

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

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)

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

DEPARTMENT OF ZOOLOGY



TANSCHÉ - CBCS With OBE

BACHELOR OF SCIENCE

PROGRAMME CODE - Z

COURSE STRUCTURE

(w.e.f. 2023 – 2024 Batch onwards)

E.M.G. YADAVA WOMENS COLLEGE, MADURAI -14.
(An Autonomous Institution – Affiliated to Madurai Kamaraj University)
Re –accredited (3rd cycle) with Grade A⁺ and CGPA 3.51 by NAAC
TANSICHE – CBCS with OBE

DEPARTMENT OF ZOOLOGY – UG
(with Allied Chemistry and Allied Botany)
(w.e.f. 2023-2024 batch onwards)

COURSE STRUCTURE

Semester	Part	Course Code	Course Title	Teaching hrs (per	Duration of Exam	Marks Allotted			Credits
						CIA	SE	Total	
III	I	23OU1TA3/ 23OU1HIN3	Tamil / Hindi	6	3	25	75	100	3
	II	23OU2EN3	General English -I	6	3	25	75	100	3
	III	23OUZO31	Core Course 5: Cell Biology	5	3	25	75	100	5
		23OUZO3P	Core Course 6: Lab in Cell Biology & Bio instrumentation	3	3	40	60	100	3
		23OUZOGEB03	GEC 3: Allied Botany –I Plant Biology - I	4	3	25	75	100	3
		23OUZOGEB03P	GEC Lab 3: Allied Botany –I Lab in Plant Biology - I	2	3	40	60	100	2
	IV	23OUZOSEC31	SEC 4 : Bioinstrumentation	2	3	25	75	100	2
		23OUZOSEC32	SEC 5: Economic Zoology	1	3	25	75	100	1
		Environmental studies	1	-	-	-	-	-	-
IV	I	23OU1TA4/ 23OU1HIN4	Tamil / Hindi	6	3	25	75	100	3
	II	23OU2EN4	General English - II	6	3	25	75	100	3
	III	23OUZO41	Core Course 7: Developmental Zoology	4	3	25	75	100	5
		23OUZO4P	Core Course 8: Lab in developmental biology & Agricultural Entomology	3	3	40	60	100	3
		23OUZOGEB04	GEC 4: Allied Botany –II Plant Biology - II	4	3	25	75	100	3
		23OUZOGEB04P	GEC lab 4: Allied Botany –II Lab in Plant Biology - II	2	3	40	60	100	2
	IV	23OUZOSEC41	SEC 6 : Agricultural entomology	2	3	25	75	100	2
		23OUZOSEC42	SEC 7 : Medical Laboratory Techniques	2	3	25	75	100	2
		23OU4EV4	Environmental Studies	1	2	25	75	100	2
		Total							47

Department of Zoology						Class: II B.Sc		
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
III	Core Course 5	23OUZO31	Cell Biology	5	5	25	75	100

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

Course Objectives:

- To learn the History of cell biology, tools and techniques and Histological study.
- To understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes and organelles.
- To understand how these cellular components are used to generate and utilize energy in cells.
- To understand the cellular components underlying mitotic cell division.
- To apply the knowledge of cell biology to selected examples of changes or losses in cell function.

Course Content:

Unit-I Microscopy: Structure, principle, magnification and applications of Compound microscope, Phase contrast microscope and Electron microscope – Tools and Techniques – Cell Fractionation, Homogenization, Centrifugation. Histological Techniques: Staining - Vital Stains. – Cytoplasmic and Nuclear Stains.

Unit-II History of cell biology – Cell theory –Types of cells (epithelial cells, Nerve cells and pancreatic cell) Difference between Prokaryotic and Eukaryotic cell. Ultra structure of an Animal Cell, Plasma Membrane – Ultra Structure, Models (Bilayer, Unit Membrane, Fluid Mosaic) and Functions.

Unit -III Protoplasm: chemical and biological properties. Ultra structure and functions of (a) Mitochondria (b) Endoplasmic Reticulum, (c) Golgi Complex, (d) Lysosome, (e) Centrioles and (f) Ribosome.

Unit-IV Ultra structure and functions of Nucleus and Nucleolus – Chromosome: Structure, heterochromatin and Euchromatin, - Giant chromosome – Polytene and Lambrush chromosomes - Cell Division and Cell Cycle: Amitosis, Mitosis and Meiosis - Genetic significance of meiosis-karyotyping.

Unit-V Cancer: Definition, types, causes, diagnosis, treatment- Apoptosis, Necrosis. Molecular basis of aging and genes responsible for aging. Stem cells: Definition – embryonic and adult stem cells.

Books for Study:

1. Veer Bala Rastogi (2000), “Introductory cytology”. Kedar Nath Ram Nath. Meerut.
2. Verma P.S. and Agarwal V.K. (2016) “Cell Biology (Cytology, Biomolecules, Molecular Biology)”, Paperback, S. Chand and Company Ltd.

