	1	Chalk & Talk	Black Board
5.3	Patterns of speciation-	1	Chalk & Talk	Black Board
5.4	Geological Time scale	2	Lecture	LCD
5.5	Human evolution	1	Chalk & Talk	Black Board
5.6	Physical/organic evolution	1	Lecture	PPT & White board
5.7	Stages of human evolution	1	Lecture	PPT & White board
5.8	Fossils of human evolution,	2	Lecture	PPT & White board
5.9	Phases of cultural evolution	1	Lecture	LCD
5.10	Milestones of cultural evolution	1	Lecture	LCD

--	--	--	--	--

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks .	T2 10 Mks .	Quiz 5 Mks .	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks .	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC	NON - SCHOLASTIC	MARKS
------------	---------------------	-------

C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recognize the basic concepts of origin of life and evidences of evolution.	K1	PSO1, PSO2, PSO4 & PSO8
CO 2	Paraphrase the theories of evolution	K2	PSO1, PSO2 PSO4 PSO8
CO 3	Examine the Modern synthetic theory and the factors causing variation.	K3	PSO1, PSO4 & PSO8
CO 4	Organize the types and salient features of natural selection and mimicry.	K4	PSO1, PSO2 PSO4 & PSO8
CO 5	Interpret the concept of speciation and human evolution	K4	PSO1, PSO3 PSO4, PSO8

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	3	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	2	3	2	2	2	2
CO3	3	2	2	3	2	2	2	3	2	2	2	2
CO4	3	3	2	3	2	2	2	3	2	2	2	2

CO5	3	2	3	3	2	2	2	3	2	2	2	2
------------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	3	2	2	2
CO4	3	2	2	2
CO5	3	2	2	2

Note: ♦ Strongly Correlated – 3


♦ Moderately Correlated – 2

♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. A. Tamil Selvi

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology**SEMESTER –IV***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/W EEK	CREDIT S
UAZO	19Z4CC12	Lab - Microbiology & Evolution	Practical	3	2

COURSE DESCRIPTION

To gain skills in analyzing the clinical and environmental samples and to learn basic techniques in microbiology and evolution

COURSE OBJECTIVES

- Understand the basic principles of Microbiology.
- Develop skills and competence in standard microbiological laboratory techniques.
- Demonstrate the natural selection and Hardy-Weinberg Equilibrium

UNITS**UNIT –I MICROBIOLOGY**

1. Laboratory biosafety Measures
2. Working Principle and Applications of Autoclave, Laminar Air Flow, Incubator and pH meter
3. **Staining -** Simple, Negative and Gram Staining
4. Preparation of Media- agar and broth
5. **Serial Dilution Technique**
6. Isolation of Single Colony using Pour plate, Streak plate, Spread plate.
7. Water quality analysis - **MPN method** Hanging drop method

UNIT –II EVOLUTION

1. Animals of Evolutionary Importance - *Peripatus*, *Limulus* and *Archaeopteryx*
2. Mimicry- Leaf insect and Stick Insect
3. Animals with adaptive coloration – Chameleon
4. Horse Evolution model
5. Human evolution model
6. Homologous organs – forelimb and skeletal of vertebrates
7. Analogous – Wing modification
8. Hardy-Weinberg Equilibrium by using beads
9. Natural selection by using beads

REFERENCES:

1. Sinha J., Chatterjee A.K., Chattopadhyay P. (2015). *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
2. Armugam, N., & Narayan L.M., (2013). *Practical Zoology (3)*. Saras publication, Tamil Nadu.
3. Rajan S., Christy, S.R. (2011). *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
4. Dutta A. (2009). *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.
5. Tembhare D.B. (2008). *Techniques in Life Sciences*, 1st edition., Himalaya Publishing House Pvt. Ltd., Mumbai

DIGITAL OPEN EDUCATION RESOURCES

1. <http://www.uwyo.edu/molb2021/virtual-edge/>
2. <http://www.evo-ed.org/index.htm>
3. <http://oer2go.org/mods/en-boundless/www.boundless.com/microbiology/textbooks/boundless-microbiology-textbook/industrial-microbiology-17/index.html>
4. <https://www.merlot.org/merlot/viewMaterial.htm?id=484489821>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 MICROBIOLOGY				
1.1	Laboratory biosafety Measures	3	Discussion	
1.2	Working Principle and Applications of Autoclave, Laminar Air Flow, Incubator and pH meter	3	Discussion	Instruments
1.3	Staining - Simple, Negative and Gram Staining	3	Hands on training	Slides & Microscope
1.4	Preparation of Media- agar and broth	3	Demonstration & hands on training	Nutrient Agar & broth
1.5	Serial Dilution Technique	3	Demonstration	Sample
1.6	Isolation of Single Colony using Pour plate, Streak plate, Spread plate.	3	Demonstration	Sample from serial dilution technique
1.7	Water quality analysis - MPN method Hanging drop method	3	Demonstration & Hands on training	Culture
UNIT -2 EVOLUTION				
2.1	Animals of Evolutionary Importance - <i>Peripatus</i> , <i>Limulus</i> and <i>Archaeopteryx</i>	3	Demonstration	Spotters

2.2	Mimicry- Leaf insect and Stick Insect	3	Demonstration	Spotters
2.3	Animals with adaptive coloration – Chameleon	3	Demonstration	Spotters
2.4	Horse Evolution model Human evolution model	3	Demonstration	Spotters
2.5	Homologous organs – forelimb and skeletal of vertebrates	3	Demonstration	Spotters
2.6	Analogous – Wing modification	3	Demonstration	Spotters
2.7	Hardy-Weinberg Equilibrium by using beads	3	Demonstration & hands on training	Beads
2.8	Natural selection by using beads	3	Demonstration & hands on training	Beads

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Find the working Principle and Applications of instruments.	K1	PSO1, PSO2
CO 2	Demonstrate the microbiological techniques and water quality analysis	K3	PSO2, PSO7
CO 3	Identify the animals of evolutionary importance, adaptive coloration and in mimicry.	K3	PSO1, PSO2 PSO7
CO 4	Identify the morphological evidences and the horse and human evolution model.	K3	PSO2, PSO7
CO 5	Analyze the Hardy – Weinberg equilibrium using beads.	K3	PSO1, PSO2, PSO8

Mapping COs Consistency with PSOs

CO/P SO	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7	PS O8	PS O9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	2	3	2	2	2	2	3	2	2	2	2	2
CO3	3	2	2	2	2	2	3	2	2	2	2	2

CO4	2	3	2	2	2	2	3	2	2	2	2	2
CO5	3	3	2	2	2	2	2	2	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	3	2
CO2	2	3	3	2
CO3	2	3	3	2
CO4	2	3	2	2
CO5	2	3	1	2

Note: ♦ Strongly Correlated – 3
 ♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:
Dr. Sr. Biji Cyriac

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology**SEMESTER –IV***For those who joined in 2019 onwards*

PROGR MME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WE K	CREDIT S
UAZO	19Z4ACQ3	Developmental Botany & Plant Breeding	Lecture	3	3

COURSE DESCRIPTION

To study basic functioning of plant life.

COURSE OBJECTIVES

To study Plant Anatomy, Physiology, Embryology and Plant breeding techniques

UNIT –I PLANT ANATOMY**(9HRS.)**

Types of Meristems- Simple permanent tissue, Complex permanent tissue, Primary structure of stem, leaf and root in dicot and monocot plants, secondary growth-dicot stem.

Self-study - Types of Meristems**UNIT –II PLANT PHYSIOLOGY****(9 HRS.)**

Transpiration-Types, Mechanism of Transpiration, Absorption of water
Photosynthesis-Light reaction and Dark reaction, Respiration - Glycolysis, Krebs's cycle - Plant Growth hormones – Physiological role of Auxins, Gibberellin and Cytokinin- Photomorphogenesis (Brief account only)

Self-study- Absorption of water and Photomorphogenesis**UNIT –III EMBRYOLOGY****(9 HRS.)**

Structure and development of anther-Male gametophyte – Structure

and Development of ovule- Types of ovule- Female gametophyte (*Polygonum* type) - Dicot embryo- crucifer type.

UNIT –IV PLANT BREEDING

(9 HRS.)

Crop improvement -Introduction & scope - methods- conventional- mutation and ploidy breeding; Non-conventional - Somaclonal variation, Somatic embryogenesis- **Hybridization technique** - Interspecific and Intraspecific hybridization.

Self-study- **Crop improvement - Introduction & scope**

UNIT –V HORTICULTURE

(9 HRS.)

Horticultural **Tools- Vegetative propagation of plants** – cuttage and layerage – Types and advantages - Indoor gardening – Hanging pot and Terrace gardening, Layout of a Kitchen Garden

Self-study- Lay out of a Kitchen Garden

TEXT BOOKS:

1. Pandey B.P., (2000). *A text Book of Botany*. Chand and Company Ltd. Ram nagar, New Delhi.
2. Gupta P.K., (2000). *Principles of Plant breeding*. John Wiley, New York.
3. Rao M., (2002). *A text Book of Horticulture*. Laxmi Publications, New Delhi.
4. Ragland A & Jeyakumar., (2010). *Plant physiology*. Saras publication, Nagercoil.
5. Kumarasen V., (2009). *Plant breeding*, Saras publication, Nagercoil.

REFERENCES

1. Pandey B.P., (2007). *Plant Anatomy*, S. Chand & Co. De, New Delhi
2. Bhojwani S.S., & Bhatnagar. S.P., (1994). *Embryology of Angiosperms*. Vikas Publishing House (P) Ltd., New Delhi
3. Rasool S.K., & Sekar T., (2002). *Allied Botany*. Popular Book Hour,

Chennai -15

4.Kumar N.,(2016). *Introduction To Horticulture*. Oxford and IBH publishing, New Delhi.

Digital Open Educational Resources (DOER) :

1. [https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Botany_Lab_Manual_\(Morrow\)/02%3A_Introduction_to_Ecology](https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Botany_Lab_Manual_(Morrow)/02%3A_Introduction_to_Ecology)
2. <https://www.medicinalplants-pharmacognosy.com/>
3. <https://manifold.lib.fsu.edu/projects/from-growing-to-biology>
4. <https://courses.lumenlearning.com/wmopen-nmbiology1/chapter/photosynthesis/>
5. <https://courses.lumenlearning.com/wmopen-nmbiology1/chapter/outcome-cellular-respiration/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 PLANT ANATOMY				
1.1	Types of Meristems	1	Discussion	Black Board
1.2	Simple permanent tissue	1	Chalk & Talk	PPT
1.3	Complex permanent tissue	2	Chalk & Talk	LCD
1.4	Primary structure of stem, leaf and root in dicot plants	2	Chalk & Talk	PPT & White board
1.5	Primary structure of stem, leaf	2	Chalk	Smart

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	and root in monocot plants		&Talk	Board
1.6	secondary growth-dicot stem.	1	Lecture	Black Board
UNIT -2 PLANT PHYSIOLOGY				
2.1	Transpiration-Types, Mechanism of Transpiration,	1	Lecture	Green Board Charts
2.2	Absorption of water	1	Discussion	Google classroom
2.3	Photosynthesis Light reaction	1	Chalk & Talk	Green Board
2.4	Dark reaction	1	Chalk & Talk	Chart
2.5	Respiration - Glycolysis	1	Chalk & Talk	Chart
2.6	Kreb's cycle	1	Lecture	Black Board
2.6	Plant Growth hormones – Physiological role of Auxins,	1	Lecture	Google classroom
2.7	Gibberellin and Cytokinin	1	Lecture	Google classroom
2.8	Photomorphogenesis (Brief account only)	1	Discussion	Google classroom
UNIT -3 EMBRYOLOGY				
3.1	Structure and development of anther, Male gametophyte	2	Chalk & Talk	Green Board
3.2	Structure and Development of ovule	2	Chalk & Talk	Chart
3.3	Types of ovule	2	Chalk	Chart

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			&Talk	
3.4	Female gametophyte (<i>Polygonum</i> type) -	2	Lecture	Black Board
3.5	Dicot embryo crucifer type.	1	Chalk & Talk	Green Board
UNIT -4 PLANT BREEDING				
4.1	Crop improvement Introduction & scope methods- conventional-mutation and ploidy breeding	3	Chalk &Talk	Chart
4.2	Non-conventional - Somaclonal variation	1	Lecture	Google classroom
4.3	Somatic embryogenesis	1	Discusssion	Google classroom
4.4	Hybridization technique - Interspecific	2	Chalk & Talk	Chart
4.5	Intraspecific hybridization.	2	Lecture	Google classroom
UNIT -5 HORTICULTURE				
5.1	Horticultural Tools	1	Chalk & Talk	Chart
5.2	Vegetative propagation of plants – cuttage	2	Lecture	Google classroom
5.3	layerage –Types and advantages	2	Lecture	Black Board
5.4	Hanging pot and Terrace gardening	2	Chalk & Talk	Green Board
5.5	Indoor gardening –Layout of a Kitchen Garden	2	Discussion	Google classroom

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks.	OBT/PP T 5 Mks.			40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO1	Recall structure & functions of various plant tissues	K1	PSO1, PSO3 & PSO2
CO2	Paraphrase the mechanism of transpiration, photosynthesis, respiration & plant growth regulators	K2	PSO2 & PSO3
CO3	Identify the structure & development Embryology of plant	K3	PSO1, PSO2 & PSO3
CO4	Examine techniques in the crop improvement programmes	K4	PSO2 & PSO3
CO5	Plan a home garden using horticultural techniques	K3	PSO2, PSO6 & PSO9

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11
CO1	3	3	3	3	3	2	3	3	3	2	2
CO2	3	3	3	3	1	2	3	3	3	2	2
CO3	3	3	2	3	1	2	3	3	3	2	2
CO4	3	3	3	3	1	2	3	3	3	2	2

CO5	3	3	3	3	1	3	3	3	3	2	3
------------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. V. Bharathy

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology**SEMESTER –IV***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
UAZO	19Z4ACQ4	Lab - Developmntal Botany & Plant Breeding	Practical	2	2

COURSE DESCRIPTION

To study basic functioning of plant life.

COURSE OBJECTIVES

To study Plant Anatomy, Physiology, Embryology and Plant breeding techniques

UNITS

1. Identification and transverse sectioning of stem, leaf and root prescribed in plant anatomy (Monocot and Dicot)
2. Mounting of leaf Epidermal peel showing Stomata
3. Demonstration to measure rate of Transpiration – Ganong's potometer
4. Demonstration of Rate of Photosynthesis – *Hydrilla* Experiment of Willmont's Bubbler using different colour filters
5. Demonstration of Anaerobic respiration
6. Identification of different stages of embryo in *Tridax*.
7. Demonstration of Emasculation techniques prescribed in the syllabus.
8. Demonstration Horticultural techniques prescribed in the syllabus
9. Spotters
10. Record note

TEXT BOOKS

1. Pandey B.P., (2000). *A text Book of Botany*. Chand and Company Ltd. Ram nagar, New Delhi.

2. Gupta P.K., (2000). *Principles of Plant breeding*. John Wiley, New York.
3. Rao M., (2002). *A text Book of Horticulture*. Laxmi Publications, New Delhi.
4. Ragland A & Jeyakumar., (2010). *Plant physiology*. Saras publication, Nagercoil.
5. Kumarasen V., (2009). *Plant breeding*, Saras publication, Nagercoil.

REFERENCES

1. Pandey B.P. A text Book of Botany. Chand and Company Ltd. Ram nagar, New Delhi (2000).
2. P.K.Gupta, Principles of Plant breeding. John Wiley, New York (2000).
3. Kumarasen.V. Plant breeding, Saras publication (2009)
4. Ragland. A & Jeyakumar. Plant physiology. Saras publication (2010).
5. Pandey B.P. Plant Anatomy, S. Chand & Co. De, New Delhi (2007).
6. Bhojwani, S.S. & Bhatnagar. S.P. Embryology of Angiosperms. Vikas Publishing House (P) Ltd., New Delhi (1994).
7. Rasool S.K. & Sekar T. Allied Botany . Popular Book Hour, Chennai - 15 (2002).

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER) :

1. [https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Plant_Anatomy_and_Physiology_\(Bellairs\)](https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Plant_Anatomy_and_Physiology_(Bellairs))
2. <https://open.umn.edu/opentextbooks/textbooks/349>
3. <https://libguides.daltonstate.edu/PrinciplesofBiology/labmanual>
4. <https://libguides.cccua.edu/c.php?g=793104&p=5698907>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
PLANT ANATOMY				
1	Identification and transverse sectioning of stem, leaf and root	12	Sectioning	Specimen & Microscope

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	prescribed in plant anatomy (Monocot and Dicot)			
2	Mounting of leaf Epidermal peel showing Stomata	2	Dissection	Specimen & Microscope
3	Demonstration to measure rate of Transpiration – Ganong's potometer	2	Demonstration	Experimental setup
4	Demonstration of Rate of Photosynthesis – Hydrilla Experiment of Willmont's Bubbler using different colour filters	2	Demonstration	Experimental setup
5	Demonstration of Anaerobic respiration	2	Demonstration	Experimental setup
7	Identification of different stages of embryo in <i>Tridax</i> .	2	Dissection	Specimen & Microscope
8	Demonstration Horticultural techniques prescribed in the syllabus	2	Demonstration	Horticultural tools
9	Spotters	-	Discussion	specimen
10.	Record Note	-	Discussion	Specimen& Black Board

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO1	Illustrate the anatomy of Monocot and dicot stem , root and leaf	K2	PSO1,PSO2&PSO7
CO2	Interpret experimental set ups in plant physiology	K2	PSO1, PSO2,PSO3&PSO7
CO3	Apply the horticultural techniques of Cuttage and layerage	K3	PSO2&PSO7
CO4	Make use of emasculation technique	K3	PSO2, PSO7&PSO9
CO5	Identify specimens and slides from Plant anatomy, Physiology, Embryology , Plant Breeding & Horticulture included in the syllabus.	K1	PSO6, PSO7&PSO9

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11
CO1	3	3	3	3	2	2	3	3	2	2	2
CO2	3	3	3	3	2	2	3	3	2	2	2

CO3	3	3	3	3	3	2	3	3	2	2	2
CO4	3	3	3	3	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	3	3	3	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. V. Bharathy

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology SEMESTER –IV

For II B.Sc Chemistry those who joined in 2019 onwards

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WE EK	CREDI TS
UAZO	19C4ACZ3	Cell & Molecular Biology	Lecture	3	3

COURSE DESCRIPTION

- This course is designed for the chemistry student which discusses the branch of Zoology that deals with Cell and Molecular Biology.

COURSE OBJECTIVES

- Attain a precise knowledge on the prokaryotic and eukaryotic cell structure and function.
- Provides foundation studies for molecular biology.

UNITS

UNIT –I OUTLINE AND ORGANIZATION OF A CELL (9 HRS.)

General structure and function of animal cell & cell organelles. Differences between Prokaryotes and Eukaryotes.

Self Study - Differences between Prokaryotes and Eukaryotes.

UNIT –II STRUCTURE AND FUNCTIONS OF CELL ORGANELLES (9 HRS.)

Plasma Membrane: Models, Chemical composition and functions. Mitochondria: Structure and Functions. Endoplasmic Reticulum: Structure and functions.

UNIT –III NUCLEAR COMPONENTS AND CELL CYCLE (9 HRS.)

Nucleus: Structure- nuclear membrane, pore complex, nucleoplasm, chromatin reticulum, nucleolus, chemical composition, functions. Chromosomes: Shapes based on position of centromere, functions, Special types- Polytene and lampbrush chromosomes. Brief account on Mitosis and Meiosis.

UNIT –IV MOLECULAR BIOLOGY (9 HRS.)

DNA as Genetic material – Griffith's experiment, Hershey and Chase experiment-Structure and types of DNA and RNA-Replication of DNA – Meselson & Stahl experiment-Types of DNA Mutation

UNIT –V CENTRAL DOGMA OF MOLECULAR BIOLOGY (9 HRS.)