Books for Reference:

1. Ambrose, E.J. and Dorothy, M. Easty, (1970). “Cell Biology”, Thomas Nelson & Sons Ltd.
2. Burke, Jack. D., (1970). “Cell Biology”, Scientific Book Agency, Calcutta.
3. DeRobertis, E.D.P. and E.M.F. De Robertis, (1988). “Cell and Molecular Biology”, 8th Edition, International Edition, Info med, Hong Kong.
4. Urry L.A. Cain M.L. , Wasserman S.A., Minorsky P.V., Jackson R.B. and Reece J.B. (2014) “Campbell Biology” in Focus. Pearson Education.
5. Albert B., Hopkin K., Johnson A.D., Morgan D., Raff M., Roberts K. and Walter P. (2018) Essential Cell Biology 5th Edn.,(paperback) W.W. Norton & Company p.864.
6. Kumar P. and Mina U. (2018) Life Sciences: Fundamentals and Practice, Part-I, 6th Edn., Pathfinder Publication.

Web Resources / E.Books:

1. [Cell Organelles and their Functions - Rs' Science \(rscience.com\)](http://rscience.com)
2. [Staining Microscopic Specimens | Microbiology | Study Guides \(nursinghero.com\)](http://nursinghero.com)
3. https://books.google.co.in/books?id=Th1uDQAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
4. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBB1101.pdf
5. <https://www.uou.ac.in/sites/default/files/slm/BSCBO-301.pdf>

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: To make students aware of cell structure and its significance in human body.

Activities to be given: Students shall be grouped into different groups and make them speak details of dreadful diseases (cancer).

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge according to Bloom's Taxonomy (Upto K level)
CLO1	To understand and recall the basic structure, origin and development of cell organelles.	K1 to K3
CLO2	To integrate and assess the biochemical, cytological and histological tools to infer cellular basis of organization.	K1 to K3
CLO3	To analyze and differentiate organisms based on structure, composition and inter and intra cellular interactions.	K1 to K4
CLO4	To explain the role of cells and cell organelles in various biological processes.	K1 to K3
CLO5	To construct and simulate the role of different cytological tools to explain the structure and complexity of cells and cell organelles.	K1 to K4

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

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

1-Basic Level

2- Intermediate Level

3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit-I Microscopy: Structure, principle, magnification and applications of Compound microscope, Phase contrast microscope and Electron microscope – Tools and Techniques – Cell Fractionation, Homogenization, Centrifugation. Histological Techniques: Staining - Vital Stains. – Cytoplasmic and Nuclear Stains.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit-II History of cell biology – Cell theory –Types of cells (epithelial cells, Nerve cells and pancreatic cell) Difference between Prokaryotic and Eukaryotic cell. Ultra Structure of an Animal Cell, Plasma Membrane – Ultra Structure, Models (Bilayer, Unit Membrane, Fluid Mosaic) and Functions.	18	Chalk and Talk, OHP, quiz, on the spot test and You tube Links
III	Unit -III Protoplasm: chemical and biological properties. Ultra structure and functions of (a) Mitochondria (b) Endoplasmic Reticulum, (c) Golgi Complex, (d) Lysosome, (e) Centrioles and (f) Ribosome.	15	Chalk and Talk, PPT, group discussion, OHP
IV	Unit-IV Ultra structure and functions of Nucleus and Nucleolus – Chromosome: Structure, heterochromatin and Euchromatin, - Giant chromosome – Polytene and Lambrush chromosomes - Cell Division and Cell Cycle: Amitosis, Mitosis and Meiosis - Genetic significance of meiosis-karyotyping.	15	Chalk and Talk, OHP, PPT presentations, quiz,
V	Unit-V Cancer: Definition, types, causes, diagnosis, treatment- Apoptosis, Necrosis. Molecular basis of aging and genes responsible for aging. Stem cells: Definition – embryonic and adult stem cells.	15	Chalk and Talk, PPT, group discussion, OHP

Course Designer:

Dr.(Mrs).G. Indira Rani

Ms.R.S.Rajalakshmi

Department of Zoology						Class: II B.Sc		
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
III	Core Course 6	23OUZO3P	Lab in Cell Biology & Bio Instrumentation	3	3	40	60	100

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

Course Objectives:

1. To encourage students learn the basic organization of cell structure
2. To encourage students learn the organization of cell organelles and its significance.
3. To make students develop skill in staining techniques.
4. To make students aware of different molecular techniques for the betterment of human kind.
5. To make students expose to field trips and prepare reports.

Lab in Cell biology :

Microscopy: Handling of dissection and compound microscopes.

Preparation and Identification of slides

1. Mitotic divisions with onion root tips.
2. Different stages of Meiosis in Grasshopper Testes –(Virtual Demo only)
3. Buccal epithelium (Barrbody) preparation.
4. Staining and observation of polytene chromosomes in salivary glands of chironomous larva.