Transcription in prokaryotes- Properties of Genetic Code. Translation: Protein Synthesis. Gene Regulation - Lac Operon.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)**REFERENCES:**

- 1.Arumugam, N., (2014). *Cell Biology*, Tenth Edition, Saras Publication, Nagercoil.
- 2.Arumugam N. (2014). *Molecular Biology*.Saras Publications, Nagercoil.
- 3.Watson J.D., Baker T.A., Stephen B.P., Gann A., Levine M and Losick R., *Molecular Biology of the Gene*, 5th ed., Pearson Education (2004).
- 4.Lodish D.J and Baltimore D. *Molecular Cell Biology*, 5th ed., Sci. American Books, W.H. Freeman and Company, New York (2004).
- 5.Wolfe S.L. *An Introduction to Cell and Molecular Biology*, Wadsworth Publishing Company, New York (1995).
- 6.Geoffery M. Cooper and Robert Hausman, (2009). *The Cell: A Molecular Approach*,Fifth edition, ASM Press and Sinauer Associates, Inc.
- 7.Rastogi S.C.,(2003). *Cell and Molecular Biology* - Second Edition, New Age International (P) Limited Publishers, Daryaganj, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://teachmephysiology.com/biochemistry/cell-growth-death/dna-replication/>
2. <https://www.nature.com/articles/nature01407>
3. <https://www2.le.ac.uk/projects/vgec/highereducation/topics/cellcycle-mitosis-meiosis>
4. <https://www2.le.ac.uk/projects/vgec/highereducation/topics/geneexpression-regulation>
5. <https://www2.le.ac.uk/projects/vgec/highereducation/topics/dna-genes-chromosomes>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 OUTLINE AND ORGANIZATION OF A CELL				
1.1	General structure and function of animal cell & cell organelles.	1	Chalk & Talk	Black Board
1.2	Subtopics: Cell membrane- structure & Functions	1	Chalk & Talk	LCD
1.3	Mitochondria- structure & Functions	1	Lecture	PPT & White board
1.4	Golgi Bodies, Lysosomes - structure & Functions	1	Lecture	Smart Board
1.5	Endoplasmic Reticulum- structure & Functions	1	Lecture	Black Board

1.6	Nucleus- structure & Functions	1	Discussion	Google classroom
1.7	Cell Inclusions	2	Lecture	Black Board
1.8	Differences between Prokaryotes and Eukaryotes	1	Discussion	Black Board

UNIT -2 STRUCTURE AND FUNCTIONS OF CELL ORGANELLES

2.1	Plasma Membrane: Models	1	Lecture	Green Board Charts
2.2	Chemical composition and functions	2	Chalk & Talk	Green Board
2.3	Mitochondria: Structure	1	Chalk & Talk	Black Board
2.4	Mitochondria: Functions	2	Chalk & Talk	LCD
2.5	Endoplasmic Reticulum: Structure	1	Lecture	PPT & White board
2.6	Ribosome structure	1	Lecture	Smart Board
2.7	Ribosome functions	1	Lecture	PPT

UNIT -3 NUCLEAR COMPONENTS AND CELL CYCLE

3.1	Nucleus: Types Structure	1	Lecture	Black Board
3.2	chemical composition, functions.	1	Discussion	Black Board
3.3	Chromosomes: Shapes based on position of centromere - functions	1	Chalk & Talk	Black Board
3.4	Nucleolus – structure and Functions	1	Chalk & Talk	LCD

3.5	Polytene chromosomes	1	Lecture	PPT & White board
3.6	Lampbrush chromosomes	1	Lecture	Smart Board
3.7	Mitosis	1	Lecture	LCD/PPT
3.8	Meiosis	2	Lecture	LCD
UNIT -4 MOLECULAR BIOLOGY				
4.1	DNA as Genetic material	1	Discussion	Black Board
4.2	Griffith's experiment	1	Chalk & Talk	Black Board
4.3	Hershey and Chase experiment	1	Chalk & Talk	LCD
4.4	Structure and types of DNA and RNA	2	Lecture	PPT & White board
4.5	Replication of DNA	2	Lecture	LCD
4.6	Meselson & Stahl experiment	1	Lecture	Black Board
4.7	Types of DNA Mutation	1	Discussion	Google classroom
UNIT -5 CENTRAL DOGMA OF MOLECULAR BIOLOGY				
5.1	Central Dogma of Molecular Biology	1	Discussion	Black Board
5.2	Transcription in prokaryotes	2	Lecture	PPT/LCD
5.3	Properties of Genetic Code.	1	Chalk & Talk	Black Board
5.4	Translation: Protein Synthesis.	3	Lecture	PPT

5.5	Gene Regulation - Lac Operon	2	Lecture	LCD
-----	------------------------------	---	---------	-----

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks.	OBT/PP T 5 Mks.	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC	NON - SCHOLASTIC	MARKS
------------	------------------	-------

C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

The students will be able to

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Outline the general structure and function of a prokaryotic and eukaryotic cell.	K2	PSO1, PSO4, PSO8 & PSO10
CO 2	Associate the structure and function of plasma membrane, mitochondria and endoplasmic reticulum	K2	PSO1, PSO4, PSO8 & PSO10
CO 3	Summarize the structure of chromosome	K2	PSO1, PSO4, PSO8 & PSO10
CO 4	Recall the structure and replication of DNA	K1	PSO1, PSO4, PSO8 & PSO10
CO 5	Organize the events in translation, transcription and gene regulation in Prokaryotes	K3	PSO1, PSO4, PSO8 & PSO10

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11
CO1	3	2	2	3	2	2	2	2	2	3	2
CO2	3	2	2	3	2	2	2	2	2	3	2
CO3	3	2	2	3	2	2	2	2	2	3	2

CO4	3	2	2	3	2	2	2	2	2	3	2
CO5	3	2	2	3	2	2	2	2	2	3	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	3	2	2	2
CO4	3	2	2	2
CO5	3	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER
Dr. N. Nagarani

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
 & Name**

II B.Sc. Zoology**SEMESTER –IV***For II B.Sc Chemistry those who joined in 2019 onwards*

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/ WEEK	CREDI TS
UAZO	19C4ACZ4	Lab - Cell & Molecular Biology	Practical	2	2

COURSE DESCRIPTION

Students develop laboratory skills with identification of preserved specimen, manipulation of prepared slides, dissections and display under the microscope

COURSE OBJECTIVES

To study the life science application in molecular field

UNIT**CELL BIOLOGY**

1. Laboratory rules and regulations
2. **Microscopic** observation of squamous epithelial cheek cells
3. **Squash preparation of mitotic stages** in Onion root tip.
4. Preparation and identification of Polytene Chromosomes in the Salivary gland of *Chironomus* larva

Spotters: Stages of Meiosis, Cellular organelles – Mitochondria, Endoplasmic reticulum, Golgi complex, Nucleus, Ribosome

MOLECULAR BIOLOGY

1. **Isolation of DNA** from onion bulb (demo).

Spotters: DNA Model, DNA Replication

REFERENCES

1. Rajan S., Christy, S.R., (2011) *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015) *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008) *Techniques in Life Sciences*, 1st ed., Himalaya Publishing House Pvt. Ltd., Mumbai.
4. Dutta A., (2009) *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/zoology_lab/labs/exp1/index.php
2. <https://www.uwlax.edu/biology/zoo-lab/>
3. https://learn5.open.ac.uk/course/format/sciencelab/section.php?name=btm_sdk100
4. <http://virtualbiologylab.org/>
5. <https://www2.le.ac.uk/projects/vgce/highereducation/topics/dna-genes-chromosomes>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
CELL BIOLOGY				
1.1	Laboratory rules and regulations	2	Discussion	PPT
1.2	Microscopic observation of squamous epithelial cheek cells	2	Hands on Training	Microscope

1.3	Squash preparation of mitotic stages in Onion root tip.	2	Hands on Training	Microscope
1.4	Preparation and identification of Polytene chromosomes in the Salivary gland of <i>Chironomus</i> larva	2	Hands on Training	Microscope
1.5	Spotters : Stages of Meiosis	2	Discussion	LCD/PPT
1.6	Sub topics: Mitochondria, Endoplasmic reticulum, Golgi complex, Nucleus, Ribosome	2	Discussion	LCD/PPT
1.7	Sub topics: Golgi complex, Nucleus, Ribosome	2	Discussion	LCD/PPT
MOLECULAR BIOLOGY				
2.1	Isolation of DNA from onion bulb (demo).	2	Hands on Training	Blood Sample
2.2	Spotters: DNA Model	2	Discussion	Model
2.3	DNA Replication	2	Discussion	Model

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the squamous epithelial cells under microscope	K3	PSO1& PSO2
CO2	Dissect and mount the Polytene Chromosomes in the Salivary gland of <i>Chironomus</i> larva.	K4	PSO1, PSO2, PSO4 & PSO7
CO 3	Interpret the mitotic stages from the squash preparation in Onion root tip	K2	PSO1, PSO2 & PSO7
CO 4	Recognize the features of the given spotters: Stages of Meiosis, Cellular organelles – Mitochondria, Endoplasmic reticulum, Golgi complex, Nucleus	K1	PSO1, PSO4 & PSO10
CO5	Recall the structure and replication of DNA	K1	PSO1, PSO4 & PSO10

Mapping of COs with PSOs


CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11
CO1	3	3	2	3	2	2	2	2	2	3	2
CO2	3	2	2	3	2	2	2	2	2	3	2
CO3	3	3	2	3	2	2	2	2	2	3	2
CO4	3	3	2	2	2	2	2	2	2	3	2
CO5	3	2	2	3	2	2	2	2	2	3	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	3	2	2	2
CO4	3	2	2	2
CO5	3	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:**Dr. N. Nagarani****Forwarded By**


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

II B.Sc. Zoology

SEMESTER –IV

For those who joined in 2019 onwards

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
UAZO	19Z4SB2	Mushroom Cultivation	Lecture	2	2

COURSE DESCRIPTION

Develop basic knowledge in mushroom cultivation and spawn production

COURSE OBJECTIVES

To understand the value of edible mushrooms, know the cultivation process and thereby increase the employability

UNITS

UNIT –I INTRODUCTION

(6 HRS.)

Morphology of Mushrooms-Identification of mushrooms - Edible and poisonous mushrooms Nutritional and medicinal value of edible mushrooms- History of Mushroom cultivation – Present status of mushroom cultivation in India

Self-study- History of Mushroom cultivation – Present status of mushroom cultivation in India

UNIT –II COMPOSTING

(6 HRS.)

Methods of Composting- Spawn production - Spawning- casing- Cropping and harvesting; Mushrooms farm design Construction and insulation – Growing rooms – Ventilation systems- Seasonal growing – casing pasteurization chamber

UNIT –III CULTIVATION

(6 HRS.)

Cultivation techniques of edible mushrooms - *Pleurotus citrinopileatus* (Oyster mushroom) and *Agaricus bisporus* (Button mushroom)-Processing , grading and preservation of Mushrooms

UNIT –IV DISEASES AND PESTS**(6 HRS.)**

Management of fungal, bacterial and viral diseases in mushroom; Competitors, pests and nematodes in mushrooms- Precautions to avoid insects, pests and diseases

UNIT –V ECONOMICS OF MUSHROOM CULTIVATION**(6 HRS.)**

Economics of mushroom cultivation – Fixed costs, variable costs- Economics of canned products - Mushroom Export- Extension training and entrepreneurship - Mushroom Recipes

TEXT BOOKS

1. Jana B.L., (2014). *Mushroom culture*. Agrotech publishing company. Udaipur
2. Nita B., (2009). *Hand book on Mushrooms*. Oxford & IBH Publishers, New Delhi.

REFERENCES

1. Marimuthu T., Krishnamoorthy A.S., Sivaprakasam K., & Jayarajan R., (1991). *Oyster Mushrooms*. Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan M., (1990). *Food and Nutrition*. Bappco, The Bangalore Printing and Publishing Co. Ltd., Bangalore.
3. Tewari, Pankaj K.S.C., (1988). *Mushroom cultivation*. Mittal Publications, Delhi.
4. Muthusamy A.D., & Yesuraja I., (1999). *Mushroom Culture*. TNAU Publishers, New Delhi.
5. Tripathi D.P., (2005). *Mushroom Cultivation*. Oxford & IBH Publishers New Delhi

Digital Open Educational Resources (DOER) :

1. [https://nios.ac.in/online-course-material/vocational-courses/certificate-in-mushroom-production-revised-\(618\).aspx](https://nios.ac.in/online-course-material/vocational-courses/certificate-in-mushroom-production-revised-(618).aspx)

2. <https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf>
3. <http://nsdl.niscair.res.in/jspui/bitstream/123456789/599/1/mushroom%20cultivation%20-%20Formatted.pdf>
4. <http://www.fao.org/3/i0522e/i0522e.pdf>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION				
1.1	Identification of mushrooms	1	Chalk & Talk	Black Board
1.2	Edible and poisonous mushrooms	1	Chalk & Talk	LCD
1.3	Morphology of Mushrooms	4	Lecture	PPT & White board
1.4	Nutritional and medicinal value of edible mushrooms	1	Lecture	Smart Board
1.5	History of Mushroom cultivation	1	Lecture	Black Board
1.6	Present status of mushroom cultivation in India	1	Discussion	Google classroom
UNIT -2 COMPOSTING				
2.1	Methods of Composting	1	Lecture	Green Board Charts
2.2	Spawn production - Spawning-casing- Cropping and harvesting	2	Chalk & Talk	Green Board
2.3	Mushrooms farm design Construction and insulation	1	Lecture	PPT & White

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
				board
2.4	Growing rooms – Ventilation systems- Seasonal growing – casing pasteurization chamber	2	Lecture	Smart Board
UNIT -3 CULTIVATION				
3.1	Cultivation techniques of edible mushrooms - <i>Pleurotus citrinopileatus</i> (Oyster mushroom)	2	Lecture	Smart Board
3.2	<i>Agaricus bisporus</i> (Button mushroom)-	2	Lecture	Black Board
3.3	Processing, grading and preservation of Mushrooms	2	Chalk &Talk	Black Board
UNIT -4DISEASES AND PESTS				
4.1	Management of fungal, bacterial	1	Chalk & Talk	Green Board
4.2	viral diseases in mushroom	1	Chalk &Talk	Black Board
4.3	Competitors, pests and nematodes in mushrooms	2	Chalk & Talk	Green Board
4.4	Precautions to avoid insects, pests and diseases	2	Lecture	PPT &White board
UNIT -5ECONOMICS OF MUSHROOM CULTIVATION				
5.1	Economics of mushroom cultivation – Fixed costs, variable costs	2	Lecture	Green Board Charts
5.2	Economics of canned products	1	Chalk & Talk	Green Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.3	Mushroom Export	1	Lecture	PPT & White board
5.4	Extension training and entrepreneurship	1	Discussion	Google classroom
5.5	Mushroom Recipes	1	Discussion	Google classroom

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks	T2 10 Mks	Quiz 5 Mks	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO1	State the prospects of mushroom cultivation	K1	PSO1, PSO2, PSO4, PSO9 & PSO11
CO2	Devise a plan for mushroom production unit	K4	PSO1, PSO2 & PSO9
CO3	Outline the techniques in cultivation, grading & processing of edible mushrooms	K2	PSO1 & PSO9
CO4	Identify and manage Insect-Pests and diseases affecting mushrooms.	K2	PSO1 & PSO9
CO5	Prepare a business plan for small scale enterprise	K4	PSO1 & PSO9

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11
CO1	3	3	2	3	3	3	2	3	3	2	3
CO2	3	3	2	3	3	3	2	3	3	2	3
CO3	3	3	2	3	3	3	2	3	3	2	3
CO4	3	3	2	3	3	3	2	3	3	2	3
CO5	3	3	2	3	3	3	2	3	3	2	3

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3


Note: ♦ Strongly Correlated – 3
 ♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:

Dr. V. Bharathy

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER – V***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z5CC13	Fundamentals of Biochemistry	Lecture	6	4

COURSE DESCRIPTION

This course will impart knowledge on the structure, properties and metabolism of biomolecules and their interaction in the biological system.

COURSE OBJECTIVES

- Understand the fundamental biochemical principles of biomolecules
- Interrelate the metabolic pathways and its regulation
- Apply this knowledge to perform biochemical experiments

UNIT – I CARBOHYDRATES**(18 HRS.)**

Outline classification, properties - physical, chemical and Biological significance of carbohydrates. Monosaccharide: structure, biological significance of Glucose and Fructose. Disaccharides: structure, biological significance of Lactose and Sucrose. Polysaccharides: Homopolysaccharide - structure, biological significance of Starch, Glycogen and Cellulose. Heteropolysaccharide: Heparin and Hyaluronic acid.

Self study - Biological significance of Carbohydrates**UNIT –II LIPIDS****[18 HRS]**

Properties, physiological significance of Simple lipids -Triacyl Glycerol – saturated and unsaturated fatty acids- essential and non-essential fatty acids, Glycerol – structure and biological significance, Waxes – Spermaceti, Complex lipids: structure and biological significance of Phospholipids and Glycolipids. Derived lipids: Structure, biological significance of Cholesterol.

Self study- Physiological significance of Simple lipids**UNIT – III PROTEINS****[18 HRS]**

Amino acid: basic structure, properties. Classification of amino acids based on the composition of their R group, polarity of R group and biological importance- Essential and non- essential amino acids. Classification of proteins: Simple proteins, Conjugated proteins, Derived proteins. Biological significance of proteins. Organization of Proteins: Primary, Secondary, Tertiary and Quaternary Structure.

Self study - Biological significance of Proteins**UNIT –IV METABOLISM****[18 HRS]**

Carbohydrate metabolism: Glycolysis, Kreb's cycle, Glycogenesis, Glycogenolysis, Lipid metabolism: β -oxidation of fatty acids and biosynthesis of Cholesterol, Protein metabolism: Transamination, Deamination and Decarboxylation. Synthesis of Urea.

UNIT – V ENZYMES**[18****HRS]**

Classification, properties of enzymes. Mechanism of enzymatic reaction – Michaelis - Menten equation. Factors affecting enzymatic reaction rate: Temperature- pH- substrate and enzyme concentration. **Enzyme inhibition**: Competitive, Non-Competitive and Allosteric types. Biological significance of fat soluble and water soluble vitamins.

Self study - Biological significance of Fat soluble and water soluble vitamins.**TEXT BOOKS**

1. Deb, A.C. (2011). *Concepts of Biochemistry*. Books and Allied (P) Ltd. Kolkata.
2. Jain, J.L. (2007). *Fundamentals of Biochemistry*. Chand & Co, New Delhi.

REFERENCE BOOKS:

1. Stryer, L. (2000). *Biochemistry*. Freeman & Company, San Francisco, Fourth edition).

2. Voet, D. & Voet, J.G. (2004). *Biochemistry*. Wiley-Liss, New York, Third Edition,.
3. Devlin, T.M. (2006). *Text Book of Biochemistry with clinical correlations*. Wiley-Liss, New York.
4. Lehninger, A.L. Nelson, D.L., & Cox, M.M. (2010). *Principles of Biochemistry*. Freeman and company, New York, Fifth edition.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)

1. <https://oli.cmu.edu/jcourse/lms/students/syllabus.do?section=de602c450a0001dc2037ef65e65085e6>
2. <https://ecampusontario.pressbooks.pub/mcmasteroerdiscipline/chapter/biochemistry-biomedical-sciences/>
3. <https://biochem.oregonstate.edu/node/392>
4. <https://courses.lumenlearning.com/boundless-biology/chapter/proteins/>
5. <https://courses.lumenlearning.com/boundless-biology/chapter/carbohydrates/>
6. <https://courses.lumenlearning.com/boundless-biology/chapter/enzymes/>
7. <https://www.oercommons.org/courses/supplement-for-standard-biochemistry-textbooks>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 CARBOHYDRATE				
1.1	Outline classification, properties - physical, chemical and Biological significance of	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	carbohydrates.			
1.2	Monosaccharide: structure, biological significance of Glucose and Fructose.	3	Chalk & Talk	LCD
1.3	Disaccharides: structure, biological significance of Lactose and Sucrose.	3	Lecture	PPT & White board
1.4	Polysaccharides: Homopolysaccharide - structure, biological significance of Starch, Glycogen and Cellulose.	3	Lecture	Smart Board
1.5	Heteropolysaccharide - Intro	3	Lecture	Black Board
1.6	Heparin and Hyaluronic acid.	3	Lecture	Google classroom
UNIT -2 LIPIDS				
2.1	Properties, physiological significance of Simple lipids	3	Lecture	Green Board Charts
2.2	Triacyl Glycerol – saturated and unsaturated fatty acids	2	Chalk & Talk	Green Board
2.3	Essential and non-essential fatty acids	2	Lecture	PPT & White board
2.4	essential and non-essential fatty acids	2	Lecture	Smart Board
2.5	Glycerol – structure and	2	Lecture	PPT & White

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	biological significance,			board
2.6	Waxes – Spermaceti	1	Lecture	PPT & White board
2.7	Complex lipids: structure and biological significance of Phospholipids and Glycolipids.	3	Lecture	PPT & White board
2.8	Derived lipids: Structure, biological significance of Cholesterol.	3	Lecture	PPT & White board
UNIT -3 PROTEINS				
3.1	Amino acid: basic structure, properties.	1	Lecture	Smart Board
3.2	Classification of amino acids based on the composition of their R group, polarity of R group and biological importance	3	Lecture	Black Board
3.3	Essential and non-essential amino acids.	2	Chalk &Talk	Black Board
3.4	Classification of proteins: Simple proteins, Conjugated proteins,	3	Lecture	PPT
3.5	Derived proteins	2	Lecture	Black Board
3.6	Organization of Proteins: Primary, Secondary,	4	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	Tertiary and Quaternary Structure.			
3.7	Biological significance of Proteins	1	Discussion	PPT
UNIT – 4 METABOLISM				
4.1	Carbohydrate metabolism: Glycolysis	3	Chalk & Talk	Green Board
4.2	Kreb's cycle	3	Chalk & Talk	Black Board
4.3	Glycogenesis, Glycogenolysis	2	Chalk & Talk	Green Board
4.4	Lipid metabolism: β -oxidation of fatty acids	2	Lecture	PPT & White board
4.5	Biosynthesis of Cholesterol	2	Lecture	PPT & White board
4.5	Protein metabolism: Transamination, Deamination and Decarboxylation.	4	Lecture	PPT & Green Board
4.6	Synthesis of Urea	2	Lecture	PPT & White board
UNIT – 5 ENZYMES				
5.1	Classification, properties of enzymes.	3	Lecture	Green Board Charts
5.2	Mechanism of enzymatic reaction – Michaelis - Menten equation.	3	Chalk & Talk	Green Board
5.3	Factors affecting enzymatic reaction rate: Temperature- pH- substrate and enzyme concentration.	4	Lecture	PPT & White board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.4	Enzyme inhibition: Competitive, Non-Competitive and Allosteric types.	4	Discussion	Google classroom
5.5	Biological significance of fat soluble and water soluble vitamins.	3	Discussion	Google classroom

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks				
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5

40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Describe the structural, properties, biological significance of carbohydrates, proteins and lipids.	K2	PSO1 PSO2 PSO4 PSO8 & PSO11
CO 2	Classify lipids based on their complexity	K2	PSO1 PSO4 PSO8 & PSO11
CO 3	Classify amino acids and proteins based on their structure	K2	PSO1 PSO4 PSO8 & PSO11
CO 4	Construct the flow chart to highlight the metabolic pathways of carbohydrates, proteins and lipids.	K3	PSO1 PSO4 PSO8 & PSO11
CO5	List down the factors affecting the normal functions of the enzymes and biological functions of the vitamins.	K1	PSO1 PSO4 PSO8 & PSO11

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	3	2	2	2	3	2	2	3	2
CO2	3	2	2	3	2	2	2	3	2	2	3	2
CO3	3	2	2	3	2	2	2	3	2	2	3	2
CO4	3	2	2	3	2	2	2	3	2	2	3	2
CO5	3	2	2	3	2	2	2	3	2	2	3	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	3	2	2
CO3	2	3	2	2
CO4	2	3	2	2
CO5	3	2	2	2


Note: ♦ Strongly Correlated – 3

♦ Moderately Correlated – 2

♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. A. Tamil Selvi Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER –V***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDIT S
UAZO	19Z5CC14	Molecular Biology	Lecture	6	4

COURSE DESCRIPTION

The course focuses on the structure of DNA double helix, structural organization of genome of prokaryotes and eukaryotes and the flow of information from genes to proteins through transcription and translation and regulation of gene expression.