Slides / Spotters:

1. Mitochondria,
2. Golgi apparatus,
3. Endoplasmic reticulum,
4. Ribosomes,
5. Nucleus,
6. Nucleolus
7. Microtome

Lab in Bio instrumentation:

1. pH Meter – Analysis of various samples.
2. Isolation of eukaryotic DNA / Quantification of DNA
3. Electrophoresis – AGE
4. Chromatography – Paper chromatography only
5. Calorimeter
6. Centrifuge

Field trip compulsory- A Report**Books for References:**

1. DeRobertis, E.D.P. and E.M.F. De Robertis, (1988). “Cell and Molecular Biology”, 8th Edition, International Edition, Info med, Hong Kong.
2. Geethalakshmi Sundararaman and Anitha Arumugam., (2017) “Lab in Cell Biology, Microbiology and Bioinstrumentation: Laboratory Manual” Kindle Edition, Independently published, ISBN 13: 9781521876718.
3. Wilson.K & Walker. J “Principles & Techniques of Biochemistry and Molecular Biology”, Cambridge University Press, NY 2006.
4. Sharma.A.K, “Basic techniques in Molecular Biology” Surzycki’s Press, Springer Verlag.Techniques in Microscopy and Cell Biology Tata MacGraw Hill Pub. Co., N Delhi 1991

Web Resources:

1. <https://www.youtube.com/watch?v=5-ur7bWqlDQ>
2. <https://www.youtube.com/watch?v=hLt884HV8bE>

Pedagogy

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

LESSON PLAN FOR PRACTICAL (TOTAL HOURS : 45)

Cycle	Description	Hrs	Mode
Lab in cell biology :			
Preparation and Identification of slides			
1	Microscopy: Handling of dissection and compound microscopes.	15	Demo Mounting /(Virtual Lab)
2	Mitotic divisions with onion root tips.		
3	Different stages of Meiosis in Grasshopper Testes –(Virtual Demo only)		
4	Buccal epithelium (Barrbody) preparation.		
5	Staining and observation of polytene chromosomes in salivary glands of chironomous larva.		
Slides / Spotters:			
6	Mitochondria, Golgi apparatus,	15	Spotter / Chart
7	Endoplasmic reticulum, Ribosomes		Spotter / Chart
8	Nucleus, Nucleolus		Spotter / Chart
9	Microtome		Spotter / Chart
Lab in Bio instrumentation:			
10	pH Meter – Analysis of various samples.	15	Demo / Hands on training /Spotters
11	Isolation of eukaryotic DNA / Quantification of DNA		
12	Electrophoresis – AGE		
13	Chromatography – Paper chromatography only		
14	Calorimeter		
15	Centrifuge		
16	Field trip compulsory- A Report		

Course Designer:
Dr.(Mrs).G. Indira Rani
Ms.R.S.Rajalakshmi

Department of Zoology						Class: II B.Sc		
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
III	SEC 4	23OUZOSEC31	Bio Instrumentation	2	2	25	75	100

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

Course Objectives:

1. To induce interest in the usage various biological instrumentation and employ them for the study of cells, tissues and genetic material.
2. To help students to map the use of specific bioinstrumentation for specific biological experiments and infer the results of such experiments.
3. To study the working principle of different bioinstrumentation and their applications
4. To enable students to design experiments and justify them with the underlying principles of bioinstrumentation.
5. To obtain employment in the field of bioinstrumentation.

Course content:

Unit I: Good Laboratory Practices: Guide lines, Laboratory symbols; Cleaning and sterilization of lab ware and reagents; handling and care of laboratory animals; Laminar flow hood: types and use; Buffers: definition and preparation of buffers, pH meter; Safety and Precautionary measures

Unit II: Biosensors - glucose biosensor, alcohol biosensor, environmental biosensors, cantilever-based biosensors, DNA biosensor.

Unit III: Separation Techniques: Working principle and types of centrifugation, Chromatography –AGE & PAGE.

Unit IV: Biomedical Instrumentation:-ESR measurement, haemoglobin measurement – Sahli's Heamoglobinometer, blood pressure, Electro Cardiogram (ECG).

Unit V: Molecular Techniques : Polymerase chain reaction; ELISA; Blotting Techniques - Southern, Western and Northern blotting.

Books for Study:

1. Ghatak K. L., (2010). "Techniques and Methods in Biology", Phi Learning Pvt. Ltd., New Delhi, India.

- Gupta P.C., (2010). “Biological Instrumentation and Methodology (Tools & Techniques)”, S. Chand & Company Limited, New Delhi, India.
- Prakash Singh Bisen, Anjana Sharma, (2012). “Introduction to Instrumentation in Life Sciences”, CRC Press, Taylor & Francis Group, New York, USA.

Books for Reference:

- Gordon M.H., Macrae R., (2012). “Instrumental Analysis in the Biological Sciences”, Blackie & Son Ltd., UK
- Leonard Davis, Mark Dibner and James Battey, (2012). “Basic Methods in Molecular Biology”, Elsevier Science Publishing Co., New York, USA.
- Aysha Divan, Janice Royds, (2013). “Tools and Techniques in Biomolecular Science”, Oxford Univeristy Press, UK.

Web Resources / E-Books:

- <https://bit.ly/3i5flym>
- <https://pbiol.rsb.org.uk>

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: To make students aware of the application of bioinstruments.

Activities to be given: Students shall be given hands on training in various clinical test using bio instruments.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge according to Bloom's Taxonomy (Upto K level)
CLO1	To describe and explain the steps in the use of various biological instrumentation that are used in the study of different animal specimens.	K1 to K3
CLO2	To relate the applications of biological techniques and employ them for the study of cells, tissues and genetic material.	K1 to K3

CLO3	To correlate and appraise the use of specific bioinstrumentation for specific biological experiments and infer the results of such experiments.	K1 to K4
CLO4	To compare the working principle of different bioinstrumentation and to summarize their applications.	K1 to K3
CLO5	To devise experiments and justify them with the understanding of the underlying principles of bioinstrumentation that are ecofriendly, ethical and have national and global relevance.	K1 to K4

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

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

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

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit I: Good Laboratory Practices: Guide lines, Laboratory symbols; Cleaning and sterilization of lab ware and reagents; handling and care of laboratory animals; Laminar flow hood: types and use; Buffers: definition and preparation of buffers, pH meter; Safety and Precautionary measures	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit II: Biosensors - glucose biosensor, alcohol biosensor, environmental biosensors, cantilever-based biosensors, DNA biosensor.	18	Chalk and Talk, OHP quiz, on the spot test
III	Unit III: Separation Techniques: Working principle and types of centrifugation, Chromatography –AGE & PAGE.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Unit IV: Biomedical Instrumentation:- ESR measurement, haemoglobin measurement – Sahli's Heamoglobinometer, blood pressure, Electro Cardiogram (ECG).	15	Chalk and Talk, OHP,PPT presentations, quiz,
V	Unit V: Molecular Techniques : Polymerase chain reaction; ELISA; Blotting Techniques - Southern, Western and Northern blotting.	15	Chalk and Talk, PPT, , open book test

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

Department of Zoology						Class: II B.Sc		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/Week	CIA	SE	Total
III	SEC 5	23OUZOSEC32	Economic Zoology	1	1	25	75	100

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

Course Objectives:

1. To understand the culturing techniques and production methods of different farm animals.
2. To know the life history of animals and disease control methods used in farming.
3. To understand the concept of breeding, cross breeding and the importance of high yield varieties.
4. To know about the marketing strategies.
5. To make students aware of various entrepreneur oppourtunities.

Course content:

Unit I: Apiculture: Species of honey bees – Social organisation of honey bee – selection of bees and location for apiary – Newton’s bee hive – products of bee keeping – enemies and diseases (Amerian foul brood, Chalk brood) of honey bees- nutritional and medical value of honey.

Unit II: Sericulture: History of Sericulture-Mulberry and Non-mulberry silkworm types -life cycle of mulberry silkworm –diseases (Pebrine, flacherie) of silkworm. **Lac Culture:** Introduction – cultivation of Lac – Enemies of lac cultivation – Economic importance of Lac.

Unit III: Aquaculture: Fresh water aquaculture: Carp culture – types of ponds – preparation – maintenance – harvesting and management. Polyculture. Prawn culture—Culture of Live feed organisms-- Marine Aquaculture: Edible oyster and pearl oyster culture.

Unit IV: Poultry Farming: Poultry industry in India –Important breeds of Poultry deep litter system - Nutritive value of egg and meat- Broiler management - Housing and equipment; Brooding, feeding and health cover of broilers; Record keeping – Culling of layers – Debeaking -Women in backyard poultry farming.

Unit V: Dairy Farming: Dairy farming – advantages of dairying – classification of breeds of cattle – Indigenous and exotic breeds – Selection of dairy cattle. Common diseases- Foot and mouth disease, Mastitis, Anthrax- Dairying as a source of additional income and employment.

Books for Study:

1. Sastry, N.S.R., C.K.Thomas and R.A.Singh, 2015. Livestock Production Management, 4th Ed.Kalyani Publishers, New Delhi.
2. Awasthi, V.B., 2012. Introduction to General and Applied Entomology, third edition, Scientific publishers, India.

Books for Reference:

- 1.Glenn Munroe, 2017. Manual of on-Farm vermicomposting and vermiculture, Holdanca Farms Ltd, Wallace, Nova Scotia.
2. Banerjee, G.C., 2006. Text book of Animal Husbandry 8thEd.Oxford and IBH Publishing Company Ltd., New Delhi.

Web Resources / E-Books:

1. <https://bit.ly/3tXHjk8>
2. <https://bit.ly/3tUTHBu>
3. <https://bit.ly/3hVv96q>

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: Mainly focus on the responsible use of natural resources and Impact of economic zoology in the development of rural people.