COURSE OBJECTIVES

To understand the role of enzymes in the molecular processes of replication, repair mechanisms, transcription, translation and protein degradation.

UNITS**UNIT –I INTRODUCTION****(18 HRS.)**

DNA as the genetic material: Griffith experiment, Avery, McCarty, and MacLeod experiment, Hershey-Chase experiment – Organization of Genome of Prokaryotes and Eukaryotes – histones – nucleosomes – heterochromatin & euchromatin, introns, exons – Watson & Crick DNA double helix – Properties of DNA.

Self-study - Griffith experiment, Hershey-Chase experiment**UNIT –II DNA REPLICATION AND REPAIR****(18 HRS.)**

DNA replication - Semi-conservative mode of replication & Meselson - Stahl

experiment - enzymes involved: Primase, DNA Polymerase, Helicase, Topoisomerases, SSBs - Initiation, elongation and termination - DNA damage and repair mechanisms - Direct, Excision, and Mismatch repair mechanisms.

Self-study - DNA damage

UNIT -III TRANSCRIPTION

(18 HRS.)

Central dogma of Molecular biology - Transcription: Enzymes involved: RNA polymerase - mechanism of transcription: Initiation, elongation, termination - Promoter sites - Transcription in Eukaryotes - Post-transcriptional modifications: Capping, Splicing and poly adenylation.

Self-study - Structure of RNA polymerase

UNIT -IV TRANSLATION, PROTEIN FOLDING & TARGETING (18 HRS.)

Properties of Genetic code - Mechanism of translation in Prokaryotes: Initiation, elongation, termination - Gene regulation in prokaryotes - lac operon - Brief account on **Post translational modifications** - protein targeting - protein degradation.

Self-study - Properties of genetic code

UNIT -V BIOINSTRUMENTATION

(18 HRS.)

Water as universal solvent, ionization of water, buffer - Principle and applications of pH metry, Colorimeter, Centrifugation - Protein separation: fractionation - **dialysis** - paper chromatography (ascending, descending and circular), **thin layer chromatography - column chromatography** - ion exchange chromatography.

Self-study - Principle and applications of pH metry

UNIT -VI DYNAMISM (Evaluation Pattern-CIA only)

(18 HRS.)

Current trends in Molecular Biology

REFERENCES:

1. Arumugam N. (2014). *Molecular Biology*. Saras Publications, Nagercoil.
2. Thiravia Raj S. (1993). *Biophysics*, Saras Publication, Kanyakumari.
3. Cooper G.M. and Robert E.H. (2009). *The Cell: A Molecular Approach*, 5th ed., ASM Press, Washington, D.C., and Sinauer Associates, Inc., Sunderland, Massachusetts.
4. Brown T.A. (2002). *Genomes*, 2nd ed., Wiley – Liss publications, New York.
5. Weaver R. (1999). *Molecular Biology*, WCB / Mc Graw-Hill, London.
6. Watson J.D., Baker T.A., Stephen B.P., Gann A., Levine M and Losick R., (2004). *Molecular Biology of the Gene*, 5th ed., Pearson Education.
7. Lodish D.J and Baltimore D. (2004). *Molecular Cell Biology*, 5th ed., Sci. American Books, W.H. Freeman and Company, New York.
8. Wolfe S.L. (1995). *An Introduction to Cell and Molecular Biology*, Wadsworth Publishing Company, New York.
9. De Robertis, E.D.P and De Robertis E.M.F. (1988). *Cell and Molecular Biology*, 8th ed., International ed., Infomed, Hong Kong.
10. Malacinski G.M. (2008). *Freifelder's Essentials of Molecular Biology*, 4th ed., Narosa Publishing House, New Delhi.
11. Rastogi S.C. (2003). *Cell and Molecular Biology*, 2nd ed., New Age International Pvt. Limited Publishers, Daryaganj, New Delhi.
12. J. Jeyaraman, (1980). *Techniques in Biology*, School of Biological Sciences, MKU,.
13. S.C.Rastogi, (2003). *Cell and Molecular Biology*, New Age International (P) Ltd Publishers, New Delhi.
14. Subramanian M.A. (2008). *Biophysics- Principles and Techniques*, M.J.P Publishers, Chennai.
15. S.Palanisamy & M.Shanmugavelu, (2006). *Principles of Biophysics*, Paramount Publications.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www2.le.ac.uk/projects/vgec/highereducation/topics/geneexpression-regulation>
2. <https://www2.le.ac.uk/projects/vgec/highereducation/topics/dna-genes-chromosomes>
3. <https://www.chemguide.co.uk/organicprops/aminoacids/dna1.html>
4. <https://www.nature.com/scitable/definition/transcription-dna-transcription-87/>
5. <https://courses.lumenlearning.com/wm-biology1/chapter/prokaryotic-translation/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION				
1.1	DNA as the genetic material: Griffith experiment	2	Chalk & Talk	Black Board
1.2	Avery, McCarty, and MacLeod experiment, Hershey-Chase experiment	2	Chalk & Talk	LCD
1.3	Genome of Prokaryotes	3	Lecture	PPT & White board
1.4	Eukaryotes	2	Lecture	Smart Board
1.5	Histones – nucleosomes	2	Lecture	Black Board

1.6	Heterochromatin & euchromatin, introns, exons	1	Discussion	Google classroom
1.7	Watson & Crick DNA double helix	2	Lecture	DNA model
1.8	Properties of DNA	1	Discussion	Black Board
1.9	Semi-conservative mode of replication - Meselson - Stahl experiment.	3	Chalk & Talk	LCD
UNIT -2 DNA REPLICATION AND REPAIR				
2.1	DNA replication	2	Discussion	Black Board
2.2	enzymes involved: Primase, DNA Polymerase	2	Chalk & Talk	LCD
2.3	Helicase, Topoisomerases, SSBs	2	Lecture	PPT & White board
2.4	Initiation, elongation of Replication	2	Lecture	Smart Board
2.5	Termination of Replication	2	Lecture	Black Board
2.6	Direct repair mechanism	2	Chalk & Talk Discussion	Google classroom
2.7	Nucleotide excision repair mechanisms	2	Lecture	Black Board
2.8	Base excision repair mechanisms	2	Discussion	Black Board

2.9	Mismatch repair mechanisms	2	Lecture	Black Board
UNIT -3 TRANSCRIPTION				
3.1	Central dogma of Molecular biology: Transcription	3	Chalk & Talk	Black Board
3.2	RNA polymerase - mechanism of transcription	2	Chalk & Talk	LCD
3.3	Initiation, elongation, termination	5	Lecture	PPT & White board
3.4	Promoter sites	2	Lecture	Smart Board
3.5	Transcription in Eukaryotes	2	Lecture	Black Board
3.6	Post-transcriptional modifications	4	Discussion	Google classroom
UNIT -4 TRANSLATION, PROTEIN FOLDING & TARGETING				
4.1	Properties of Genetic code	3	Chalk & Talk	Black Board
4.2	Mechanism of translation in Prokaryotes: Initiation	3	Chalk & Talk	LCD
4.3	Elongation, termination	4	Lecture	PPT & White board
4.4	Gene regulation in prokaryotes - <i>lac</i> operon	2	Lecture	Smart Board
4.5	Brief account on Post	2	Lecture	Black Board

	translational modifications			
4.6	Protein targeting	2	Discussion	Google classroom
4.7	Protein degradation.	2	Lecture	Black Board
UNIT – 5 BIOINSTRUMENTATION				
5.1	Water as universal solvent, ionization of water, buffer	1	Chalk & Talk	Black Board
5.2	Principle and applications of pH metry	1	Chalk & Talk	LCD
5.3	Colorimeter, Centrifugation	4	Lecture	PPT & White board
5.4	Protein separation: fractionation, dialysis	1	Lecture	Smart Board
5.5	paper chromatography (ascending, decending and circular)	1	Lecture	Black Board
5.6	Thin layer chromatography	1	Discussion	Google classroom
5.7	Column chromatography	2	Lecture	Black Board
5.8	Ion exchange chromatography	1	Discussion	Black Board

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Illustrate the Watson and Crick model of DNA double helix; mechanism of DNA replication and the role of enzymes	K1	PSO1 PSO4& PSO8
CO 2	Discuss the different types of DNA damages and repair mechanisms	K2	PSO1& PSO4
CO 3	Describe the transcription and translation in prokaryotes and eukaryotes	K1	PSO1 PSO4& PSO8
CO 4	Discuss the post-transcriptional modifications, properties of genetic code and role of repressor in gene regulation	K2	PSO1& PSO4
CO 5	Employ the appropriate separation technique based on the size, shape, and charge of biomolecules	K3	PSO1 PSO4& PSO8

Mapping of COs with PSOs

CO/ PSO	PS O1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	2	2	2	3	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	3	2	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	3	2	2	2	2	2	2	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	2	2	3	2
CO3	2	3	2	2
CO4	2	2	1	2
CO5	2	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
♦ Weakly Correlated -1

COURSE DESIGNER:
Dr. J. Asnet Mary

Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER -V***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WE EK	CREDIT
UAZO	19Z5CC15	Lab - Biochemical Analysis	Practical	4	2

COURSE DESCRIPTION

This course introduces the students to the biochemical analytical experiments for Carbohydrates, Protein and Lipids by providing familiarization with the preparation of reagents, proper use of instrumentation and interpretation of the properties of the Biomolecules.

COURSE OBJECTIVES

- Acquire skills in handling basic equipments
- Estimate the various biomolecules using standard protocols
- Critically analyze and interpret the results
- Design experiments to solve research problems

UNITS**CONTENT**

1. Laboratory biosafety guidelines
2. Preparation of solutions – Percentage, Normality, Molarity, Molality, ppm, preparation of working standard from stock solution.
3. **Qualitative analysis of Carbohydrates**: Barford's Test, Fehling's test, Seliwanoff's test and Iodine test.
4. Qualitative analysis of Proteins: Biuret test and Ninhydrin test.
5. Qualitative analysis of lipids: Saponification test, Iodine Absorption test, Salkowski's Test for Cholesterol and Dunstan's Test for Glycerol.
6. **Estimation** of Glucose by Anthrone method.

7. Estimation of Protein by Lowry's method.

8. Spotters- pH meter, Chromatographic Chamber, Colorimeter, Spectrophotometer

REFERENCES:

1. Plummer, D.T. (2008). *An Introduction to Practical Biochemistry*. Tata McGraw- Hill Publication, New Delhi.
2. Wilson, K and Walker, J. (2008). *Practical Biochemistry*. Cambridge State University Press, U.K.
3. Boyer, R.F. (2012). *Modern Experimental Biochemistry*. Pearson Education, India.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <http://www.oercommons.org/courses/biochemistry-3/view>
2. <https://louis.oercommons.org/curated-collections/52>
3. <https://libguides.wesleyan.edu/c.php?g=924060&p=6671362>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
CONTENT				
1	Laboratory biosafety guidelines	1	Lecture	LCD
2.1	Preparation of solutions - Percentage, Normality, Molarity	2	Chalk & Talk	Black Board
2.2	Preparation of solutions - Molality, ppm, preparation of working standard from stock solution.	2	Chalk & Talk	Black Board
3.1	Qualitative analysis of Carbohydrates: Barford's Test, Fehling's test	1	Demonstration & hands on training	Black Board

3.2	Qualitative analysis of Carbohydrates: Seliwanoff's test and Iodine test.	1	Demonstration & hands on training	Black Board
4.1	Qualitative analysis of Proteins: Biuret test and Ninhydrin test.	1	Demonstration & hands on training	Black Board
5.1	Qualitative analysis of lipids - Saponification test, Iodine Absorption test	2	Demonstration & hands on training	Black Board
5.2	Qualitative analysis of lipids: Salkowski's Test for Cholesterol and Dunstan's Test for Glycerol.	1	Demonstration & hands on training	Black Board
6	Estimation of Glucose by Anthrone method.	1	Demonstration & hands on training	Green Board
7	Estimation of Protein by Lowry's method	2	Demonstration & hands on training	Green Board
8	Spotters- pH meter, Chromatographic Chamber, Colorimeter, Spectrophotometer	1	Specimen	LCD

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Make use of the knowledge of basic principles of Biochemistry to carry out the biochemical experiments	K3	PSO1, PSO2, PSO4, PSO7 & PSO8
CO 2	Infer the outcome of the qualitative analytical tests of Biomolecules	K2	PSO1, PSO2, PSO4 & PSO8
CO 3	Estimate the biomolecules using standard protocols	K5	PSO1, PSO2, PSO4, PSO7 & PSO8
CO 4	Develop skills in handling basic equipments	K3	PSO1, PSO2, PSO4, PSO7 & PSO8
CO 5	Develop familiarity with the principles of Laboratory safety	K3	PSO1, PSO2, PSO4, PSO7 & PSO8

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	3	2	2	3	3	2	2	2	2
CO2	3	3	2	3	2	2	2	3	2	2	2	2
CO3	3	3	2	3	2	2	3	3	2	2	2	2
CO4	3	3	2	3	2	2	3	3	2	2	2	2
CO5	3	3	2	3	2	2	3	3	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	3	2
CO2	3	2	3	2
CO3	3	3	3	2
CO4	3	3	3	2
CO5	3	3	2	3


Note: ♦ Strongly Correlated – 3
♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:

Dr.A.Tamil Selvi

Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER – V***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WE EK	CREDIT
UAZO	19Z5CC16	Lab - Molecular Biology	Practical	4	2

COURSE DESCRIPTION

The course intends to provide hands on experience on techniques related to isolation and estimation of DNA, RNA and separation of phytoconstituents by paper chromatography and thin layer chromatography

COURSE OBJECTIVES

To gain practical skills to isolate, estimate and separate various biomolecules

EXPERIMENTS**MOLECULAR BIOLOGY**

1. Laboratory biosafety guidelines
2. Isolation of Genomic DNA from Bacteria.
3. Isolation of Genomic DNA from mammalian tissue.
4. Qualitative analysis of DNA
5. Isolation of RNA from Yeast.
6. Qualitative analysis of RNA
7. pH metry - Titration curve
8. Buffer preparation
9. Separation of phytoconstituents and amino acids - Ascending chromatography
10. Circular paper chromatography
11. Separation of amino acids - Thin Layer Chromatography
12. Plasmolysis

13. **Spotters:** DNA Double Helix Model, DNA Replication, Agarose Gel Electrophoresis, Polyacrylamide Gel Electrophoresis, Centrifuge

BIOSTATISTICS

1. **Measures of central tendency** & Measures of dispersion (problems)
2. Diagrammatic representation of data

ANIMAL BEHAVIOUR

1. Social behavior of animals – Ant
2. Geotactic and phototactic behavior of earthworms

REFERENCES:

1. Rajan S., Christy, S.R., (2011). *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015). *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008). *Techniques in Life Sciences*, 1st ed., Himalaya Publishing House Pvt. Ltd., Mumbai.
4. Dutta A., (2009). *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.
5. Plummer T.D., (1990). *An Introduction to Practical Biochemistry*, 4th ed., Mc Graw Hill Book Company, Europe.
6. Palanivelu P., (2004). *Analytical Biochemistry and Separation Techniques – A laboratory manual for B.Sc and M.Sc students*, 3rd ed., Kalaimani Printers, Madurai.
7. Wilson K and Walker J., (2013). *Principles and Techniques of Biochemistry and Molecular Biology*, 7th ed., Cambridge University Press, New York.
8. Boyer R., (2000). *Modern Experimental Biochemistry*, 3rd ed., Pearson Education Inc.
9. Wilson K and Kenneth H.G., (1992). *A Biologists Guide to Principles and Techniques of Practical Biochemistry*, 3rd ed., Cambridge University Press, Cambridge, UK.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.oercommons.org/authoring/2459-conditioning-animals-learning-behaviour-ecology-en/view>
2. <https://www.oercommons.org/authoring/2442-adaptation-vampirism-ecology-environment-the-virtu/view>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
MOLECULAR BIOLOGY				
1.1	Laboratory biosafety guidelines	4	Lecture & Demonstration	Blackboard & Specimen
1.2	Isolation of Genomic DNA from Bacteria.	4	Demonstration	Specimen
1.3	Isolation of Genomic DNA from mammalian tissue.	4	Demonstration	Specimen
1.4	Qualitative analysis of DNA	4	Demo	Calf Thymus DNA
1.5	Isolation of RNA from Yeast.	4	Demo	Specimen
1.6	Qualitative analysis of RNA	4	Demo	Specimen
1.7	pH metry - Titration curve	4	Hands on training	Buffers & Fruit Juices
1.8	Buffer preparation	2	Hands on training	Buffers
1.9	Separation of phytoconstituents and amino acids - Ascending	4	Hands on training	Calf Thymus DNA

	chromatography			
1.10	Circular paper chromatography	4	Hands on training	Tissue sample
1.11	Separation of amino acids - Thin Layer Chromatography	4	Hands on training	Std. RNA, tissue sample
1.12	Plasmolysis	4	Hands on training	Agarose gel electrophoretic unit
1.13	Spotters: DNA Double Helix Model, DNA Replication, Descending Chromatography, Colorimeter, Centrifuge	2	Observation	Models, equipments, Microscope
BIOSTATISTICS & ANIMAL BEHAVIOUR				
2.1	Measures of central tendency & Measures of dispersion (problems)	2	Hands on training	Specimen
2.2	Diagrammatic representation of data	2	Hands on training	MS - Excel
2.3	Social behavior of animals	4	Hands on training	Specimen
2.4	Geotactic and phototactic behavior of earthworms	4	Hands on training	Specimen

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Estimate the pH of different samples	K2	PSO 2
CO 2	Infer the color changes in DNA and RNA estimation	K2	PSO 2 PSO 7
CO 3	Compute the Rf value for paper chromatography	K3	PSO 2
CO 4	Demonstrate the genomic DNA isolation, DNA estimation and chromatography	K3	PSO 2
CO 5	Solve the presence of nucleic acid in the given sample	K3	PSO 2

Mapping of COs with PSOs

CO/ PSO	PS O1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
------------	----------	----------	----------	----------	----------	----------	----------	----------	----------	-----------	-----------	-----------

CO1	2	3	2	2	2	2	2	2	2	2	2	2
CO2	2	3	2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	2	2	2	2	2	2	2	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	2	2	2	2
CO3	2	2	2	2
CO4	2	2	2	3
CO5	2	2	2	2

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
 ♦ Weakly Correlated -**1**

COURSE DESIGNER:
Dr. J. Asnet Mary

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER –V***For those who joined in 2019 onwards*

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDIT S
UAZO	19Z5ME1	Biostatistics	Lecture	5	5

COURSE DESCRIPTION

This course deals with the application of statistical principles in biology.

COURSE OBJECTIVES

- To study the **analysis** and statistical significance of biological data.
- Interpret the results using different descriptive statistical methods.

UNIT - I COLLECTION & PROCESSING OF DATA (15 HRS.)

Introduction-Collection of data – primary & secondary, methods of data collection, methods of sampling-Classification of data- Types: geographical, chronological, qualitative & quantitative. Tabulation of data-parts of the table – methods of classification –Individual, Discrete and Continuous series.

UNIT – II MEASURES OF CENTRAL TENDENCY AND DISPERSION (15 HRS.)

Tabulation of data-Normalization of data-Analysis of data – Measures of central tendency & Measures of dispersion. Calculation of mean, mode, median, standard deviation, range, variance, coefficient of variance.

UNIT – III PRESENTATION OF DATA (15 HRS.)

Presentation of data – techniques of graphic presentation- line graph and histogram-Diagrammatic presentation- line diagram, bar diagram, pie diagram, pictogram and cartogram, Interpretation of data.

Self-Study-Diagrammatic presentation- line diagram, bar diagram, pie diagram, pictogram and cartogram, Interpretation of data.

UNIT - IV CORRELATION& REGRESSION

(15 HRS.)

Correlation analysis - Kinds, Degree - Types of correlation- Pearson's Correlation Coefficient (Problems)-Regression analysis- Simple, Linear Regression (Problems) -Chi- Square Test – goodness of fitness (Problems).

UNIT -V TEST OF VARIANCE

(15 HRS.)

MS Excel – statistical functions- Test of Significance – Large and Small samples – (Students T test) - ANOVA- one way and two way.

TEXT BOOK:

Ramakrishnan P., (2010). *Biostatistics*, Saras publications, Nagarcoil, Tamil Nadu.