Activities to be given: Students visit different small scale farming units.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge according to Bloom's Taxonomy (Upto K level)
CLO1	To identify the breeds and varieties of poultry, fish, bees, and cattle and understand the basic aspects of farming.	K1 to K3
CLO2	To assess and integrate the available tools and techniques to increase the productivity in farms.	K1 to K3
CLO3	To analyse the pros and cons of different methods of farming and marketing strategies of products.	K1 to K4
CLO4	To evaluate the use of available resources in improving the breeds, vermicomposting, farm products etc..	K1 to K3

CLO5	To design new methods to improve farm animals with increased productivity and disease resistance and to construct new methods in vermicomposting.	K1 to K4
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Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

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

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

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit I:: Apiculture: Species of honey bees – Social organisation of honey bee – selection of bees and location for apiary – Newton’s bee hive – products of bee keeping – enemies and diseases (Amerian foul brood, Chalk brood) of honey bees- nutritional and medical value of honey.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit II: Sericulture: History of Sericulture-Mulberry and Non-mulberry silkworm types -life cycle of mulberry silkworm –diseases (Pebrine, flacherie) of silkworm. Lac Culture: Introduction –cultivation of Lac – Enemies of lac cultivation – Economic importance of Lac.	18	Chalk and Talk, OHP quiz, on the spot test
III	Unit III: Aquaculture: Fresh water aquaculture: Carp culture – types of ponds – preparation – maintenance – harvesting and management. Polyculture. Prawn culture—Culture of Live feed organisms-- Marine Aquaculture: Edible oyster and pearl oyster culture.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Unit IV: Poultry Farming: Poultry industry in India –Important breeds of Poultry deep litter system - Nutritive value of egg and meat- Broiler management - Housing and equipment; Brooding, feeding and health cover of broilers; Record keeping – Culling of layers – Debeaking - Women in backyard poultry farming.	15	Chalk and Talk, OHP,PPT presentations, quiz,
V	Unit V: Dairy Farming: Dairy farming – advantages of dairying – classification of breeds of cattle – Indigenous and exotic breeds – Selection of dairy cattle. Common diseases- Foot and mouth disease, Mastitis, Anthrax- Dairying as a source of additional income and employment.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

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

Department of Zoology						Class: II B.Sc		
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
IV	Core Course 7	23OUZO41	Developmental Biology	5	4	25	75	100

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

Course Objectives:

1. To create an awareness to the students about the theories, concepts and basics of developmental biology.
2. To provide students about the idea of sex cells, fertilization, cleavage, differentiation and development of organs.
3. To make an awareness of the induction, organizers and development of extra embryonic structures.
4. To provide adequate explanation to students about the late embryonic developments and post embryonic development and ageing
5. To give an idea about teratogenesis, invitro fertilization, stem cells and amniocentesis to the students

Course Content:

Unit-I Gametogenesis & Fertilization - Basic concepts of developmental biology. Structure & types of Spermatozoa, Mammalian egg - Egg membranes. types of egg - Spermatogenesis – Oogenesis. Fertilization – mechanism, theories and significance – Parthenogenesis.

Unit-II Blastulation & Gastrulation - Cleavage - Planes and its Patterns, Factors controlling cleavage - Fate map and its construction. Blastulation – types of blastula. Morphogenetic movements - Gastrulation of frog.

Unit-III Organogenesis - Development of Eye and Heart in frog. Foetal membranes in chick. Development of Pronephric, Mesonephric and Metanephric Kidneys. Placentation in Mammals.

Unit-IV Applied Embryology - Organizer concept – Structure – mechanism of induction and competence. Nuclear transplantation - Teratogenesis – Regeneration: types - events and factors.

Unit-V Human Embryology - Reproductive organs, Menstrual cycle and menopause - Pregnancy –

prenatal diagnosis - trimesters – development. Erythroblastosis foetalis -Twins – types. Infertility – causes - Test tube baby and Assisted Reproductive Technology (IVF) - Embryo transfer

Books for Study:

1. Subramoniam, T. (2003). Developmental Biology, Narosa Publishing House, New Delhi, India.
2. Verma, P.S., Agarwal, V. K. (2010). “Chordate Embryology: Developmental Biology”, S. Chand & Company, New Delhi., India.

Books for Reference:

1. Balinsky, B.I. (1970). “Introduction to Embryology”, Philadelphia & London, UK.
2. Berril, N.J.(1971). “Developmental Biology”, McGraw Hill, New York, USA.
3. Carlson, Bruce, M. (2009). “Human embryology and Developmental Biology”, Elsevier, Philadelphia, USA
4. Gilbert S.F. (2010). “Developmental Biology”, Sinauer Associates, Massachusetts,USA.
5. Russ Hodge (2010). “Developmental Biology”, Facts on File, Inc., New York, USA.

Web Resources / E.Books:

1. <https://bgc.ac.in/pdf/study-material/developmental-biology-7th-ed-sf-gilbert.pdf>
2. <https://www.slideshare.net/slideshow/developmental-biology-noteszoology-third-year-delhi-university/70568410>
3. <https://www.thebiomics.com/notes/csir/unit-5>

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: To make students learn the different developmental stages of frog and chick.