REFERENCES:

1. Khan and Khanum., (2017). *Fundamentals & Biostatistics*, 2nd ed., Ukaaz Publications, Hyderabad.
2. Gurumani N., (2010) *An Introduction to Biostatistics*, MJP Publishers, Chennai.
3. Prasad S., (2012) *Elements of Biostatistics*, Rastogi publications, Meerut.

Digital Open Educational Resources (DOER):

1. <https://www.oercommons.org/courses/chi-square-test-08-54>
2. <http://www.oercommons.org/courses/biostatistics-methods-2/view>
3. <https://www.oercommons.org/courses/anova-calculations>
4. <https://www.oercommons.org/authoring/21429-wp-12-1-additional-test-of-two-population-variance/view>
5. <https://vivaopen.oercommons.org/courseware/unit/420>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT - 1 COLLECTION & PROCESSING OF DATA				
1.1	Introduction-Collection of data – primary & secondary data	2	Chalk & Talk	Black Board
1.2	Methods of data collection, Methods of sampling	3	Chalk & Talk	Black Board
1.3	Classification of data- Types: geographical, chronological, qualitative & quantitative.	4	Lecture	PPT & White board
1.4	Tabulation of data-parts of the table	2	Lecture	Black Board
1.5	Methods of classification – Individual, Discrete and Continuous series.	4	Lecture	Black Board
UNIT - 2 MEASURES OF CENTRAL TENDENCY AND DISPERSION				
2.1	Tabulation of data- Normalization of data-Analysis of data	2	Lecture	Black Board
2.2	Measures of central tendency & Measures of dispersion	3	Chalk & Talk	Black Board
2.3	Calculation of mean, mode, median	3	Chalk & Talk	Black Board

2.4	Standard deviation	2	Lecture	Black Board
2.5	Range, variance	3	Chalk & Talk	Black Board
2.6	Coefficient of variance	2	Lecture	Black Board
UNIT – 3 PRESENTATION OF DATA				
3.1	Presentation of data – techniques of graphic presentation- line graph and histogram	5	Chalk & Talk	Black Board
3.2	Diagrammatic presentation- line diagram, bar diagram, pie diagram, pictogram and cartogram	8	Chalk & Talk	Black Board
3.3	Interpretation of data	2	Lecture	Black board
UNIT - 4 CORRELATION & REGRESSION				
4.1	Correlation analysis Kinds, Degree - Types of correlation- Pearson's Correlation Coefficient (Problems)	8	Lecture	Black Board
4.2	Regression analysis- Simple, Linear Regression (Problems)	5	Chalk & Talk	Black Board
4.3	Chi- Square Test (goodness of fitness -Problems)	2	Chalk & Talk	Black Board
UNIT - 5 TEST OF VARIANCE				
5.1	MS Excel – statistical functions	4	Lecture	Black Board
5.2	Test of Significance – Large and	5	Chalk	Black

	Small samples (Student T test)		&Talk	Board
5.3	ANOVA- one way and two way	6	Chalk & Talk	Black Board

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks	T2 10 Mks	Quiz 5 Mks	Assignment 5 Mks	OBT/PP T 5 Mks			40Mks	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Outline the importance of data collection and its types.	K1	PSO1
CO 2	Estimate and interpret the data, by various measures including mean, median, and standard deviation.	K3	PSO2
CO 3	Apply the basic numeric and graphical techniques to display and summarize the collected data.	K3	PSO8
CO 4	Interpret statistical results effectively in context to Correlation and Regression.	K2	PSO8
CO 5	Choose and apply appropriate statistical methods for analyzing one or two variables.	K2	PSO9

Mapping of COs with PSOs

[illegible]

PSO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	2	3	2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	2	2	2	2	2	1	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	3	2	2
CO3	2	3	2	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. X. Devanya Rosaline

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc.Zoology**SEMESTER -V***For those who joined in 2019 onwards*

PROGR MME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z5ME2	Animal Behaviour	Lecture	5	5

COURSE DESCRIPTION

Students gain knowledge on learning, behaviour and biorhythm in animal.

COURSE OBJECTIVES

- Acquire fundamental knowledge on the behavioural concept in animals
- Understand the environment, social and reproductive behaviour in animals
- Summarize the phenomenon behind the molecular basis of biological rhythm including circadian.

UNITS**UNIT I – INTRODUCTION TO ANIMAL BEHAVIOUR (15 HRS.)**

Origin, history and scope of Ethology. Contribution of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen. Causes - Proximate and ultimate. Types - Innate and Acquired, Instinctive and Motivated behaviour. Pattern of behaviour - Stereotyped Behaviours (Orientation, Reflexes); Individual Behavioural patterns; Instinct vs. Learnt behaviour.

Self-Study - Origin, history and scope of Ethology**UNIT II – LEARNING AND MEMORY (15 HRS.)**

Types of learning - Physiology and phylogeny of learning - trial and error learning, Imprinting, habituation. Classical conditioning: - Pavlov's experiment; Operant learning – Skinner's experiment, insight, Instrumental

conditioning, association learning and reasoning.

UNIT III – SOCIAL AND REPRODUCTIVE BEHAVIOUR - (15 HRS.)

Social Behaviour - Communication and the senses; Altruism; Insects' society with Honey bee as example; Foraging in honey bee and advantages of the waggle dance. Sexual Behaviour: Courtship and signal: *Hilara sartor* (Balloon fly) and ♂ Stickleback's zigzag dance. Asymmetry of sex - Sexual dimorphism, Mate choice, Intra-sexual selection (male rivalry), Inter-sexual selection (female choice), Sexual conflict in parental care.

Self-Study - Insects' society with Honey bee as example

UNIT IV – NEURAL AND HORMONAL CONTROL OF BEHAVIOUR(15 HRS.)

Role of pheromones in reproductive behaviour. Communication - Chemical, visual, light and audio. Ecological aspects of behaviour - Habitat selection, food selection, anti-predator defence, aggression, host parasite relations.

Self-Study - Host parasite relations

UNIT V – BIOLOGICAL RHYTHM (15 HRS.)

Types and characteristics of biological rhythms: Short- and Long- term rhythms, Circadian rhythms, Tidal rhythms and Lunar rhythms. Concept of synchronization and masking - Photic and non-photic zeitgebers. Circannual rhythms; Photoperiod and regulation of seasonal reproduction in vertebrates - Role of melatonin.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

REFERENCES:

1. Arumugam, N and P. Natarajan, (2018). Animal Behaviour – Ethology. Saras Publication. Nagercoil
2. Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). (2004). Chronobiology Biological Timekeeping: Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
3. Saunders, D.S., C.G.H. Steel, X., (2002) Insect Clocks Afopoulou (ed.) R.D. Lewis. (3rd Ed) Barenz and Noble Inc. New York, USA

4. Vinod Kumar (2002) Biological Rhythms: Narosa Publishing House, Delhi/ Springer-Verlag, Germany.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.oercommons.org/authoring/2459-conditioning-animals-learning-behaviour-ecology-en/view>
2. <https://www.oercommons.org/browse?f.keyword=animal-behaviour>
3. <https://www.psychologytoday.com/intl/basics/animal-behavior>
4. <https://seaworld.org/animals/all-about/training/animal-behavior-and-learning/>
5. <https://www.nature.com/subjects/animal-behaviour>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO ANIMAL BEHAVIOUR				
1.1	Origin, history and scope of Ethology	2	Chalk & Talk	Black Board
1.2	Contribution of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen.	1	Lecture	Black Board
1.3	Contribution of Konrad Lorenz, Niko Tinbergen	1	Lecture	PPT & White board
1.4	Causes of behaviour: Proximate and ultimate	1	Lecture	Smart Board
1.5	Types of Behaviour: Innate and Acquired	2	Lecture	Black Board

1.6	Instinctive and Motivated behaviour.	1	Discussion	Google classroom
1.7	Pattern of behaviour: Stereotyped Behaviours (Orientation, Reflexes)	3	Lecture	Black Board
1.8	Individual Behavioural patterns	2	Lecture	Black Board
1.9	Instinct vs. Learnt behaviour	2	Lecture	Black Board
UNIT -2 LEARNING AND MEMORY				
2.1	Types of learning	1	Lecture	Green Board Charts
2.2	Physiology and phylogeny of learning	2	Chalk & Talk	Green Board
2.3	Trial and error learning, Imprinting, habituation.	2	Chalk & Talk	Black Board
2.4	Classical conditioning: - Pavlov's experiment	2	Chalk & Talk	LCD
2.5	Operant learning – Skinner's experiment	4	Lecture	PPT
2.6	Insight - Instrumental conditioning, association learning and reasoning.	4	Lecture	PPT
UNIT -3 SOCIAL AND REPRODUCTIVE BEHAVIOUR				
3.1	Social Behaviour: Concept of	3	Lecture	Black Board

	Society; Communication and the senses			
3.2	Altruism; Insects' society with Honey bee as example	2	Discussion	Black Board
3.3	Foraging in honey bee and advantages of the waggle dance	2	Chalk & Talk	Black Board
3.4	Sexual Behaviour: Courtship and signal: <i>Hilara sator</i> (Balloon fly) and ♂ Stickleback's zigzag dance.	3	Chalk & Talk	LCD
3.5	Asymmetry of sex, Sexual dimorphism, Mate choice	2	Lecture	PPT
3.6	Intra-sexual selection (male rivalry), Inter-sexual selection (female choice)	1	Lecture	PPT/LCD
3.7	Sexual conflict in parental care.	2	Lecture	PPT & White board
UNIT -4 NEURAL AND HORMONAL CONTROL OF BEHAVIOUR				
4.1	Motivation: Role of hormones	2	Discussion	Black Board
4.2	Aggregation	1	Lecture	PPT
4.3	Role of pheromones in reproductive behaviour	3	Chalk & Talk	Black Board
4.4	Communication: Chemical, visual, light and audio.	3	Chalk & Talk	LCD

4.5	Ecological aspects of behaviour: Habitat selection, food selection, anti-predator defenses, aggression,	4	Lecture	PPT & White board
4.6	Host parasite relations	2	Discussion	Black Board
UNIT -5 BIOLOGICAL RHYTHM				
5.1	Types and characteristics of biological rhythms	2	Discussion	Black Board
5.2	Short- and Long- term rhythms;	2	Lecture	PPT/LCD
5.3	Circadian rhythms; Tidal rhythms and Lunar rhythms	2	Chalk & Talk	Black Board
5.4	Concept of synchronization and masking; Photic and non-photic zeitgebers	3	Lecture	Green Board
5.5	Circannual rhythms	2	Lecture	PPT
5.6	Photoperiod and regulation seasonal reproduction of vertebrates	3	Lecture	PPT
5.7	Role of melatonin	1	Lecture	LCD

INTERNAL – UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total

10	10	5	5	5	5	40	60	100
----	----	---	---	---	---	----	----	-----

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Outline the scope and history of Ethology	K1	PSO1, PSO3, PSO4 & PSO6
CO 2	Explain the types of learning	K2	PSO1, PSO4 & PSO10
CO 3	Summarize the methods adopted by the animals in mate selection.	K2	PSO1, PSO3, PSO4 PSO8 & PSO10
CO 4	Discuss the various parameters controlling the behaviour in context to nerve and hormone	K6	PSO1, PSO3 PSO4 PSO6& PSO8
CO 5	Recall the types and features of biological rhythm	K1	PSO1, PSO3, PSO4 PSO8 & PSO10

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	1	3	2	2	2	2	2	2	2	2
CO2	2	2	2	3	2	2	2	2	2	3	2	2

C03	3	2	1	3	2	2	2	2	2	3	2	2
C04	3	2	1	3	2	2	2	2	2	2	2	2
C05	3	2	1	3	2	2	2	3	2	3	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
C01	2	2	1	1
C02	2	2	1	1
C03	2	2	1	1
C04	2	2	1	1
C05	2	2	1	1

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2 ♦ Weakly Correlated -1

COURSE DESIGNER:
Dr. N. Nagarani

Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER –V***For those who joined in 2019 onwards*

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WEE K	CREDIT S
UAZO	19Z5SB3	Ornamental Fish Culture	Lecture	2	2

COURSE DESCRIPTION

This course familiarizes the status and the importance of ornamental fish industry.

COURSE OBJECTIVES

- Enable the students to know about the characteristics of ornamental fishes and their development.
- Know about the diseases caused to them and their preventive measures.
- Motivate them to become an entrepreneur.

UNITS**UNIT –I INTRODUCTION TO AQUARIUM****(6HRS.)**

Introduction to Fish keeping and Scope and entrepreneurial aspects of Ornamental Fish Culture - Types of Aquarium - Aquarium equipment - Setting up Aquarium.

Self-study –Scope of Ornamental Fish Culture**UNIT –II COMMERCIALLY IMPORTANT SPECIES****(6 HRS.)**

Species of Ornamental Fishes – Gold fish, Fighter, Guppies, swordtails, mollies; Marine – Angels, Parrot fish, Butterfly fishes, clown fish, anemone- Aquarium Plants – Floating plants – Fairy moss, Indian Fern, Small eared *Salvinia* and Water lettuce; Submerged plants – Japanese Dwarf rust, Madagascar lace plant, *Hydrilla* and *Vallisneria*.

Self-study – Gold fish, Fighter, Guppies, swordtails, mollies**UNIT –III QUALITY MANAGEMENT****(6 HRS.)**

Water Quality Management - Fish Nutrition – Live feed- *Artemia*, *Tubifex* - Artificial feed.

UNIT –IV DEVELOPMENT AND PARENTAL CARE**(6 HRS.)**

Breeding and development of Aquarium fishes - Parental Care among Aquarium Fishes.

UNIT –V AQUARIUM DISEASES AND TREATMENT**(6 HRS.)**

Aquarium Fish Diseases – Bacterial- Red pest, Clumnaris, Dropsy, Scale protrusion, Tail Rot and Fin Rot Viral- Lymphocystis/Cauliflower disease Parasitic - Black spot disease, *Ergasilus*, *Uronema marinum*, Leeches.

TEXT BOOK:

1. Thara Devi, C.S and Jayashree, K.V., (2009) *Aquarium*. Saras Publication, Nagercoil,

REFERENCES:

1. Biswas, S.P., J.N. Das, U.K. Sarkar and Lakra, W.S., (2007) *Ornamental fishes of North East India: An Atlas*: NBFGR.
2. Spotte, S., (1993) *Marine Aquarium keeping: The Sciences, Animals and Art*, John Wiley & Sons, New York.
3. Jhingran,V.G., (1993) *Fish and Fisheries of India*, Hindustan publishing corporation, India,(1975).
4. Rath, A.K., (2011) *Freshwater Aquaculture*, Scientific publishers, Jodhpur, India.
5. Murthi.V.S. (2002) *Marine ornamental Fishes of Lakshadweep*, CMFRI, Special publication.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. https://mpeda.gov.in/?page_id=791

2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4952235/>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3435374/>
4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3648355/>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4203283/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO AQUARIUM				
1.1	Introduction to Fish keeping	1	Chalk & Talk	Black Board
1.2	Scope and entrepreneurial aspects of Ornamental Fish Culture	1	Discussion	
1.3	Types of Aquarium	1	Chalk & Talk	Black Board
1.4	Aquarium equipment	2	Chalk & Talk	Black Board
1.5	Setting up Aquarium	1	Chalk & Talk	Black Board
UNIT -2 COMMERCIALLY IMPORTANT SPECIES				
2.1	Species of Ornamental Fishes- Gold fish, Fighter, Guppies, swordtails, mollies. Marine – Angels, Parrot fish	1	Discussion	
2.2	Butterfly fishes, clown fish, anemone	1	Chalk & Talk	Black Board
2.3	Aquarium Plants – Floating plants – Fairy moss, Indian Fern	1	Chalk & Talk	PPT
2.4	Small eared <i>Salvinia</i> and	1	Chalk & Talk	Black Board

	Water lettuce			
2.5	Submerged plants – Japanese Dwarf rust	1	Chalk & Talk	Black Board
2.6	Madagascar lace plant, <i>Hydrilla</i> and <i>Vallisneria</i>	1	Chalk & Talk	Black Board
UNIT -3 QUALITY MANAGEMENT				
3.1	Water Quality Management	2	Lecture	Black Board
3.2	Fish Nutrition	1	Chalk & Talk	Black Board
3.3	Live feed- <i>Artemia</i> , <i>Tubifex</i>	2	Chalk & Talk	Black Board
3.4	Artificial feed	1	Chalk & Talk	Black Board
UNIT – 4 DEVELOPMENT AND PARENTAL CARE				
4.1	Breeding and development of Aquarium fishes	3	Lecture	Black Board
4.2	Parental Care among Aquarium Fishes	3	Chalk & Talk	Black Board
UNIT – 5 AQUARIUM DISEASES AND TREATMENT				
5.1	Aquarium Fish Diseases – Bacterial- Red pest	1	Lecture	Black Board
5.2	Clumnaris, Dropsy, Scale protrusion, Tail Rot and Fin Rot	2	Chalk & Talk	Black Board
5.3	Viral- Lymphocystis/Cauliflower disease	1	Chalk & Talk	PPT
5.4	Parasitic - Black spot disease	1	Chalk & Talk	Black Board
5.6	<i>Ergasilus</i> , <i>Uronema marinum</i> , Leeches	1	Chalk & Talk	PPT

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	List the types of aquarium.	K1	PSO9
CO 2	Plan the use of common aquarium ornamental fish and aquatic plants to decorate it.	K3	PSO9
CO 3	Outline the physico – chemical parameters of water required for the growth of fish.	K2	PSO2 & PSO9
CO 4	Explain the techniques followed in ornamental fish breeding.	K2	PSO4 & PSO9
CO 5	Identify the symptoms of various diseases prevalent in ornamental fish.	K3	PSO9

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	3	2	2	2

CO2	2	2	2	2	2	2	2	2	3	2	2	2
CO3	2	2	2	2	2	2	2	2	3	2	2	2
CO4	2	2	2	2	2	2	2	2	3	2	2	2
CO5	2	2	2	2	2	2	2	2	3	2	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	2	2	2	2
CO3	2	2	3	2
CO4	3	2	2	2
CO5	2	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:
Dr. S. Barathy

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
 & Name**

III B.Sc. Zoology**SEMESTER – V***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
UAZO	19Z5SB4	Sericulture	Lecture	2	2

COURSE DESCRIPTION

This course provides the knowledge of rearing of silkworm to produce raw silk.

COURSE OBJECTIVES

- Motivate young minds to become an entrepreneur for practicing sericulture as cottage industry.
- Gain knowledge about the diseases that affect silkworms.
- Know the steps involved in reeling process.

UNITS**UNIT –I INTRODUCTION TO SERICULTURE****(6HRS.)**

Scope of Sericulture– Silk route- Sericulture in India – Sericulture in Tamil Nadu -Role of Central Silk Board- National Sericulture Project (NSP) - Sericulture as Cottage industry - Biology of silkworm - Classification of Silkworm-Mulberry and Non mulberry.

Self-study – Scope of Sericulture – Sericulture in Tamil Nadu**UNIT – II MULBERRY CULTIVATION****(6 HRS.)**

Moriculture - varieties of mulberry - optimum conditions for mulberry growth - planting systems - Propagation: Vegetative - Seedling - Micropropagation - Biofertilizers - Triacntanol, Green manuring and Seriboost.

Self-study – Propagation: Vegetative**UNIT –III SILKWORM REARING****(6 HRS.)**

Life Cycle of mulberry Silkworm – Voltinism - Rearing of Silkworms - Rearing appliances - Rearing methods - Adult and Young rearing methods - types of mountage.

UNIT –IV REELING OPERATIONS

(6 HRS.)

Steps involved in Reeling - cocoon stifling - storage and sorting of cocoons – deflossing - riddling boiling and brushing - reeling operations - Reeling appliances - charka, cottage basin and filature - Raw Silk - Visual and Mechanical tests - marketing.

UNIT –V SILKWORM DISEASES

(6 HRS.)

Diseases of Silkworm – Protozoan diseases – Pebrine - Bacterial diseases: Bacterial Flacherie, Septicemia - Viral diseases: Viral Flacherie, Grasserie, Fungal diseases: Muscardine - Pest of silkworm- Uzifly, Dermestid Beetles

TEXT BOOKS:

1. Arumugam, N., Murugan, T., Rajeswar, J.J. &, R. (2015) *Applied Zoology*, R,Saras Publication, Kanyakumari.
2. Johnson, M & Kesary, M, (2008) *Sericulture*, CSI press, 4th Edition, Marthandam.