Activities to be given: students shall be grouped in small sections to discuss the different stages of chick embryo.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge according to Bloom's Taxonomy (Upto K level)
CLO1	To describe and illustrate the significance of cellular processes in embryonic development.	K1 to K3
CLO2	To relate the factors that contribute to the developmental process, construct fate maps and illustrate the steps in morphogenesis and organogenesis.	K1 to K3
CLO3	To correlate the involvement of specific cell types in the formation of specific organs and explain the importance of morphogens.	K1 to K4
CLO4	To distinguish between the different types of developmental mechanisms in various organisms and appraise the species-based differences in development.	K1 to K3
CLO5	To justify and validate the role of environment and genetics in influencing embryonic development	K1 to K4

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

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

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

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	Details	No. of Hours	Mode
I	Gametogenesis & Fertilization Unit-I Gametogenesis & Fertilization - Basic concepts of developmental biology. Structure & types of Spermatozoa, Mammalian egg - Egg membranes. types of egg - Spermatogenesis – Oogenesis. Fertilization – mechanism, theories and significance – Parthenogenesis.	12	Chalk and Talk, PPT,
II	Unit-II Blastulation & Gastrulation - Cleavage - Planes and its Patterns, Factors controlling cleavage - Fate map and its construction. Blastulation – types of blastula. Morphogenetic movements - Gastrulation of frog.	12	group discussion
III	Unit-III Organogenesis - Development of Eye and Heart in frog. Foetal membranes in chick. Development of Pronephric, Mesonephric and Metanephric Kidneys. Placentation in Mammals.	12	OHP and YouTube Links
IV	Unit-IV Applied Embryology - Organizer concept – Structure – mechanism of induction and competence. Nuclear transplantation - Teratogenesis – Regeneration: types - events and factors.	12	Chalk and Talk, PPT,
V	Unit-V Human Embryology - Reproductive organs, Menstrual cycle and menopause - Pregnancy – prenatal diagnosis - trimesters – development. Erythroblastosis foetalis - Twins – types. Infertility – causes - Test tube baby and Assisted Reproductive Technology (IVF) - Embryo transfer	12	group discussion
	Total	60	

Course Designer:

Dr.(Mrs).M.A.Soniya

Dr.(Mrs).S.Sharmila

Department of Zoology						Class: II B.Sc		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/Week	CIA	SE	Total
IV	Core Course 8	23OUZO4P	Lab in Developmental Biology and Agricultural Entomology	3	3	40	60	100

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

Course Objectives:

- Make students understand the different stages of mammalian gametes.
- Analyze the Early developmental stages of Frog
- Make students learn the significance of placentation in sheep and man.
- Make students expose various kinds of harmful insect pest and their deleterious effect
- Importance of beneficial insects as scavengers, pollinators, predators. etc.

Course Content:**Lab in Developmental Biology****I.Experiments**

1. Different stages of chick embryo-24 Hours, 48 Hours, 72 Hours and 96 Hours.
2. Mounting of insect egg

II. Slides / Spotters :

1. Observations of testis and ovary showing the maturation stages of gametes (Mammalian)
2. Early developmental stages of Frog - Cleavage, blastula and gastrula
3. Placenta of sheep / Man
4. Test tube baby
5. Twins
6. Metamorphosis in Amphibian

Lab in Agricultural Entomology

1. Methods of collection and identification of insect pests in the college campus. (Any 2)
2. Methods of mounting of insect pests.

3. Methods of preservation of insect pests.
4. Preparation of Insect Box.

Spotter:

1. Beneficial insects as Scavengers,
2. Pollinators,
3. Predators
4. **Life cycle and control measure of**
 - Rice pest -*Tryporyza incertulas*,
 - Coconut pest – *Oryctes rhinoceros*

Books for References:

1. Gilbert S.F. (2010). “Developmental Biology”, Sinauer Associates, Massachusetts, USA.
2. B. I. Balinsky, (2004) “An introduction to Embryology”, A East West Press, New Delhi.
3. Dhaliwal GS & Arora R. (2001). Integrated Pest Management: Concepts and Approaches. Kalyani Publ., New Delhi.
4. Ignacimuthu SS & Jayaraj S. (2003). Biological Control of Insect Pests. Phoenix Publ., New Delhi.

Web Resources:

1. <https://www.youtube.com/watch?v=Vky8QN63eVE>
2. <https://www.youtube.com/watch?v=nrBbJYyZ8gM>

Pedagogy

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

LESSON PLAN FOR PRACTICAL (TOTAL HOURS : 45)

Cycle	Description	Hrs	Mode
Lab in Developmental Biology			
1	Different stages of chick embryo-24 Hours, 48 Hours, 72 Hours and 96 Hours.	15	Mounting /(Virtual Lab)
2	Mounting of insect egg		
Slides / Spotters:			
3	Observations of testis and ovary showing the maturation stages of gametes (Mammalian)		Slides