REFERENCES:

1. Krishnaswamy S. (1988) *Sericulture Manual* 1, 2 & 3, FAO Publications, New Delhi.
2. Reddy,S. G. (1994) *Silkworm Breeding*, Oxford & INH Publishing Co Pvt. Ltd., New Delhi.
3. Boraiah,G. (1994) *Lectures on Sericulture*, SBS Publishers distributors, Bangalore.
4. Ganga & Sulochana Chetty J.G. (2005) *An introduction to sericulture*, second edition, Oxford & IBH Publishing & Co. Pvt. Ltd., New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5633739/>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC379057/>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7904692/>

4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3115026/>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4909305/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO SERICULTURE				
1.1	Scope of Sericulture – Silk route- Sericulture in India - Sericulture in Tamil Nadu	1	Chalk & Talk	Black Board
1.2	Role of Central Silk Board – National Sericulture Project (NSP)	1	Chalk & Talk	LCD
1.3	Sericulture as Cottage industry	1	Lecture	PPT
1.4	Biology of silkworm	2	Chalk & Talk	Black Board
1.5	Classification of Silkworm- Mulberry and Non mulberry	1	Chalk & Talk	Black Board
UNIT -2 MULBERRY CULTIVATION				
2.1	Moriculture - varieties of mulberry	1	Chalk & Talk	Black Board
2.2	optimum conditions for mulberry growth	1	Chalk & Talk	LCD
2.3	planting systems	1	Lecture	PPT
2.4	Propagation: Vegetative, Seedling and Micropropagation	2	Chalk & Talk	Black Board
2.5	Biofertilizers -Triacontanol, Green manuring and Seriboost	1	Chalk & Talk	Black Board
UNIT – 3 SILKWORM REARING				

3.1	Life Cycle of mulberry Silkworm, Voltinism	1	Chalk & Talk	Black Board
3.2	Rearing of Silkworms - Rearing appliances and Rearing methods	2	Chalk & Talk	LCD
3.3	Adult and Young rearing methods	2	Lecture	PPT
3.4	Types of mountage	1	Chalk & Talk	Black Board
UNIT - 4 REELING OPERATIONS				
4.1	Steps involved in Reeling - cocoon stifling	1	Chalk & Talk	Black Board
4.2	Storage and sorting of cocoons	1	Chalk & Talk	LCD
4.3	Deflossing, riddling boiling and brushing, reeling operations	2	Lecture	PPT
4.4	Reeling appliances- charka, cottage basin and filature	1	Chalk & Talk	Black Board
4.5	Raw Silk-Visual and Mechanical tests, marketing	1	Chalk & Talk	Black Board
UNIT -5 SILKWORM DISEASES				
5.1	Diseases of Silkworm – Protozoan diseases – Pebrine	1	Chalk & Talk	Black Board
5.2	Bacterial diseases: Bacterial Flacherie, Septicemia	1	Chalk & Talk	LCD
5.3	Viral diseases: Viral Flacherie, Grasserie	1	Lecture	PPT
5.4	Fungal diseases: Muscardine	1	Chalk & Talk	Black Board
5.5	Pest of silkworm- Uzifly, Dermestid Beetles	2	Chalk & Talk	Black Board

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks.	OBT/PP T 5 Mks.			40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	List the importance of sericulture as cottage industry and the support provided by Central Silk Board.	K1	PSO9
CO 2	Explain the different methods of vegetative propagation followed in mulberry cultivation.	K2	PSO6
CO 3	Outline the life cycle of mulberry silkworm and the methods of rearing.	K2	PSO1 & PSO9
CO 4	Organize the steps involved in processing of silk and its marketing.	K3	PSO9
CO 5	Find various diseases that affect silkworm and cocoon formation	K3	PSO9

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	3	2	2	2
CO2	2	2	2	2	2	3	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	3	2	2	2
CO4	2	2	2	2	2	2	2	2	3	2	2	2
CO5	2	2	2	2	2	2	2	2	3	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	3	2	2	2
CO3	2	2	2	2
CO4	2	2	3	2
CO5	3	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2 ♦
Weakly Correlated -1

COURSE DESIGNER:

Dr. S. Barathy

Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER – VI***For those who joined in 2019 onwards*

PROGR AMME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
UAZO	19Z6CC17	Basic Immunology	Lecture	5	4

COURSE DESCRIPTION

The course is concerned with the overall organization of the human immune system and the techniques related to immunology.

COURSE OBJECTIVES

- To understand the immune system and immune response involved in human body.
- To identify the types of immunity, the cellular and molecular basis of immune responsiveness.
- To identify the immunological techniques involving antigen and antibody interactions.
- Learning in depth about the diseases related to immune system

UNITS**UNIT – I IMMUNITY****(15 HRS.)**

Overview of Immune System: History and Scope of immunology- Cells and organs of the Immune system. Immunity, Types - Innate and acquired - Immunization schedule - children and HPV adults - Primary and secondary lymphoid organs - Immune cells - Types and functions of T cells, B cells and macrophages.

Self Study - Overview of Immune System: History and Scope of immunology

UNIT – II ANTIGENS AND ANTIBODIES**(15 HRS.)**

Structure of antigens and super antigens - Types of antigens - antigenicity - immunogenicity - factors influencing immunogenicity - adjuvants and haptens - B and T cell epitopes. Immunoglobulins: Structure and functions of different classes of immunoglobulins.

Self Study - Nature of antigens and antibody

UNIT –III ANTIGEN AND ANTIBODY INTERACTIONS(15HRS.)

Antigen and Antibody interactions, Precipitation, Agglutination, Cytolysis, opsonisation, flocculation - complement fixation. **Immunological techniques:**

Single immunodiffusion, Double immunodiffusion, Radioimmunoassay, Immuno electrophoresis and ELISA.

Self Study – Applications of immunological techniques

UNIT – IV IMMUNE RESPONSES**(15 HRS.)**

Immune responses - Types and mechanism of humoral and cell mediated immune response – Complement pathway: Classical - Alternate - Lectin. Hybridoma technology - Monoclonal antibodies in therapeutic and diagnosis - Transplantation - Types of grafts.

Self Study – Transplantation - Types of grafts

UNIT –V HYPERSENSITIVITY AND IMMUNE DISEASE**(15HRS.)**

Hypersensitivity reactions - Type I - anaphylactic reactions, Type II - cytotoxic reactions, Type III - immune complex reactions, Type IV - delayed type hypersensitivity reactions. Autoimmune disease – Rheumatoid Arthritis - Immunodeficiency diseases – AIDS and SCID.

Self Study – AIDS

REFERENCES:**TEXT BOOKS:**

1. Dulsy Fatima, (2004), *A Textbook of Immunology*, Saras Publications, Kanyakumari

REFERENCES:

1. Chakravarthy A.K., (2006), *Immunology and Immunotechnology*, Oxford University Press, India.
2. Nandini Shetty., (2005). *Immunology: Introductory text book*. New Age International Publishers, India.
3. Dubey R. C., & Maheshware, D. K., (2004). *A Textbook of Microbiology* S. Chand & Company Ltd, New Delhi.
4. Goldsby R. A., Kindt T.J., Osborne B.A & Kuby J., (2003). *Immunology* 5th edition., W. H. Freeman and Company, New York.
5. Roitt I. M. (2001., *Essential Immunology*, S. Chand & Company Ltd, New Delhi.
6. Benjamini E., Sunshine G and Leskowitz S., (1996). *Immunology: A short course*, 3rd edition., Wiley-Liss Inc, New York.
7. Pelczar, M. JE. C., S. Chan and Kreig, N.R. (1980). *Microbiology*, 5th edition. McGraw-Hill Book Co., Singapore

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.oercommons.org/courses/immunology-basics/view>
2. <https://open.umich.edu/find/open-educational-resources/medical/immunology-m1#lectures>
3. <https://www.oercommons.org/courses/anatomy-and-physiology-ii/view>
4. <https://www.oercommons.org/courses/biology-ii/view>
5. <https://www.oercommons.org/authoring/51354-anatomy-and-physiology-for-health-care-professiona/1/view>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 IMMUNITY				

1.1	Overview of Immune System: History and Scope of immunology	1	Discussion	Black Board
1.2	Cells and organs of the Immune system.	1	Chalk & Talk	Black Board
1.3	Immunity-Types - Innate	2	Chalk &Talk	LCD
1.4	Acquired immunity	2	Lecture	PPT & White board
1.5	Immunization schedule - children and HPV adults -	1	Lecture	PPT
1.6	Primary Lymphoid organs	2	Lecture	Black Board
1.7	Secondary lymphoid organs	1	Discussion	Google classroom
1.8	Immune cells	2	Chalk & Talk	Black Board
1.9	Types and functions of T cells	1	Discussion	PPT
1.10	Types and functions of B cells	1	Chalk & Talk	Black Board
1.11	Macrophages	1	Lecture	LCD
UNIT -2 ANTIGENS AND ANTIBODIES				
2.1	Nature of antigens	1	Discussion	Black Board
2.2	Super antigens	1	Lecture	Green Board Charts
2.3	Types of antigens	2	Chalk & Talk	PPT
2.4	Antigenicity - immunogenicity - factors influencing	2	Chalk & Talk	Green Board

	immunogenicity			
2.5	Adjuvants and haptens	1	Chalk & Talk	LCD
2.6	B and T cell epitopes..	2	Chalk & Talk	Black Board
2.7	Immunoglobulins	2	Lecture	PPT & White board
2.8	Structure and functions of different classes of immunoglobulins	4	Chalk & Talk	Black Board
UNIT -3 ANTIGEN AND ANTIBODY INTERACTIONS				
3.1	Antigen and Antibody interactions	1	Chalk & Talk	Black Board
3.2	Precipitation & Agglutination	1	Chalk & Talk	LCD
3.3	Cytolysis & opsonisation	2	Lecture	PPT & White board
3.4	Flocculation & complement fixation.	2	Lecture	Smart Board
3.5	Immunological techniques: Single immunodiffusion	1	Lecture	Black Board
3.6	Double immunodiffusion	1	Discussion	Google classroom
3.7	Radioimmunoassay	2	Chalk & Talk	Black Board
3.8	Immunoelectrophoresis	2	Discussion	LCD
3.9	ELISA	2	Chalk & Talk	Black Board
3.10	Applications of immunological techniques	1	Discussion	Google Classroom
UNIT - 4IMMUNE RESPONSES				

4.1	Immune responses - Types	1	Chalk & Talk	Black Board
4.2	Mechanism of humoral response	2	Chalk & Talk	LCD
4.3	Mechanism of cell mediated immune response	4	Lecture	PPT & White board
4.4	Complement pathway: Classical	1	Lecture	Smart Board
4.5	Alternate & Lectin pathway	2	Lecture	Black Board
4.6	Hybridoma technology	2	Discussion	Google classroom
4.7	Monoclonal antibodies in therapeutic and diagnosis.	2	Chalk & Talk	LCD
4.8	Transplantation - Types of grafts	1	Discussion	Black Board
UNIT -5 HYPERSENSITIVITY AND IMMUNE DISEASE				
5.1	Hypersensitivity reactions	2	Chalk & Talk	Black Board
5.2	Type I - anaphylactic reactions	2	Chalk & Talk	LCD
5.3	Type II - cytotoxic reactions	2	Lecture	PPT & White board
5.4	Type III - immune complex reactions	2	Lecture	Smart Board
5.5	Type IV - delayed type hypersensitivity reactions.	2	Lecture	Black Board
5.6	Autoimmune disease – Rheumatoid Arthritis -	2	Discussion	Google classroom
5.7	Immunodeficiency disease - SCID	2	Lecture	PPT

5.8	AIDS	1	Discussion	Black Board
-----	------	---	------------	-------------

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PP T 5 Mks				
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC	NON - SCHOLASTIC	MARKS
------------	------------------	-------

C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Outline the types of immunity, immunization and origin of immune cells	K2	PSO1, PSO4
CO 2	Explain the structure and properties of antigen and antibody	K2	PSO4, PSO8, PSO10
CO 3	Identify the antigen and antibody interactions and the steps involved in the immunological techniques	K3	PSO1, PSO4, PSO8
CO 4	Illustrate the types and mechanism of immune response and events in hybridoma technology	K2	PSO1, PSO8, PSO10
CO 5	Describe the types of hypersensitivity reactions and autoimmune diseases	K2	PSO1, PSO4, PSO8

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	3	2	2	2	2	2	2	2	2

C02	2	2	2	3	2	2	2	3	2	2	2	2
C03	3	2	2	2	2	2	2	2	2	2	2	2
C04	3	2	2	2	2	2	2	2	2	2	2	2
C05	3	2	2	3	2	2	2	2	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
C01	3	2	1	2
C02	2	2	1	2
C03	2	2	3	2
C04	2	2	3	2
C05	3	2	3	2

Note: ♦ Strongly Correlated – 3
 ♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:
Dr. Sr. Biji Cyriac

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
 & Name**

III B.Sc. Zoology**SEMESTER –VI*****For those who joined in 2019 onwards***

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEG ORY	HRS/WE K	CREDIT S
UAZO	19Z6CC18	Principles of Biotechnology	Lecture	5	4

COURSE DESCRIPTION

This course encompasses a wide range of procedures for modifying living organisms according to human purposes and it is the application of biological organisms, systems, or processes by various industries to learning about the science of life and the improvement of the value of materials and organisms

COURSE OBJECTIVES

- To familiarize the use of the techniques of engineering and technology in Biology for the study of living organisms,
- To modify products or processes for specific use.
- To find solution of problems concerning human activities including agriculture, medical treatment, industry and environment

UNITS**UNIT I: INTRODUCTION OF BIOTECHNOLOGY (15 HRS.)**

Introduction to Biotechnology - Biotechnology as an interdisciplinary pursuit, History and scope of Biotechnology, Applications of Biotechnology,

Biosafety guidelines and Containments - Brief account on Intellectual Property Rights – Copyrights, traditional knowledge and Patents.

Self – Study - Biotechnology as an interdisciplinary pursuit, History and scope of Biotechnology

UNIT II: TOOLS AND TECHNIQUES IN BIOTECHNOLOGY (15 HRS.)

Basic steps of recombinant DNA technology (Insulin production), Enzymes involved- Ligase, restriction endonuclease, polymerase, modifying enzymes- Klenow fragment, Alkaline phosphatase, DNA methylases. Vectors – pBR322, Phage & Cosmids, Coupling tools- adaptors, Linkers and Homopolymer tailing. **Gene transfer mechanisms** –Transformation, Electroporation, Liposome mediated transfer & Microinjection. Polymerase chain reaction (Working Principle only)

UNIT III: ANIMAL CELL CULTURE TECHNIQUES (15 HRS.)

Basic techniques in animal cell culture and organ culture, Primary Culture and Cell lines, Culture media- Natural and Synthetic, Cryopreservation of cultures. Stem cells: culture, types and applications. Agarose and Polyacrylamide Gel Electrophoresis, Southern, Northern and Western blotting, DNA Fingerprinting - RFLP.

UNIT IV: APPLIED BIOTECHNOLOGY-I (15 HRS.)

Production of human healthcare products – Insulin, Vaccine (Genetically engineered vaccine - Hepatitis B vaccine, FMD vaccine, & Edible vaccine) - Application of Biotechnology in Agriculture - Biofertilizer –VAM fungi: Mass production and Field applications - Biopesticide - *Bacillus thuringiensis* as a pest control.

Self- Study - Biofertilizer –VAM fungi

UNIT V: APPLIED BIOTECHNOLOGY-II (15 HRS.)

Application of Biotechnology in Industry: Single Cell Protein - Methods of Production & applications of *Spirulina*. Environmental Biotechnology: Sewage treatment - Primary, Secondary & Tertiary treatment, Composting - Indore & Bangalore method, Bioremediation-Methods - *In situ* Bioremediation, Composting, Land Farming & Digestion in above ground reactors.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

TEXT BOOK:

- 1.Kumaresan.V, Biotechnology, Saras Publication, Nagercoil, (2005).

REFERENCE BOOKS:

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

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.oercommons.org/courseware/lesson/15022/overview>
2. <https://loyalistlibrary.com/biotechnology/oer>

3. <https://www.oercommons.org/authoring/8657-biotechnology-resources>
4. <https://www.nature.com/nbt/articles?type=resource>
5. <https://libguides.umgc.edu/biotechnology>
6. http://biotechnologygateway.googlepages.com/open_access_e_books.html

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION OF BIOTECHNOLOGY				
1.1	Introduction to Biotechnology	2	Chalk & Talk	Black Board
1.2	Biotechnology as an interdisciplinary pursuit	2	Discussion	Google Cllsroom
1.3	History and scope of Biotechnology	2	Discussion	Google Cllsroom
1.4	Applications of Biotechnology	1	Chalk & Talk	Black Board
1.5	Biosafety guidelines	2	Lecture	PPT
1.6	Containments	2	Chalk & Talk	Black Board
1.7	Gentically Engineered Organisms ;Pros and Cons	2	Chalk & Talk	Black Board
1.7	Brief account on Intellectual Property Rights.	2	Discussion	Google classroom

UNIT - 2 TOOLS AND TECHNIQUES IN BIOTECHNOLOGY

2.1	Basic steps of recombinant DNA	1	Chalk & Talk	Green Board
2.2	Insulin production	2	Chalk & Talk	Black Board
2.3	Enzymes involved- Ligase and Klenow fragment	1	Chalk & Talk	Black Board
2.4	DNA modifying enzymes: Restriction endonuclease	1	Chalk & Talk	Black Board
2.5	Alkaline phosphatase and DNA methylases	1	Chalk & Talk	Black Board
2.6	Vectors – pBR322	1	Chalk & Talk	Black Board
2.7	Vectors- Phage & Cosmids	1	Lecture	PPT
2.8	Coupling tools- Adaptors, Linkers and Homopolymer tailing	2	Chalk & Talk	Black Board
2.9	Gene transfer mechanisms – Transformation & Microinjection	1	Lecture	PPT & White board
2.10	Gene transfer mechanisms Electroporation & Liposome mediated transfer	2	Lecture	LCD
2.11	Polymerase chain reaction (Working Principle only)	2	Lecture	PPT

UNIT - 3 ANIMAL CELL CULTURE TECHNIQUES

3.1	Basic techniques in animal cell culture	2	Lecture	PPT
3.2	Organ culture	1	Lecture	PPT & White board
3.3	Primary Culture and Cell lines	2	Lecture	LCD
3.4	Culture media- Natural and Synthetic	1	Lecture	LCD
3.5	Cryopreservation of cultures	1	Lecture	LCD
3.6	Stem cells culture	1	Lecture	PPT & White board
3.7	Stem Cells- types and applications	1	Lecture	PPT & White board
3.8	Agarose Gel Electrophoresis	1	Lecture	PPT & White board
3.9	Polyacrylamide Gel Electrophoresis(SDS PAGE)	1	Lecture	LCD
3.10	Southern blotting	1	Lecture	PPT & White Board
3.11	Northern and Western blotting	1	Lecture	PPT & White Board
3.12	DNA Fingerprinting - RFLP	2	Lecture	PPT & White Board

UNIT – 4 APPLIED BIOTECHNOLOGY-I

4.1	Production of human healthcare products – Insulin	2	Chalk & Talk	Black Board
4.2	Genetically engineered vaccine - Hepatitis B vaccine	2	Lecture	LCD
4.3	FMD vaccine	2	Discussion	Google classroom
4.4	Edible vaccine	1	Lecture	LCD
4.5	Application of Biotechnology in Agriculture	2	Lecture	LCD
4.6	Biofertilizer –VAM fungi	2	Chalk & Talk	Black Board
4.7	Mass production and Field applications	2	Lecture	LCD
4.8	Biopesticide - <i>Bacillus thuringiensis</i> as a pest control.	2	Lecture	LCD
UNIT – 5 APPLIED BIOTECHNOLOGY-II				
5.1	Application of Biotechnology in Industry	1	Chalk & Talk	Black Board
5.2	Single Cell Protein - Methods of Production	2	Chalk & Talk	Black Board
5.3	Single Cell Protein - Applications of <i>Spirulina</i>	1	Chalk & Talk	Black Board

5.4	Environmental Biotechnology	2	Lecture	LCD
5.5	Sewage treatment – Primary	2	Chalk & Talk	Black Board
5.6	Sewage treatment- Secondary & Tertiary treatment	2	Lecture	PPT & White board
5.7	Composting - Indore & Bangalore method	2	Lecture	PPT & White board
5.8	Bioremediation	1	Lecture	PPT & White board
5.9	Methods - <i>In situ</i> Bioremediation, Composting, Land Farming & Digestion in above ground reactors	2	Lecture	LCD

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks	T2 10 Mks	Quiz 5 Mks	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %

Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the principles and applications of Biotechnology biosafety guidelines and IPR for the benefit of mankind	K1	PSO1, PSO2 & PSO4

CO 2	Discuss the tools and Techniques to manipulate DNA using rDNA technology for the development of transgenic plants, animals, and microbes or products for specific use	K2	PSO1, PSO2, PSO4 & PSO5
CO 3	Describe basic techniques in animal cell culture and the application of stem cell production.	K1	PSO1, PSO4, PSO6 & PSO10
CO 4	Summarize the biotechnology products and applications in the healthcare products, medicine, agriculture	K2	PSO1, PSO4, PSO6 & PSO10
CO 5	Analyse the appropriate technology and application of biotechnology in industry and environmental sectors to increase SCP production and sewage management.	K3	PSO1, PSO4, PSO6, PSO8 & PSO10

Mapping of COs with PSOs

CO/ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1	3	2	2	3	2	2	2	2	2	2	2	2
CO2	3	2	2	3	2	2	2	2	2	2	2	2
CO3	3	2	2	3	2	2	2	2	2	3	2	2
CO4	3	2	2	3	2	1	2	2	2	3	2	2
CO5	3	2	2	3	2	1	2	1	2	3	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	3	2
CO2	3	2	3	2
CO3	3	2	3	2
CO4	3	2	3	2
CO5	3	2	3	2

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. N.Malathi

Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER –VI***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WEE K	CREDIT S
UAZO	19Z6CC19	Lab - Immunology	Practical	3	2

COURSE DESCRIPTION

The overall objective of this course is to provide the undergraduate students of Zoology an experience of exploring immunological principles through experimentation and to introduce the procedures, basic techniques and instruments used in the clinical laboratories.

COURSE OBJECTIVES

- Acquire skills in handling basic equipments
- Estimate the various biomolecules using standard protocols
- Critically analyze and interpret the results
- Design experiments to solve research problems

IMMUNOLOGY

1. Virtual dissection and onscreen display of lymphoid organs of mouse.
2. Separation of serum and plasma.
3. Separation of lymphocytes from peripheral blood and counting in Haemocytometer.
4. ABO blood grouping in man.
5. Single radial immunodiffusion.
6. Rheumatoid factors – Demo.

Spotters: Lymphoid organs- thymus, spleen, lymph nodes and Bone marrow,
Ig – Models.

EMBRYOLOGY

Spotters: Embryonic stages of Chick (24 or 48 hrs); Mammalian Sperm and Ovum, Stages of Human embryo and Placenta of goat.

CLINICAL LABORATORY TECHNIQUES

1. Laboratory biosafety guidelines
2. Preparation of stained blood film to study various types of blood cells.
3. Total W.B.C. & R.B.C. count
4. Differential leukocyte count
5. Qualitative analysis of urine for glucose- Benedict's Test.
6. Qualitative analysis of urine for albumin-Biuret Test.
7. Qualitative analysis of Ketone – Rothera's Test.
8. Qualitative analysis of urine for Urea -Urease Test.
9. Qualitative analysis of Creatinine- Jaffe's Test.
10. Field visit to clinical laboratory & report submission

REFERENCE BOOKS:

1. Hudson, L., Hay, F.C. (1986). *Practical Immunology*. 3rd ed., Blackwell Publishing, London.
2. Garvey, J.S., Cremer, N.E., Sussdorf, D.H. (1983). *Methods in Immunology*. 3rd ed., Benjamin / Cummins Publishing, London.
3. Stites, D.P., Terr, A.L., Parslow, T.G. (1994). *Basic and Clinical Immunology*. Prentice Hall Publishing, Canada.
4. Mukerjee, K.L. and Gosh, S. (2010). *Medical Laboratory Technology*. Volume II, McGraw Hill, New Delhi-17.
5. Harold Varley. (2005). *Practical Clinical Biochemistry*. 4th ed. CBS Publishers Pvt Ltd, New Delhi-02.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://bio.davidson.edu/courses/immunology/Bio307.html>

2. <https://www.oercommons.org/courses/clinical-immunology>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5633739/>
4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC379057/>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7904692/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
IMMUNOLOGY				
1.1	Virtual dissection and onscreen display of lymphoid organs of mouse	1	Demonstration & hands on training	LCD, Online Virtual Dissection Tools
1.2	Separation of serum and plasma	1	Demonstration & hands on training	Black board
1.3	Separation & counting of lymphocytes	4	Demonstration & hands on training	Microscope
1.4	ABO blood grouping	1	Demonstration & hands on training	Teaching Kit PPT & White board
1.5	Single radial immunodiffusion	1	Demonstration & hands on training	Teaching Kit
1.6	Rheumatoid factors	1	Demonstration	Teaching Kit
1.7	Spotters: Lymphoid organs- thymus, spleen, lymph nodes and Bone marrow, Ig – Models.	1	Specimen & Models	Microscope

EMBRYOLOGY				
2	Spotters: Embryonic stages of Chick (24 or 48 hrs); Mammalian Sperm and Ovum, Stages of Human embryo and Placenta of goat.	1	Permanent Slides & Preserved Specimen	Microscope
CLINICAL LABORATORY TECHNIQUES				
3.1	Laboratory biosafety guidelines	1	Lecture	LCD
3.2	Preparation of stained blood film	1	Demonstration & hands on training	Microscope
3.3	Total W.B.C. & R.B.C. count	1	Demonstration & hands on training	Microscope
3.4	Differential leukocyte count	1	Demonstration & hands on training	Microscope
3.5	Qualitative analysis of urine for glucose- Benedict's Test	1	Demonstration & hands on training	Black Board
3.6	Qualitative analysis of urine for albumin-Biuret Test	1	Demonstration & hands on training	Black Board
3.7	Qualitative analysis of Ketone – Rothera's Test	1	Demonstration & hands on training	Black Board
3.8	Qualitative analysis of urine for Urea -Urease Test	1	Demonstration & hands on training	Black Board
3.9	Qualitative analysis of Creatinine- Jaffe's Test	1	Demonstration & hands on training	Black Board
3.10	Field visit to clinical laboratory & report	-	On-site Learning	=

	submission			
--	------------	--	--	--

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Relate the knowledge of basic principles of immunology to carry out the related experiments	K1	PSO1, PSO2 PSO4, PSO7 PSO8 & PSO10
CO 2	Acquire skills in handling basic equipments	K2	PSO1, PSO2 PSO4, PSO7 PSO8 & PSO10
CO 3	Infer the outcome of the experiments of Immunology	K2	PSO1, PSO2 PSO4, PSO7 PSO8 & PSO10
CO 4	Relate the biochemical properties of Glucose, Albumin & Ketone bodies while performing the qualitative analytical tests for their detection in urine sample	K1	PSO1, PSO2 PSO4, PSO8 & PSO10

CO 5	Develop familiarity with the principles of Laboratory safety	K3	PSO1 PSO2 PSO4 PSO7 PSO8
-------------	--	-----------	--------------------------------------

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO12
CO1	3	3	2	2	2	2	3	3	2	3	2	2
CO2	3	3	2	2	2	2	3	3	2	3	2	2
CO3	3	3	2	2	2	2	3	3	2	3	2	2
CO4	3	3	2	2	2	2	3	3	2	2	2	2
CO5	3	3	2	2	2	2	3	3	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	3	2
CO2	3	2	3	2
CO3	3	2	3	2
CO4	3	2	3	2
CO5	3	2	3	3

Note: ♦ Strongly Correlated – 3
 ♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:

Dr. A Tamil Selvi Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER – VI*****For those who joined in 2019 onwards***

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/ WEEK	CREDI TS
UAZO	19Z6CC20	Lab - Biotechnology	Practical	3	2

COURSE DESCRIPTION

Students gain hands-on experience and learn the theoretical basis of lab techniques common to a variety of biological disciplines such as biotechnology, Bioinformatics and Entomology and they will work in groups, learning how to collect, analyze, and present data while using the scientific method to conduct inquiry-based laboratory experiments.

COURSE OBJECTIVES

- Introductory laboratory course in current principles and techniques applicable to research problems in biotechnology, Bioinformatics and Entomology
- Learners can identify insects and able to group them into different taxa
- Learners gain knowledge handling biological database and retrieve information

UNITS

UNIT – I BIOTECHNOLOGY

1. Laboratory biosafety guidelines
2. Isolation of protein from spinach leaves
3. Estimation of Total soluble proteins using Bradford method
4. Electrophoretic separation proteins
5. Isolation of genomic DNA from goat liver/Bacteria.
6. Isolation of Plasmid DNA by alkaline lysis method.
7. Electrophoretic separation of DNA.
8. Demonstration of PCR.
9. Spotters: Agarose gel electrophoresis, SDS-PAGE, pBR322, Spirulina and Insulin

UNIT-II ENTOMOLOGY

1. Collection and Preservation of Insects.
2. Spotters: Mouth parts of Cockroach & Honey bee; Life Cycle of Holometabolous (Butterfly) and Hemimetabolous Insects (Cockroach), Pests of Agricultural Importance – Rice Weevil, Rhinoceros Beetle.

UNIT- III BIOINFORMATICS

1. Sequence retrieval from GenBank
2. Pairwise alignment - BLAST
3. Molecular visualization of Proteins- RASMOL

REFERENCE BOOKS:

1. Rajan S., Christy, S.R., (2011) Experimental procedures in Life Sciences, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015) Advanced Practical Zoology, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008) Techniques in Life Sciences, 1st ed., Himalaya Publishing House

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.oercommons.org/courseware/lesson/15022/overview>
2. <https://www.oercommons.org/authoring/8657-biotechnology-resources/4/view>
3. <https://www.wileyindia.com/practical-biotechnology-principles-and-protocols.html>
4. https://www.researchgate.net/publication/303997580_Principles_of_Biotechnology-Practical_Manual
5. https://www.apsnet.org/edcenter/disimpactmngmnt/labexercises/Plant_Biotechnology/Pages/Activity5.aspx

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
BIOTECHNOLOGY				
1.1	Laboratory biosafety guidelines	3	PPT & Discussion	LCD
1.2	Isolation of protein from spinach leaves	3	Hands on training	Chemicals, Glass wares & Instruments
1.3	Estimation of Total soluble proteins using Bradford method	3	Hands on training	Chemicals, Glass wares & Instruments
1.4	Electrophoretic separation proteins	3	Demonstration	Chemicals, Glass wares & Instruments
1.5	Isolation of genomic DNA from goat liver.	3	Hands on training	Chemicals, Glass wares & Instruments
1.6	Isolation of Plasmid DNA by alkaline lysis method	3	Hands on training	Chemicals, Glass wares & Instruments

1.7	Electrophoretic separation of DNA	3	Hands on training	Chemicals, Glass wares & Instruments
1.8	Demonstration of PCR	3	Demonstration	Chemicals, Glass wares & Instruments
1.9	Spotters: Agarose gel electrophoresis, SDS-PAGE, pBR322, Spirulina and Insulin	3	Demonstration	Specimens, Models, Print-Outs, Bio-Visula Charts

ENTOMOLOGY

2.1	Collection and Preservation of Insects.	3	Demonstration	Model and specimens
2.2	Spotters: Mouth parts of Cockroach & Honey bee;	3	Demonstration & Hands on training	Glass Slide, Microscope and chemicals etc.,
2.3	Spotters: Life Cycle of Holometabolous (Butterfly) and Hemimetabolous Insects (Cockroach)	3	Demonstration	Bio-Visual Charts, LCD
2.4	Spotters: Pests of Agricultural Importance – Rice Weevil, Rhinoceros Beetle.	3	Demonstration	Specimens, Models, Preserved Insect Box

BIOINFORMATICS

3.1	Sequence retrieval from GenBank	3	Demonstration & Hands on training	LCD
3.2	Pairwise alignment - BLAST	3	Demonstration & Hands on training	LCD
3.3	Molecular visualization of Proteins- RASMOL	3	Demonstration & Hands on training	LCD

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

O. N	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
------	-----------------	--	----------------

CO 1	Acquire skills in handling basic equipments	K1	PSO1, PSO2, & PSO7
CO 2	Identify the insects	K1	PSO1, PSO2 & PSO4
CO 3	Estimate the various biomolecules using standard protocols	K3	PSO1, PSO2 & PSO7
CO 4	Identify and comment on the spotters Agarose gel electrophoresis, SDS-PAGE, pBR322, Spirulina and Insulin and Bioinformatics tools	K3	PSO1, PSO2 PSO8 & PSO10
CO 5	Examine the features in mouth parts of Cockroach & Honey bee, Pests of Agricultural Importance – Rice Weevil, Rhinoceros Beetle	K4	PSO1 & PSO 4

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1	3	3	2	2	2	2	3	2	2	2	2	2
CO2	3	2	2	3	2	2	2	2	2	2	2	2
CO3	3	3	2	2	2	2	3	2	2	2	2	2
CO4	3	3	2	2	2	2	2	2	2	3	2	2
CO5	3	2	2	3	2	2	2	2	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	3	2
CO2	3	2	2	2
CO3	3	2	3	2
CO4	3	2	3	2
CO5	3	2	2	2


Note: ♦ Strongly Correlated – 3
♦ Weakly Correlated -1

♦ Moderately Correlated – 2

COURSE DESIGNER:

Dr. N. Malathi

Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER –VI***For those who joined in 2019 onwards*

PROGR AMME CODE	COURSE CODE	COURSE TITLE	CATEG ORY	HRS/W EEK	CRED ITS
UAZO	19Z6ME3	Embryology	Lecture	5	5

COURSE DESCRIPTION

This course imparts knowledge on the developmental process of egg to the formation of organism.

COURSE OBJECTIVES

To acquaint with the basic concepts of development of Organisms.

UNITS**UNIT –I INTRODUCTION TO EMBRYOLOGY****(15 Hrs)**

Historical Thoughts – Theories - Preformation, Epigenesis, Baer's Law, Biogenetic Law, Pangenesis, Germ Plasm, Gradient Theory; Branches and Scope of Embryology

Gametes - Structure and Types of sperms and eggs - influence of yolk - polarity - symmetry - Egg membranes.

UNIT II - GAMETOGENESIS & FERTILIZATION**(15 Hrs)**

GAMETOGENESIS: Spermatogenesis and Oogenesis; Semination and Ovulation - Hormonal Control and factors affecting Ovulation & Induced Ovulation in Fisheries.

Fertilization - Physical, Chemical, Cytological and Physiological factors; Parthenogenesis – Types & Significance.

UNIT III - EARLY EMBRYONIC DEVELOPMENT**(15 Hrs)**

Cleavage: Salient features, Planes, Patterns and Physiology of Cleavage- Morphogenetic movements and Fate map; Cleavage, Gastrulation and Fate map of Frog, Chick and Rabbit.

UNIT IV - ORGANOGENESIS**(15 Hrs)**

Development of Brain, Eye, Heart and Foetal membranes in Chick and Mammals; Placenta - Characteristics, Classification, Functions and Development.

UNIT V - HUMAN EMBRYOLOGY**(15 Hrs)**

Sexual Cycles; Gastrulation, Implantation, development of germ layer, development of foetus (Brief account on Trimester stages); In vitro Fertilization; Infertility - Types and methods of treatment; Birth Control methods; Embryonic Stem Cell & its applications.

TEXTBOOKS:

1. Arumugam, N., (2014). *A Text Book of Embryology*. Fourteenth Edition. Saras Publication, Nagarcoil.
2. Bhatnagar S.M., Kothari M.L., Lopa A. Mehta and Natarajan, M., (2000). *Essentials of Human Embryology* -Third Edition, Orient Longman Ltd., Hyderabad, India.

REFERENCES:

1. Balinsky, B.I., (1981). *Introduction to Embryology*, Saunders, Philadelphia.
2. Majumdar. N.N., (1990). *Text book of Vertebrate Embryology*. Tata Mc-Graw-Hill Publishing Company Ltd, New Delhi.
3. McEwen, R.S., (1969). *Vertebrate Embryology*. Oxford and IBH Publishing Co., New Delhi.
4. Jam, P.C., (1998). *Elements of Developmental Biology*. Vishal Publication, Delhi.
5. Verma, P.S., V.K. Agarwal and Tyagi, (1995). *Chordate Embryology*, S. Chand & Co., New Delhi.
6. Vijiya D Joshi, *Prep Manual for Undergraduates Physiology* (2001), Second Edition, B. I. Published by Churchill Livingstone, New Delh

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://embryology.med.unsw.edu.au/>
2. <https://www.med.umich.edu/lrc/coursepages/m1/embryology/embryo/links.htm>

3. <http://www.tulane.edu/~embryo/>

4. <https://www.3dembryoatlas.com/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO EMBRYOLOGY				
1.1	Branches and Scope of Embryology	2	Chalk & Talk	Black Board
1.2	Historical Thoughts – Theories - Preformation, Epigenesis, Baer's Law, Biogenetic Law, Pangenesis, Germ Plasm, Gradient Theory	4	Chalk & Talk	LCD
1.3	Gametes - Structure and Types of sperms and eggs - influence of yolk - polarity - symmetry - Egg membranes.	4	Lecture	LCD
UNIT -2 GAMETOGENESIS & FERTILIZATION				
2.1	Spermatogenesis and Oogenesis; Semination and Ovulation	4	Lecture	LCD
2.2	GAMETOGENESIS: - Hormonal Control and factors affecting Ovulation & Induced Ovulation in Fisheries.	2	Chalk & Talk	Green Board
2.3	Fertilization - Physical, Chemical, Cytological and Physiological factors	5	Lecture	LCD

2.4	Parthenogenesis – Types & Significance.	2	Lecture	PPT
UNIT -3 EARLY EMBRYONIC DEVELOPMENT				
3.1	Cleavage: Salient features	2	Lecture	PPT
3.2	Cleavage: Planes, Patterns and Physiology of Cleavage	3	Lecture	PPT
3.3	Morphogenetic movements and Fate map	3	Lecture	PPT
3.4	Gastrulation and Fatemap of Frog, Chick and Rabbit.	6	Lecture	PPT
UNIT -4 ORGANOGENESIS				
4.1	Development of Brain, Eye, Heart	9	Lecture	PPT
4.2	Foetal membranes in Chick and Mammals	2	Lecture	PPT
4.3	Placenta - Characteristics, Classification, Functions and Development.	3	Lecture	PPT
UNIT -5 HUMAN EMBRYOLOGY				
5.1	Sexual Cycles; Gastrulation, Implantation, development of germ layer, development of foetus (Brief account on Trimester stages)	7	Lecture	PPT

5.2	In vitro Fertilization; Infertility – Types and methods of treatment	2	Lecture	PPT
5.3	Birth Control methods; Embryonic Stem Cell & its applications.	3	Lecture	PPT

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks	T2 10 Mks	Quiz 5 Mks	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

COURSE OUTCOME

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recall the basic concepts of developmental biology.	K1	PSO1& PSO2
CO 2	Tell how fertilization, cleavage and gastrulating occur.	K1	PSO3
CO 3	Compare the basic concepts of organogenesis in different organisms.	K2	PSO4
CO 4	Relate the development of egg into a foetus, then into adult, among Vertebrates.	K2	PSO5
CO 5	Associate the embryo development with Phylogeny.	K2	PSO7

[illegible]

CO2	2	2	3	2	2	2	2	2	2	2	2	2
CO3	2	2	2	3	2	2	2	2	2	2	2	2
CO4	2	2	2	2	3	2	2	2	2	2	2	2
CO5	2	2	2	2	2	2	2	3	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	3	2	2
CO3	2	2	2	3
CO4	2	2	2	2
CO5	2	2	3	2


Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2 ♦

Weakly Correlated -1

COURSE DESIGNER:

Dr. Antony Amala Jayaseeli

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER –VI***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
UAZO	19Z6ME4	Clinical Laboratory Technique s	Lecture	5	5

COURSE DESCRIPTION

This course provides current knowledge and upgraded skills in clinical laboratory techniques.

COURSE OBJECTIVES

- To perform routine clinical laboratory procedures within acceptable quality control parameters in urine analysis, Haematology, analysis of stool, sputum and semen.
- Perform laboratory testing with accuracy.
- Able to interpret clinical procedures and laboratory test data accurately.

UNITS**UNIT –I LABORATORY SAFETY AND STERILIZATION (15HRS.)**

Common laboratory accidents – Universal work precautions (UWP) for lab personnel - good laboratory practice - Sterilization: sterilization by heat – cold – ultra violet radiation – Ionizing radiations – Filtration – chemical sterilization - Laboratory instruments: Light microscope and centrifuge.

Self-study – Laboratory instruments: Light microscope and centrifuge

UNIT –II ANALYSIS OF URINE (15 HRS.)

Composition of urine - Collection and preservation - Physical parameter: Colour, Odour, pH, Density - Chemical parameters: Sugar, Albumin, bile salts, bile pigment, urea, uric acid, creatinine and Ketone bodies and their

clinical significances - Pregnancy tests - Gestational diabetes - Abnormal constituents (Proteinuria - Polyuria - Hematuria - Glycosuria).

Self-study – Composition of urine

UNIT –III HEMATOLOGY

(15 HRS.)

Blood: collection of blood & lab procedure- types of anaemia - bleeding time- clotting time - **Total count of RBC & WBC** - Differential count of WBC- blood grouping - haemostasis- bleeding disorder of man - Haemolytic disease of new born, **Platelet count**, reticulocytes count, Absolute Eosinophil count.

Self-study – Blood grouping

UNIT –IV ANALYSIS OF STOOL AND SPUTUM

(15 HRS.)

Faeces: Specimen collection - microscopic examination - ova, cysts occult blood, parasitic infestation - amoebic dysentery - Physical and chemical examination of stool - Stool Culture and sensitivity. Sputum: Macroscopic & Microscopic examination of sputum - AFB staining - Sputum culture.

UNIT –V SEMEN ANALYSIS

(15 HRS.)

Semen: Collection of semen - Semen analysis - motility, total count - abnormality. STD: AIDS, syphilis, gonorrhea. Amniocentesis: Need-procedure for collection- Karyotype studies. Safe disposal of bio medical wastes - incineration.

TEXT BOOK:

Sood R. (2009) *Medical Laboratory Technology: Methods and Interpretations* Vol 1, 6th ed., Jaypee Brothers Medical Publishers, New Delhi.