4	Early developmental stages of Frog - Cleavage, blastula and gastrula	15	Slides
5	Placenta of sheep / Man		Slides
6	Test tube baby Twins		Virtual lab
7	Metamorphosis in Amphibian		Virtual lab
Lab in Agricultural Entomology			
10	Methods of collection and identification of insect pests in the college campus. (Any 2)	15	Demo / Hands on training/ Mounting /Spotters
11	Methods of mounting of insect pests.		
12	Methods of preservation of insect pests.		
13	Preparation of Insect Box.		
14	Beneficial insects as Scavengers, Pollinators, Predators		
15	Life cycle and control measure of Rice pest -Tryporyza incertulas, Coconut pest – Oryctes rhinoceros		

Course Designer:

Dr.(Mrs).M.A.Soniya

Dr.(Mrs).S.Sharmila

Department of Zoology						Class: II B.Sc		
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
IV	SEC 6	23OUZOSEC41	Agricultural Entomology	2	2	25	75	100

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

Course Objectives:

1. Explain the basic concepts of entomology and observe the pest status of agriculture.
2. Illustrate and examine the systemic and functional morphology of various group of agricultural insect pests.
3. Differentiate and classify the various groups of insect animals and estimate biodiversity.
4. To compare and distinguish the general and specific characteristics integrated pest management.
5. Infer and integrate the economic importance of insect species.

Course Content :

Unit I: Outline classification of Insect upto orders with an Indian example - Insect metamorphosis. Methods of collection, mounting and preservation of insect pests.

Unit II: Beneficial insects as Scavengers, Pollinators, Predators, Parasites and weed killers. (Any 2 each)

Unit III: - Insect pest -definition, kinds of pests, pest outbreaks and control measures – Pheromones.

Unit IV: Methods of Pest control – Physical, Chemical, Mechanical, Biological, and Integrated pest management.

Unit V: Life cycle and control measure of Rice pest -*Tryporyza incertulas*, Cotton pest-*Helicoverpa armigera*, Sugarcane pest- *Scirpophaga nivella*, Coconut pest – *Oryctes rhinoceros* and Migratory locust- *Locusta migratoria*.

Books for study

1. Pruthi, H.S. (1969). "Textbook on Agricultural Entomology", I.C.A.R. Publication, New Delhi.

2. Vasantharaj David, B and Ananthkrishnan, T.N. (2006). "General and Applied Entomology", Second edition, Tata McGraw hill publishing company Ltd., New Delhi, India.
3. Vasanthraj David, B. and Ramamurthy, VV. (2012). Elements of Economic Entomology, Seventh edition, Namrutha publications, Chennai.

Books for reference

1. John William S. (1995). "Management of Natural Wealth", Loyola College Publications, Chennai.
2. Abishek Shukla, D. (2009). "A Hand Book of Economic Entomology", Vedamse Books, New Delhi.

Web resources/ E.Books:

1. <http://www.fao.org>
2. <http://flybase.bio.indiana.edu/>
3. <http://www.ipm.ucdavis.edu>

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: To expose students to different kinds of pest and its identification.

Activities to be given: Collection and preservation of insect pests of important economic crops.

Course Learning Outcomes (COs)

CLO	Course Outcomes Statement	Knowledge according to Bloom's Taxonomy (Upto K level)
CLO1	List the economic importance of agricultural insect species.	K1 to K3
CLO2	Differentiate and classify the various groups of insects and estimate the biodiversity.	K1 to K3
CLO3	Explain the pest status in agriculture and control measures.	K1 to K4
CLO4	To compare the methods and outcomes of integrated pest management.	K1 to K3
CLO5	Examine and identify the systemic and functional morphology of various group of agricultural insect pests.	K1 to K4

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

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

1-Basic Level

2- Intermediate Level

3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit I: Outline classification of Insect upto orders with an Indian example - Insect metamorphosis. Methods of collection, mounting and preservation of insect pests.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit II: Beneficial insects as Scavengers, Pollinators, Predators, Parasites and weed killers. (Any 2 each)	18	Chalk and Talk, OHP quiz, on the spot test
III	Unit III: - Insect pest -definition, kinds of pests, pest outbreaks and control measures – Pheromones.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
IV	Unit IV: Methods of Pest control – Physical, Chemical, Mechanical, Biological, and Integrated pest management.	15	Chalk and Talk, OHP, PPT presentations, quiz,
V	Unit V: Life cycle and control measure of Rice pest - <i>Tryporyza incertulas</i> , Cotton pest- <i>Helicoverpa armigera</i> , Sugarcane pest- <i>Scirpophaga nivella</i> , Coconut pest – <i>Oryctes rhinoceros</i> and Migratory locust- <i>Locusta migratoria</i> .	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

**Course Designer:
Dr.G. Indira Rani**

Department of Zoology						Class: II B.Sc		
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
IV	SEC 7	23OUZOSEC42	Medical Laboratory Techniques	2	2	25	75	100

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

Course Objectives:

1. To understand the different protocols and procedures to collect clinical samples.
2. To explain the characteristics of clinical samples.
3. To demonstrate skill in handling clinical equipment.
4. To evaluate the safety precautions while handling clinical samples.
5. To summarise the control measures to avoid contamination of clinical samples.