REFERENCES:

1. J. E. Park, (2007) *Text Book of Preventive Medicine*, Benansider Bhanot - Napier Town.
2. Kanai L. Mukherjee, (1988) *Medical Laboratory Technology, vol. I*, Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. Kanai L. Mukherjee, (1988) *Medical Laboratory Technology, vol. II* Tata McGraw Hill Publishing Company Ltd., New Delhi

4. Kanai L. Mukherjee, (1990) *Medical Laboratory Technology*, vol. III, Tata McGraw Hill Publishing Company Ltd., New Delhi
5. Monica Cheesbrough, (1998). *Medical Laboratory manual of tropical countries*.
6. Manual of Basic Techniques for a Healthy Laboratory – Published by WHO in 1980 Academic Publishers, Calcutta – 700 073.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5667583/>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3735139/>
3. <https://www.ncbi.nlm.nih.gov/books/NBK302/>
4. <https://www.ncbi.nlm.nih.gov/books/NBK560808/>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4317545/>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 LABORATORY SAFETY AND STERILIZATION				
1.1	Common laboratory accidents – Universal work precautions (UWP) for lab personnel	4	Chalk & Talk	Black Board
1.2	good laboratory practice	3	Chalk & Talk	LCD
1.3	Sterilization: sterilization by heat – cold – ultra violet radiation – Ionizing radiations	4	Lecture	PPT
1.4	Filtration – chemical sterilization.	4	Lecture	Black Board

1.5	Laboratory instruments: Light microscope and centrifuge		Discussion	
UNIT - 2 ANALYSIS OF URINE				
2.1	Composition of urine - Collection and preservation	2	Chalk & Talk	Black Board
2.2	Physical parameter: Colour, Odour, pH, Density	2	Chalk & Talk	LCD
2.3	Chemical parameters: Sugar, Albumin, bile salts, bile pigment, urea	3	Lecture	PPT
2.4	uric acid, creatinine and Ketone bodies and their clinical significances	3	Lecture	Black Board
2.5	Pregnancy tests – Gestational diabetes	2	Chalk & Talk	Black Board
2.6	Abnormal constituents (Proteinuria – Polyuria – Hematuria – Glycosuria)	3	Chalk & Talk	LCD
UNIT -3 HEMATOLOGY				
3.1	Blood: collection of blood & lab procedure	2	Chalk & Talk	Black Board
3.2	types of anaemia	2	Chalk & Talk	LCD
3.3	bleeding time- clotting time	2	Chalk & Talk	Smart Board
3.4	Total count of RBC & WBC - Differential count of WBC- Blood grouping	2	Lecture	Black Board
3.5	haemostasis- bleeding disorder of man - Haemolytic disease of newborn	2	Chalk & Talk	Black Board
3.6	Platelet count, reticulocytes count, Absolute Eosinophil	3	Chalk	LCD

	count		&Talk	
UNIT -4 ANALYSIS OF STOOL AND SPUTUM				
4.1	Faeces: Specimen collection	2	Chalk & Talk	Black Board
4.2	microscopic examination – ova, cysts occult blood, parasitic infestation	2	Chalk & Talk	LCD
4.3	amoebic dysentery	1	Lecture	PPT
4.4	Physical and chemical examination of stool	3	Lecture	Smart Board
4.5	Stool Culture and sensitivity	2	Chalk & Talk	Black Board
4.6	Sputum: Macroscopic and Microscopic examination of sputum	3	Chalk & Talk	LCD
4.7	AFB staining Sputum culture	2	Chalk & Talk	Black Board
UNIT -5 SEMEN ANALYSIS				
5.1	Semen: Collection of semen	3	Chalk & Talk	Black Board
5.2	Semen analysis – motility, total count and abnormality	3	Chalk & Talk	LCD
5.3	STD: AIDS, syphilis, gonorrhea	3	Lecture	PPT
5.4	Amniocentesis: Need, procedure for collection and Karyotype studies	3	Lecture	Smart Board
5.5	Safe disposal of bio medical wastes – incineration	3	Lecture	Black Board

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total

10	10	5	5	5	5	40	60	100
----	----	---	---	---	---	----	----	-----

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	List the different sterilization methods followed in clinical laboratory.	K1	PSO2
CO 2	Explain the collection method and techniques used in laboratory for urine analysis.	K2	PSO2
CO 3	Outline the method of blood collection and related analysis.	K2	PSO2
CO 4	Find the way to process clinical specimens safely according to established procedures.	K3	PSO8
CO 5	Utilize the knowledge of karyotyping in detection of congenital malformations.	K3	PSO1

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
------------	----------	----------	----------	----------	----------	----------	----------	----------	----------	-----------	-----------	-----------

CO1	2	3	2	2	2	2	2	2	2	2	2	2
CO2	2	3	2	2	2	2	2	2	2	2	2	2
CO3	2	3	2	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	2	2	2	3	2	2	2	2
CO5	3	2	2	2	2	2	2	2	2	2	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	2	2	3	2
CO3	2	2	3	2
CO4	2	2	2	2
CO5	2	2	3	2

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
 ♦ Weakly Correlated -**1**

COURSE DESIGNER:
Dr. S. Barathy

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
 & Name**

III B.Sc. Zoology**SEMESTER –VI***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z6ME5	Bioinformatics	Lecture	5	5

COURSE DESCRIPTION

This course focuses on the various biological databases, sequence analysis of pairwise alignment, multiple sequence alignment and basics of phylogenetic tree construction. It outlines the principle and method of secondary **structure prediction** and tertiary structure prediction.

COURSE OBJECTIVES

To enable the students to appreciate the significance of computational programs in the development and **analysis of biological database**

UNITS**UNIT –I COMPUTERS AND BIOLOGICAL DATABASES (15 HRS.)**

Introduction- Definition, History, and scope -World Wide Web - web page – Browsers - search engines - Internet protocol - TCP/IP - Biological Database- classification of databases- Nucleotide sequence database: Genbank, EMBL.

Self-study – History of bioinformatics**UNIT –II PROTEIN DATABASES (15 HRS.)**

Protein sequence database: UniProtKB - Secondary database: PROSITE - Structure database – PDB - Human genome project.

Self-study - Secondary database

UNIT –III PAIRWISE ALIGNMENT**(15 HRS.)**

DOTPLOT - **Similarity and homology** – Scoring matrices (PAM&BLOSUM), Local alignment, Global alignment – gapped and ungapped alignment – BLAST: Method and types.

Self-study - DOTPLOT**UNIT –IV MULTIPLE SEQUENCE ALIGNMENT****(15 HRS.)**

Introduction to Multiple sequence alignment – methods and applications- CLUSTALO. **Phylogenetic analysis**: rooted and unrooted tree, UPGMA and NJ algorithm.

Self-study - CLUSTALO**UNIT –V PROTEIN STRUCTURE PREDICTION****(15 HRS.)**

Secondary structure prediction: Chou – Fasman method, GOR method –*In silico* structure prediction of proteins - Homology modeling: model generation, validation and refinement – Ramachandran plot.

Self-study – Threading and *ab initio* modeling**REFERENCES:**

1. Attwood T.K and Smith P.D.J. (2001). *Introduction to Bioinformatics*. 1st ed., Pearson Education Pvt. Ltd., New Delhi.
2. Baxevanis A.D. (2003). *A practical guide to the analysis of genes and proteins*. Wiley-Interscience, Singapore.
3. Mount D.W. (2001). *Bioinformatics – Sequence and Genome Analysis*. Cold Spring Harbor Laboratory Press, New York.
4. S.C. Rastogi, N. Mendiratta and P. Rastogi. (2004). *Bioinformatics: Methods and applications*. Prentice – hall of India Private Limited, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. www.ncbi.nlm.nih.gov
2. www.uniprot.org
3. www.rcsb.org
4. <https://prosite.expasy.org>
5. www.ncbi.nlm.nih.gov/blast/

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 BASICS OF COMPUTERS AND BIOLOGICAL DATABASES				
1.1	Introduction- Definition, and scope	3	Chalk & Talk	Black Board
1.2	World Wide Web - web page – Browsers	2	Chalk & Talk	LCD
1.3	search engines	2	Lecture	PPT & White board
1.4	Internet protocol - TCP/IP -	2	Lecture	Smart Board
1.5	Biological Database- classification of databases	2	Lecture	Black Board
1.6	Nucleotide sequence database: Genbank, EMBL.	4	Discussion	Google classroom
UNIT -2 PROTEIN DATABASES				
2.1	Protein sequence database: UniProtKB	3	Lecture	LCD
2.2	Secondary database:	3	Chalk & Talk	Green Board
2.3	PROSITE	3	Lecture	Black Board
2.4	Structure database – PDB	3	Lecture	Black Board
2.5	Human genome project	3	Lecture	Black Board
UNIT - 3 PAIRWISE ALIGNMENT				

3.1	Similarity and homology	3	Chalk & Talk	Black Board
3.2	Scoring matrices (PAM&BLOSUM)	3	Chalk & Talk	LCD
3.3	Local alignment, Global alignment	3	Lecture	PPT & White board
3.4	gapped and ungapped alignment	3	Lecture	Smart Board
3.5	BLAST: Method and types	3	Lecture	Black Board
UNIT – 4 MULTIPLE SEQUENCE ALIGNMENT				
4.1	Introduction to Multiple sequence alignment	3	Chalk & Talk	Black Board
4.2	methods and applications	3	Chalk & Talk	LCD
4.3	Phylogenetic analysis	3	Lecture	PPT & White board
4.4	rooted and unrooted tree	1	Lecture	Smart Board
4.5	UPGMA	3	Lecture	Black Board
4.6	NJ algorithm	2	Discussion	Google classroom
UNIT -5 PROTEIN STRUCTURE PREDICTION				
5.1	Secondary structure prediction: Chou – Fasman method	3	Chalk & Talk	Black Board
5.2	GOR method	2	Chalk & Talk	LCD
5.3	<i>In silico</i> structure prediction of proteins	4	Lecture	PPT & White board

5.4	Homology modeling: model generation	2	Lecture	Smart Board
5.5	Validation	1	Lecture	Black Board
5.6	Refinement	1	Discussion	Google classroom
5.7	Ramachandran plot	2	Lecture	LCD

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Enumerate the applications of bioinformatics, web browsers and search engines and biological databases	K1	PSO1& PSO4
CO 2	Describe the flat file of UniProtKB, secondary and tertiary structure prediction	K2	PSO1& PSO4
CO 3	Employ the appropriate substitution matrices and global and local alignment and BLAST	K3	PSO1 PSO4&PSO8
CO 4	Summarize the methods of multiple sequence alignment and phylogenetic tree	K2	PSO1& PSO4
CO5	Compute and develop Ramachandran plot and protein structure prediction	K3	PSO1 PSO4& PSO8

Mapping of COs with PSOs

CO/ PSO	PS O1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	3	2	2	2	2	2	2	2	2
CO2	2	2	2	3	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	3	2	2	3	2	2	2	2	2	2	2	2
CO5	3	2	2	3	2	2	2	3	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	2	2	2	2
CO3	2	2	3	2
CO4	2	2	2	2
CO5	2	2	3	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:**Dr. J. Asnet Mary****Forwarded By**


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
 & Name**

III B.Sc. Zoology**SEMESTER –VI***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEG ORY	HRS/WE EK	CREDIT S
UAZO	19Z6ME6	Entomology	Lecture	5	5

COURSE DESCRIPTION

This course provides knowledge about the interaction of insects with human and environment.

COURSE OBJECTIVES

- Understand about the classification, biology and control of insects.
- Appreciate the importance of beneficial insects.
- Acquire skills for collecting, mounting and preserving insects for scientific study.

UNITS**UNIT –I TAXONOMY****(15HRS.)**

Definition & outline **classification** of Class- Insecta upto orders - Salient features of some economically important insect orders: Thysanura, Orthoptera, Isoptera, Hemiptera, Coleoptera, Lepidoptera, Dermaptera, Odonata, Neuroptera and Hymenoptera - Collection of insects - methods - collecting equipment - mounting - preservation.

Self-study – Mounting and preservation**UNIT –II MORPHOLOGY AND METAMORPHOSIS****(15 HRS.)**

General structural organization of insects: head, compound eyes, antennae, mouthparts; thorax- legs, wings; abdomen – nongenital & genital abdominal

appendages. Brief account on metamorphosis, moulting, diapause. Brief account on special glands of insects-wax gland, silk gland and pheromone gland. Bioluminescence.

Self-study – mouthparts, metamorphosis, moulting and silk gland

UNIT –III BENEFICIAL INSECTS

(15 HRS.)

Beneficial aspects of insects-role of insects as pollinators of crops-insects as bio agents in control of crop pests - insects as suppliers of useful products-honey, propolis, royal jelly, bee wax, silk, natural dye, insect galls, cantharidin - Lac insect: culture - harvesting.

UNIT –IV HARMFUL INSECTS

(15 HRS.)

Pests-definition, kinds of pests - Brief account & control measures of the following pests: -

Household insect pests- Cockroach & silver fish, medically important insects-*Anopheles*, *Culex*, *Aedes*, sand flies, black flies- insects injurious to livestock-Horse flies, Warble flies.

UNIT –V INSECT PEST OF AGRICULTURAL CROPS

(15 HRS.)

Pests of crops - brief account on pink cotton boll worm, paddy stem borers, red hairy caterpillar & Rhinoceros Beetle - Pests of stored grains - Rice Weevil, grain moth, Rice moth, flour beetle, Khapra beetle, pulse beetle, management of insect pests of stored food grains - prevention & curative measures, brief account on **Integrated Pest Management** - Chemical, Biological methods of control.

TEXT BOOK:

1. Singh R. and Sachan G. C (2012) *Elements of entomology*, Rastogi Publications, Meerut, India.

REFERENCES:

1. Vasantharaj D and Kumaraswami, D., (1998) *Elements of Economic entomology*, Popular book depot, Chennai.
2. Romosa W.S and Stoffolano J.G., (1998) *The science of entomology*, Mc Grow-Hill Company, New York.

3. Pedigo LIP, (2002) *Entomology and pest management*, Pearson Education, Singapore.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4541473/>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6628405/>
3. <https://www.nature.com/articles/501S15a>
4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6391707/>
5. <https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7164>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 TAXONOMY				
1.1	Definition & outline classification of Class- Insecta up to orders	3	Chalk & Talk	Black Board
1.2	Salient feature of some economically important insect orders Thysanura, Orthoptera, Isoptera,	3	Chalk & Talk	LCD
1.3	Hemiptera, Coleoptera, Lepidoptera	2	Lecture	PPT
1.4	Dermaptera, Odonata, Neuroptera and Hymenoptera	2	Lecture	Black Board
1.5	Collection of insects- methods and collecting equipment	2	Lecture	Black Board
1.6	Mounting and preservation	1	Discussion	
UNIT -2 MORPHOLOGY AND METAMORPHOSIS				
2.1	General structural organization of insects-head	3	Lecture	Green Board

				Charts
2.2	compound eyes, antennae, Mouth parts	2	Chalk & Talk	Green Board
2.3	thorax-legs, wings; abdomen – nongenital & genital abdominal appendages	3	Chalk & Talk	Black Board
2.4	Brief account on metamorphosis, moulting, Diapause	2	Chalk & Talk	LCD
2.5	Brief account on special glands of insects-wax gland and silk gland	2	Lecture	PPT
2.6	pheromone gland. Bioluminescence	3	Chalk & Talk	LCD
UNIT -3 BENEFICIAL INSECTS				
3.1	Beneficial aspects of insects- role of insects as pollinators of crops	3	Chalk & Talk	Black Board
3.2	insects as bio agents in control of crop pests	3	Chalk & Talk	LCD
3.3	insects as suppliers of useful products-honey	2	Lecture	PPT
3.4	propolis, royal jelly, bee wax	2	Lecture	Black Board
3.5	silk, natural dye, insect galls, cantharidin	2	Lecture	Black Board
3.6	Lac insect: culture - harvesting	3	Lecture	Black Board
UNIT -4 HARMFUL INSECTS				
4.1	Pests-definition, kinds of pests	2	Chalk & Talk	Black Board

4.2	Brief account & control measures of the following pests: -Household insect pests Cockroach	3	Chalk & Talk	LCD
4.3	silver fish	2	Lecture	PPT
4.4	medically important insects- <i>Anopheles</i>	2	Lecture	Black Board
4.5	<i>Culex</i> , <i>Aedes</i> , sand flies and black flies	3	Lecture	Black Board
4.6	Insects injurious to livestock- Horse flies, Warble flies	3	Chalk & Talk	Black Board
UNIT -5 INSECT PEST OF AGRICULTURAL CROPS				
5.1	Pests of crops-brief account on pink cotton boll worm	2	Chalk & Talk	Black Board
5.2	paddy stem borers, red hairy caterpillar	2	Chalk & Talk	LCD
5.3	Rhinoceros Beetle	2	Lecture	PPT
5.4	Pests of stored grains-Rice Weevil, grain moth	2	Lecture	Black Board
5.5	Rice moth, flour beetle, Khapra beetle, pulse beetle	2	Lecture	Black Board
5.6	Management of insect pests of stored food grains-prevention & curative measures	2	Chalk & Talk	Black Board
5.7	Brief account on Integrated Pest Management-Chemical, Biological methods of control	3	Chalk & Talk	LCD

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
--------	----	----	----	----	----	------------------------	-------------------------	-----------	-----------------

	T1 10 Mks	T2 10 Mks	Qui z 5 Mks	Assignmen t 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholasti c	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	List the different methods of insect collection.	K1	PSO1
CO 2	Find the morphological modifications of insects with different functions.	K3	PSO1
CO 3	Summarize the beneficial aspects of insects. Lect	K2	PSO1
CO 4	Explain the harmful effects of insects.	K2	PSO1
CO 5	Identify the agricultural pests and the economic damage caused.	K3	PSO6

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	3	2	2	2	2	2	2	2	2	2	2	2
CO3	3	2	2	2	2	2	2	2	2	2	2	2
CO4	3	2	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	2	2	3	2	2	2	2	2	2


Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	3	2	2	2
CO4	3	2	2	2
CO5	2	2	3	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
♦ Weakly Correlated -1

COURSE DESIGNER:

1. Dr. S. Barathy Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc.Zoology**SEMESTER –VI***For those who joined in 2019 onwards*

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WEEK	CREDITS
UAZO	19Z6SB5	Apiculture	Lecture	2	2

COURSE DESCRIPTION

This course is designed for skill development the chemistry student which discusses the branch of Zoology that deals with animal diversity, structure and function of various systems, development and inheritance of man.

COURSE OBJECTIVES

- Aware of the bee keeping tools and techniques
- Develop skills on bee keeping methods and honey production
- Exercise bee keeping as a hobby or small scale entrepreneurs

UNITS**UNIT I – BEE TYPES****(6HRS.)**

Introduction to Apiculture - Scope of Apiculture - Honey bee types: *Apis dorsata*, *A. florea*, *A. ceranaindica*, *A. mellifera* and *Trigonairidipennis*.

UNIT II – BEE COLONY**(6HRS.)**

Bee colony - Queen, Drones and Workers - Structure of mouthparts and sting – Life cycle of Honey bee.

Self- Study – Mouth parts

UNIT III – BEE HIVES**(6HRS.)**

Bee keeping methods - Primitive beekeeping - Modern hives - Langstroth hive and Newton's hive - Bee keeping equipments.

UNIT IV – BEE PRODUCTS**(6HRS.)**

Products of Apiculture - Nutritional and medicinal values of honey - Extraction of honey, Preservation and storage of honey - bee wax and bee venom.

Self- Study -Products of Apiculture - Nutritional and medicinal values of honey - Extraction of honey

UNIT V – BEE ENEMIES

(6HRS.)

Enemies of bees: Wax moths, Wax beetles and black ants - Bee diseases: Brood diseases, Fungal brood disease - Relationship between plants and Bees. Preventive measure.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only)

(HRS.)

REFERENCES:

1. Jayashree, K.V. Tharadevi, C.S & Arumugam, N. 2014. Apiculture, Saras Publication, Nagercoil, Tamil Nadu.
2. Jayasurya et al., 2013. Economic Zoology, Saras Publication, Nagercoil, Tamil Nadu.
3. Arumugam N, Murugan T, Johnson Rajeswar J and Ram Prabu, R, Economic Zoology, Saras Publication, Kanyakumari, (2015).
4. Vasantharaj D and Kumaraswami, D., (1998) Elements of Economic entomology, Popular book depot, Chennai.
5. Romosa W.S and Stoffolano J.G., (1998) The science of entomology, Mc Grow-Hill Company, New York.
6. Pedigo LIP, (2002) Entomology and pest management, Pearson Education, Singapore.
7. Roger. A.M, 1978. The complete guide to Beekeeping, Pelham books LTD, London.
8. Nagaraja N and D.Rajagopal, 2009. Honey Bees- Diseases, Parasites, Pests, Predators & their management, MJP Publishers, Chennai.
9. Mishra, R.C., 1998. Perspectives in Indian Apiculture, Agro Botanica, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.yourarticlelibrary.com/essay/essay-on-apiculture/42293>

2. <http://network.bepress.com/life-sciences/agriculture/apiculture/>
3. <https://www.oercommons.org/authoring/21640-honey-bees-and-environmental-sustainability-bee-my/view>
4. <https://www.uaex.edu/farm-ranch/special-programs/beekeeping/about-honey-bees.aspx#:~:text=Like%20all%20insects%2C%20a%20honey,and%20contains%20several%20important%20glands.>
5. <https://www.vedantu.com/biology/apiculture-beekeeping>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 BEE TYPES				
1.1	Introduction and Scope of Apiculture	1	Chalk & Talk	Black Board
1.2	<i>Apis dorsata</i> ,	1	Lecture	Black Board
1.3	<i>A.florea</i>	1	Lecture	PPT & White board
1.4	<i>A. cerana indica</i> ,	1	Lecture	Smart Board
1.5	<i>A.mellifera</i>	1	Lecture	Black Board
1.6	<i>Trigona iridipennis</i> .	1	Discussion	Google classroom
UNIT -2 BEE COLONY				
2.1	Bee colony	1	Lecture	Green Board Charts
2.2	Queen, Drones and Workers	1	Chalk & Talk	Green Board
2.3	Structure of mouthparts and sting	2	Chalk & Talk	Black Board

2.4	Life cycle of Honey bee	2	Chalk & Talk	LCD
UNIT -3 BEE HIVES				
3.1	Bee keeping methods	1	Lecture	Black Board
3.2	Primitive beekeeping	1	Discussion	Black Board
3.3	Modern hives	1	Chalk & Talk	Black Board
3.4	Langstroth hive and Newton's hive	1	Chalk & Talk	LCD
3.5	Bee keeping equipments	2	Lecture	PPT & White board
UNIT -4 BEE PRODUCTS				
4.1	Products of Apiculture	1	Discussion	Black Board
4.2	Nutritional value of honey	1	Chalk & Talk	Black Board
4.3	Medicinal values of honey -	1	Chalk & Talk	LCD
4.4	Extraction of honey	1	Lecture	PPT & White board
4.5	Preservation and storage of honey	1	Lecture	LCD
4.6	Bee wax and bee venom.	1	Lecture	Black Board
UNIT -5 BEE ENEMIES				
5.1	Enemies of bees	1	Discussion	Black Board
5.2	Wax moths, Wax beetles and black ants	1	Lecture	PPT/LCD
5.3	Bee diseases: Brood diseases,	1	Chalk & Talk	Black Board
5.4	Fungal brood disease	1	Lecture	PPT

5.5	Relationship between plants and Bees	1	Lecture	PPT
5.6	Preventive measure.	1	Lecture	LCD

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PP T 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain the scope of apiculture in India	K2	PSO1 & PSO11
CO 2	Recall the structure of honey bee	K1	PSO1, PSO4 & PSO10
CO 3	List the equipments used in bee keeping	K1	PSO2, PSO4, PSO8 & PSO10
CO 4	Explain the extraction, Preservation and storage of honey	K2	PSO2, PSO4, PSO8 & PSO9
CO 5	Outline the types of bee diseases	K2	PSO1, PSO4, PSO9 & PSO10

[illegible]

PSO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	3	2	2	3	2	2	2	2	2	3	2	2
CO3	2	3	2	3	2	2	2	2	2	3	2	2
CO4	2	3	2	3	2	2	2	2	2	2	2	2
CO5	3	2	2	3	2	2	2	2	2	3	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	2	2	2
CO2	2	2	2	2
CO3	2	2	2	2
CO4	2	2	2	2
CO5	2	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. N. Nagarani

Forwarded By


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

**HOD'S Signature
& Name**

III B.Sc. Zoology**SEMESTER – VI***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z6SB6	Dairy Farming	Lecture	2	2

COURSE DESCRIPTION

This course provides comprehensive knowledge on the breeds of Dairy animals, their management. The course also introduces the method of preparation and nutritional value of various Dairy products for the benefit of mankind.