Course content:

Unit I: Laboratory Safety and Human Health and Hygiene : Laboratory safety –toxic chemicals and biohazards waste- biosafety level- good laboratory practice – hygiene and health issue – physiology effect of alcohol, tobacco, smoking & junk food & its treatment - biomedical waste management.

Unit II: Haematology: Composition of blood and their function- collection of blood & lab procedure - haemopoiesis- types of anaemia- mechanism of blood coagulation- bleeding time- clotting time- determination of haemoglobin - erythrocyte sedimentations rate- packed cell volume- Total count of RBC & WBC- Differential count WBC- blood grouping and typing- haemostasis- bleeding disorder of man - Haemolytic disease of new-born, Platelet count, reticulocytes count, Absolute Eosinophil count.

Unit III: Medical Microbiology and Instrumentation Techniques: Definition - structure and function of cells - parasites - Leishmania and Trypanosome- Computer tomography (CT scan)– Magnetic Resonance imaging – flow cytometry – treadmill test – PET.

Unit IV: Medical Physiology: Cardiovascular system- Blood pressure - Pulse – regulation of heart rate, cardiac shock. Heart sounds, Electrocardiogram (ECG) – significance – ultra sonography- Electroencephalography (EEG).

Unit V: Diagnostic Pathology: Handling and labelling of histology specimens - Tissue processing - processing of histological tissues for paraffin embedding, block preparation. Microtomes –sectioning– mounting- problems encountered during section cutting and remedies - Frozen section techniques- freezing microtome.

Books for study

1. Pruthi, H.S. (1969). “Textbook on Agricultural Entomology”, I.C.A.R. Publication, New Delhi.
2. Vasantharaj David, B and Ananthkrishnan, T.N. (2006). “General and Applied Entomology”, Second edition, Tata McGraw hill publishing company Ltd., New Delhi, India.
3. Awasthi, V.B. (2012). “Introduction to General and Applied Entomology”, third edition, Scientific publishers.
4. Vasanthraj David, B. and Ramamurthy, VV. (2012). Elements of Economic Entomology, Seventh edition, Namrutha publications, Chennai.

Books for reference

1. John William S. (1995). “Management of Natural Wealth”, Loyola College Publications, Chennai.
2. Abishek Shukla, D. (2009). “A Hand Book of Economic Entomology”, Vedamse Books, New Delhi.
3. Ministry of Agriculture, Government of India, (1995). “Manual on Integrated Pest Management in Rice and Cotton”.

Web resources/ E.Books:

1. <http://www.fao.org>
2. <http://flybase.bio.indiana.edu/>
3. <http://www.ipm.ucdavis.edu>
4. <http://www.ent.iastate.edu/list/>
5. www.entsoc.org

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: To expose students to different kinds of instruments handling technology and its application .

Activities to be given: hands on training for blood grouping and typing

Course Learning Outcomes (COs)

CLO	Course Outcomes Statement	Knowledge according to Bloom's Taxonomy (Upto K level)
CLO1	Understand protocols and procedures to collect clinical samples for blood analysis and to study human physiology.	K1 to K3
CLO2	Explain the characteristics of clinical samples.	K1 to K3
CLO3	Demonstrate skill in handling clinical equipment.	K1 to K4
CLO4	Evaluate the hematological and histological parameters of biological samples.	K1 to K3
CLO5	Elaborate the role of medical laboratory techniques in health care industry.	K1 to K4

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

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

1-Basic Level

2- Intermediate Level

3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit I: Laboratory Safety and Human Health and Hygiene : Laboratory safety –toxic chemicals and biohazards waste- biosafety level- good laboratory practice – hygiene and health issue – physiology effect of alcohol, tobacco, smoking & junk food & its treatment - biomedical waste management.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Unit II: Haematology: Composition of blood and their function- collection of blood & lab procedure - haemopoiesis- types of anaemia- mechanism of blood coagulation- bleeding time- clotting time- determination of haemoglobin - erythrocyte sedimentations rate- packed cell volume- Total count of RBC & WBC- Differential count WBC- blood grouping and typing- haemostasis- bleeding disorder of man - Haemolytic disease of new-born, Platelet count, reticulocytes count, Absolute Eosinophil count.	18	Chalk and Talk, OHP quiz, on the spot test
III	Unit III: Medical Microbiology and Instrumentation Techniques: Definition - structure and function of cells - parasites - Leishmania and Trypanosome- Computer tomography (CT scan)– Magnetic Resonance imaging – flow cytometry – treadmill test – PET.	15	Chalk and Talk, PPT, group discussion , OHP and You tube Links
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V	Unit V: Diagnostic Pathology: Handling and labelling of histology specimens - Tissue processing - processing of histological tissues for paraffin embedding, block preparation. Microtomes –sectioning– mounting- problems encountered during section cutting and remedies - Frozen section techniques- freezing microtome.	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

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