COURSE OBJECTIVES

- Interpret the management of high yielding dairy species
- Prepare value added products using milk
- Manage Livestock diseases in Animal Husbandry
- Become an entrepreneur

UNITS**UNIT I: INTRODUCTION****[6 HRS]**

Introduction and Scope of dairy farming. Dairy animals- Dairy Cows: Indigenous- Red Sindhi, Sahiwal and Gir, Exotic- Jersey and Holstein Friesian. Buffaloes- Murrah and Surti, Brief account on the significance of indigenous cow breeds.

Self Study - Scope of dairy farming**UNIT II: MANAGEMENT OF DAIRY BARN****[6 HRS]**

Brief account on Dairy house. Stages of Management of Dairy Cows: Management of new born calf, Management of Heifer, Management of

Milking cow - Feeding and breeding management.

Self Study - Brief account on Dairy house

UNIT III: STERILIZATION OF MILK

[6 HRS]

Composition and Nutritive value of Milk, Milking machine. Pasteurization - Methods of Pasteurization and advantages. Detection of adulteration of Milk- Lactometer- Methylene Blue Reductase test (MBR) -Sulphuric acid method.

Self Study - Nutritive value of Milk

UNIT IV: MILK PRODUCTS

[6 HRS]

Brief account on milk products: Whole milk powder, Skim milk powder, Homogenized milk, Standardized milk and Toned milk, Panir, Rabri, Khoa and Ice cream. Fermented milk products: Kefir, Koumiss, Dahi, Butter milk, Desi butter and Ghee. **Cheese: Types-preparation**- spoilage of Cheese and Whey.

Self Study - Ice cream

UNIT V: LIVESTOCK DISEASES

[6 HRS]

Livestock diseases: Etiology, Mode of transmission, Clinical findings and Control measures of Mastitis, Rinder pest (Cattle Plague-Bovine typhus) and Foot and mouth disease.

Self Study - Rinder pest

UNIT -VI DYNAMISM (Evaluation Pattern-CIA only)

(HRS.)

REFERENCES:

TEXT BOOK:

1. Arumugam N, Murugan T, Johnson Rajeswar J and Ram Prabu,R. (2015). *Economic Zoology*. SarasPublication, Kanyakumari.

REFERENCE BOOKS:

1. Uma Shankar Singh. (2008). *Dairy Farming*. Anmol Publications, New Delhi.
2. Banerjee, G.C. (2012). *A Text Book of Animal Husbandry*. Oxford & IBH Publication, New Delhi.

3. ICAR. (2000). *Hand book of Animal Husbandry*. The Indian Council for Agricultural Research, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://toolkit.climate.gov/case-studies/precise-soil-climate-and-weather-data-help-dairy-optimize-water-use>
2. <https://www.oerafrica.org/resource/farm-milk-production-marketing-and-processing-activities-kiruhura-district-situational>

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION				
1.1	Introduction to dairy farming	1	Chalk & Talk	Black Board
1.2	Scope of dairy farming	1	Discussion	Google classroom
1.3	Dairy animals- Dairy Cows: Indigenous- Red Sindhi, Sahiwal and Gir	1	Lecture	PPT
1.4	Exotic- Jersey and Holstein Friesian	1	Lecture	PPT& Video
1.5	Buffaloes- Murrah and Surti	1	Lecture	PPT& Video
1.6	Cloning of Cow	1	Chalk & Talk	Black Board
UNIT -2 MANAGEMENT OF DAIRY BARN				
2.1	Brief account on Dairy house	1	Lecture	LCD & Video
2.2	Stages of Management of Dairy Cows: Management of new born calf	2	Lecture	LCD

2.3	Stages of Management of Dairy Cows: Management of Heifer	1	Lecture	LCD
2.4	Stages of Management of Dairy Cows: Management of Milking cow	2	Lecture	LCD
UNIT -3 STERILIZATION OF MILK				
3.1	Composition and Nutritive value of Milk	1	Lecture	PPT
3.2	Milking machine	1	Lecture	LCD & Video
3.3	Pasteurization - Methods of Pasteurization and advantages	2	Chalk & Talk	Black Board
3.4	Detection of adulteration of Milk- Lactometer	1	Chalk & Talk	Black Board
3.5	Detection of adulteration of Milk- - Methylene Blue Reductase test (MBR) -Sulphuric acid method.	1	Chalk & Talk	Black Board
UNIT - 4 MILK PRODUCTS				
4.1	Milk products: Whole milk powder, Skim milk powder, Homogenized milk, Standardized milk and Toned milk	2	Lecture	LCD
4.2	Panir, Rabri, Khoa and Ice cream	1	Lecture	LCD
4.3	Fermented milk products: Kefir, Koumiss, Dahi, Butter milk, Desi butter and Ghee	2	Lecture	LCD
4.4	Cheese: Types-preparation-spoilage of Cheese and Whey	1	Lecture	PPT & White Board
UNIT -5 LIVESTOCK DISEASES				
5.1	Livestock diseases: Introduction	1	Chalk & Talk	Black Board

5.2	Etiology, Mode of transmission, Clinical findings and Control measures of Mastitis	2	Lecture	LCD
5.3	Etiology, Mode of transmission, Clinical findings and Control measures of Rinder pest (Cattle Plague-Bovine typhus)	1	Discussion	Google classroom
5.4	Etiology, Mode of transmission, Clinical findings and Control measures of Foot and mouth disease	2	Lecture	LCD

INTERNAL - UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks				
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35

Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the features of various indigenous and exotic breeds of dairy cattles.	K3	PSO1, PSO3, PSO4, PSO6 & PSO9
CO 2	Discuss the management of new born calf, Heifer and milk cow.	K2	PSO1, PSO2 PSO3, PSO4 PSO6, & PSO9
CO 3	Summarize the significance of Pasteurization in the preservation of the nutritive value of milk.	K1	PSO1, PSO2 PSO3, PSO4 PSO8, PSO9 & PSO11
CO 4	Develop an idea regarding the formulation of value added dairy products.	K3	PSO1, PSO2 PSO4, PSO6 PSO9 & PSO11
CO 5	Describe the clinical findings, treatment and control measures of livestock diseases.	K2	PSO1, PSO2 PSO3, PSO4 PSO6, PSO8 & PSO9

Mapping of COs with PSOs

CO/	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO1	PSO	PSO1
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	-----	------

PSO	1	2	3	4	5	6	7	8	9	0	11	2
CO1	3	-	3	3	2	3	2	2	3	2	2	2
CO2	3	3	3	3	2	2	2	2	3	2	2	2
CO3	3	3	3	3	2	2	2	2	3	2	3	2
CO4	3	2	-	3	2	2	2	2	3	2	3	2
CO5	3	3	2	3	2	2	2	2	3	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	3	2	2
CO2	3	3	3	2
CO3	3	3	3	2
CO4	3	3	3	2
CO5	3	3	3	2

Note: ♦ Strongly Correlated – 3

♦ Moderately Correlated – 2

♦ Weakly Correlated -1

COURSE DESIGNER:1. **Dr. A. Tamil Selvi****Forwarded By**


Dr. A. TAMIL SELVI
 Head, Dept. of Zoology
 FATIMA COLLEGE (AUTONOMOUS)
 MADURAI-625 018

HOD'S Signature**& Name**

I B.Sc. Zoology**SEMESTER -II***For those who joined in 2019 onwards*

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	21Z2SL1	Single Cell Protein Culture	Tutorial	-	2

COURSE DESCRIPTION

This course provides the knowledge of cultivation and usage of Single Cell Protein.

COURSE OBJECTIVES

- Emphasize the importance of microbes as an alternative source of food.
- Gain knowledge about the nutritive value of SCP.

UNITS**UNIT – I INTRODUCTION**

Introduction to Single Cell Protein (SCP) - History of Single Cell Protein (SCP)- Microorganisms used in single cell protein production- Advantages of SCP – Limitations of using SCP.

UNIT –II ALGAL PROTEIN

Algae as a source of protein-nutritive value - cultivation - extraction of protein - *Spirulina* sp., *Chlorella* sp.

UNIT –III BACTERIAL PROTEIN

Bacterial Proteins – Culture - extraction of SCP - *Bacillus* sp., *Pseudomonas* sp., *Methylococcus capsulatus*.

UNIT –IV FUNGAL PROTEIN

Fungal Proteins – Culture - extraction from Yeasts - *Candida* sp. & *Saccharomyces* sp. Extraction from Fungi - *Agaricus* sp. & *Aspergillus* sp.

UNIT –V SCP PRODUCTION USING WASTE MATERIAL

Production of SCP from Biomass and Waste Materials- Nutritive values of SCP – Dietary supplements for Human, Cattle and birds- Industrially used SCP (Quoron, Pruteen).

REFERENCES:

1. Patel, A.H. (2008). Industrial Microbiology, Macmillan India Ltd.
2. Arumugam, N. (2006). Microbiology, Saras Publ. Nagercoil – India
3. Kumarasan, V. (2001). Biotechnology, Saras Publ. Nagercoil – India
4. Dubey, R.C and Maheswari, D.K. (2005). A Text book of Microbiology - S. Chand & Co., New Delhi – India.
5. Rao, A.S. (1997). Introduction to Microbiology – Prentice-Hall, New Delhi, New Delhi – India.

Digital Open Educational Resources (DOER) :

7. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5645522/>
2. <https://pubmed.ncbi.nlm.nih.gov/7180229/>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5937888/>
4. <https://pubmed.ncbi.nlm.nih.gov/8543324/>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6925167/>

EVALUATION PATTERN**Self-Learning Courses for UG****Internal****Assignment – 20 Marks****Test – 20Marks****Total – 40Marks****External****Objective – 20 Marks****Essay Type Qns. – 40 Marks****Total – 60Marks****COURSE OUTCOMES**

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	List the importance of Single cell protein	K1	PSO1
CO 2	Explain the different components present in algal proteins	K2	PSO2
CO 3	Outline the method of extraction of bacterial proteins.	K2	PSO2
CO 4	Organize the steps involved in the cultivation of yeast proteins.	K3	PSO2, PSO6
CO 5	Find the nutritive values of SCP	K4	PSO1, PSO6

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	2	2	2	2	2	2	2	2	2	2
CO2	2	3	2	2	2	2	2	2	2	2	2	2
CO3	2	3	2	2	2	2	2	2	2	2	2	2
CO4	2	3	2	2	2	2	2	2	2	2	2	2
CO5	3	2	2	2	2	3	2	2	2	2	2	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	2	3	2
CO5	2	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
♦ Weakly Correlated -1

COURSE DESIGNER:

Dr. S. Barathy

Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

HOD'S Signature &
Name

Value Added Certificate Course
For those who joined in 2019 onwards

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEG ORY	HRS	CREDIT S
UAZO	19UGVA CZ1	Herbalism In Health Care	Certific ate Course	60	-

COURSE DESCRIPTION

This course deals with the study of Herbs intended for medicinal purposes

COURSE OBJECTIVES

- To know the principles and practices of traditional medicines.
- To demonstrate basic skills in identification of herbs and preparation of herbal drugs

UNIT –I TRADITIONAL MEDICINE

(8HRS.)

Traditional systems of Medicine - History of Herbs – Definition of Herbs – Different systems of Medicine –Ayurveda, Unani, Siddha and Homeopathy- AYUSH – Central government Organization.

Self-study- AYUSH – Central government Organization.

UNIT –II COMMON MEDICINAL PLANTS

(8 HRS.)

Morphology, Chemical constituents and Medicinal uses of Neem (*Azadirachta indica*), *Aloe vera* (Kumari), *Acalypha indica* (Indian Nettle), *Trigonella foenum-graecum* (Fenugreek), *Vitex negundo* (Chinese chaste tree), *Adhatoda vasica* (Malabar Nut), *Piper nigrum* (Pepper)

UNIT –III HOME REMEDIES

(8HRS.)

Herbal remedies for common cold – *Ocimum sanctum* (Holy Basil), *Coleus amboinicus*- Renal implication of herbal remedies – *Musa paradisiaca*(Plantain), *Tribulus terrestris*(Puncture vine) - Herbal medicines for Gastrointestinal problems – *Allium sativum*(Garlic),

Zingiberofficinale(Ginger) *Trachyspermum ammi*(Caraway seeds) - Herbal remedies for Hepatic disorders – *Phyllanthus niruri* Stonebreaker) , *Eclipta alba* (False daisy)- Herbal remedies for skin diseases – *Holarrhena antidysenterica* (Tellicherry Bark)

UNIT –IV LIFESTYLE DISORDERS (8HRS.)

Physical Properties, Nutritional value and uses of *Amarathus sp.*(Greens), *Moringa oleifera*(Drumstick), *Macrotyloma uniflorum*(Horse gram) - Role of Nutraceuticals in Diabetic cure, Management of Obesity, Constipation, Blood pressure & Cardiovascular diseases – Female health disorders.

UNIT –V MARKETING OF HERBAL PRODUCTS (8HRS.)

Marketing-Procurement of Raw materials-Packing(Kinds)-Costing-Distribution to customers(Concepts of marketing)-Adulteration- Trading - Foreign Trade – Export promotion council –Trading in medicinal plants – Local , Domestic and global trading.

Practical aspects: [20 HRS]

- Herbal Face Powder
- Bath powder
- Herbal hair care: hair conditioner & hair oil
- Cough choornam
- Anti-diabetic Powder
- Triphala and Thirikadugu Choornam
- Astavarga Choornam
- Prasava Lehyam
- Health Mix powder
- Preparation of Amla candy
- Ginger candy
- Gulkand
- Sherbath.

REFERENCE

1. Schulz V., Haensel R., and Tyler V.E., (2001). *Rational Phytotherapy. A Physician's Guide to Herbal Medicine*, Springer Publishers, Berlin.
2. McKenna D.J., Jones K., and Hughes K., (2004). *Botanical Medicines, The Desk Reference for Major Herbal Supplements*, The Haworth Herbal Press, New York.
3. Amrita singh, (2006). *Medicinal plants the world*. Oxford & IBH Co. Pvt. Ltd, New Delhi.
4. Penguly A., (2006). *The Constituents of medicinal plants*, Allen and Win 2 nd Edition, Australia.
5. Jain S.K., (1999). *Medicinal plants*, National book Trust, India.

TEXT BOOK

1. Annie R. and Kumaresan V., (2014). *Angiosperms – Taxonomy, Systematic Botany, Economic Botany, Ethnobotany*, Saras Publication, Nagercoil.
2. Arumugam N., Ragland A., Kumaresan V., (2014)., *Plant diversity and Medicinal Botany*,Saras Publication, Nagercoil.

REFERENCES

1. Jain S. K., (1999). *Medicinal plants*, National book Trust, India.
2. Victor S.A., Sudhakar B.D. and Das P.K., *Marketing management*, Directorate Of Distance Education, Pondicherry University
3. Joshi S.G., (2010). *Medicinal Plants*, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
4. Khan N.A. and Iqbal S.A., *Importance of Medicinal Plants*. (2011). DPH Discovery Publishing House Pvt. Ltd, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)

1. <https://www.oercommons.org/courseware/lesson/19559>
2. <https://www.merlot.org/merlot/viewMaterial.htm?id=773402407>
3. <https://www.oercommons.org/courses/classify-the-trees-leaves>
4. <https://www.oercommons.org/authoring/21765-native-plant-medicinal-garden-design-activity>
5. <https://vivaopen.oercommons.org/courseware/lesson/682/student/?t>

[ask=2](#)

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO1	Utilize the Traditional systems of Medicine	K1	PSO11
CO2	Outline the importance of herbs used in day today life.	K2	PSO2,PSO6 & PSO11
CO3	Make use of medicinal plants in home remedies.	K2	PSO2,PSO6 &PSO11
CO4	Solve the lifestyle disorders by treating them with herbs.	K3	PSO6&PSO11
CO 5	Develop entrepreneurial skill by the preparation of herbal products.	K3	PSO9&PSO11

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	2	2	3	2
CO2	2	2	2	2	2	2	2	2	2	2	3	2
CO3	2	2	2	2	2	2	2	2	2	2	3	2
CO4	2	2	2	2	2	2	2	2	2	2	3	2
CO5	2	2	2	2	2	2	2	2	3	2	3	2

Mapping of COs with POs


CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	2	2	2
CO3	2	2	2	2
CO4	2	3	2	2
CO5	2	2	2	2

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
♦ Weakly Correlated -1

COURSE DESIGNER:

1. Dr.V. Bharathy&
2. Dr. X. Devanya Rosaline

22Forwarded By


Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

**HOD'S Signature
& Name**

UNDERGRADUATE

For those who joined in 2021 onwards
(Offered as SKILL – EMBEDDED VALUE ADDED CERTIFICATE COURSE
For all students)

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDIT S
UAZO	21UGVACZ1	Livestock Farming	Skill – Embedded Value Added Certificate Course	-	2

COURSE DESCRIPTION

To apply the principles of management and breeding of domestic, livestock or farm animals for the purpose of obtaining their products (meat, milk, eggs, etc.)

COURSE OBJECTIVES

- Understand the methods of rearing farm animals.
- Inculcate the skills needed to formulate the strategies to be adopted for sustainable development.
- Promotion of Dairying for self-employment.

UNIT - I INTRODUCTION**(12 HRS.)**

Present status and future prospects of livestock development in India.

Buffalo: Breeds of Buffalo, Housing, Feed Management, Milking and Disease Management

UNIT – II SWINE**(12 HRS.)**

Swine: Importance of pig as a meat animal. Selection of breeds, breeding systems and feeding strategies. Care and Management of pregnant sows and unweaned piglets.

UNIT - III – RABBIT REARING**(12 HRS.)**

Rabbit: Economic importance. Important fur and meat type breeds. Housing, handling, feeding, watering, breeding, management, sanitation and health

care of rabbits.

UNIT - IV -CATTLE FARMING

(12 HRS.)

Important breeds of Cow, Housing and rearing systems. Breeding Management, Prenatal and Postnatal care - Milking management - Machine and hand milking.

UNIT - V - SHEEP AND GOAT

(12 HRS.)

Breeds of Sheep and Goat, Nutritional value of Chevon and goat milk, Commercial Rearing of Sheep and goat: Feeding, Housing, Breeding and Health Management Strategies,

REFERENCES:

1. ICAR, *Hand book of Animal Husbandry*, The Indian Council for Agricultural Research, New Delhi.
2. Uma Shankar Singh, (2008) *Dairy Farming*, Anmol Publications, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. <https://www.agrifarming.in/livestock-farming>
2. <https://vikaspedia.in/agriculture/livestock/>
3. <https://www.apnikheti.com/en/pn/livestock/bee/dammer-or-stingless-bee>
4. https://agritech.tnau.ac.in/expert_system/poultry/

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S	PSOs ADDRESSED
-----	-----------------	---	-------------------

		TAXONOMY)	
CO 1	Illustrate the Breeds of Buffalo and its rearing techniques.	K2	PSO2
CO 2	Plan for a Swine Breeding and Feeding Strategies.	K3	PSO4, PSO11
CO 3	Analyze the rearing methods of Rabbit.	K4	PSO10
CO 4	Assess the Rearing of Sheep and Goat.	K1	PSO9
CO 5	Assess the commercial importance of Livestock Farming.	K5	PSO9

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	3	2	2	2	2	2	2	2	2	2	2
CO2	2	2	2	3	2	2	2	2	2	2	3	2
CO3	2	2	2	2	2	2	2	2	2	3	2	2
CO4	2	2	2	2	2	2	2	2	3	2	2	2
CO5	2	2	2	2	2	2	2	2	3	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	2	2	2
CO3	1	2	2	2
CO4	2	3	2	2

C05	2	2	2	2
-----	---	---	---	---

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
♦ Weakly Correlated -1

COURSE DESIGNER**Dr. Antony Amala Jayaseeli****Forwarded By**

Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

HOD'S Name &Signature