

CODE	COURSE TITLE
18ZOUC304	DEVELOPMENTAL BIOLOGY AND EVOLUTION

Category	CIA	ESE	L	T	P	Credit
Core - IV	25	75	55	5	-	4

### Preamble

To gain knowledge on the concepts involved in development of a single cell into complex organism, the basic properties and self renewal mechanism of stem cells, the origin of life and the process of organic evolution

### Course Outcomes

On the successful completion of the course, students will be able to get in-depth knowledge on the sequences of developmental mechanism in animals with an exposure to stem cells, the process of change in biological system and the concepts of evolution

CO Number	CO Statement	Knowledge Level
CO1	To understand the basis of embryonic development, the formation of functional multicellular organisms and the theories and concepts of evolution	K <sub>1</sub>
CO2	To describe different phases of development of an organism and identify the mechanism by which the evolution occurs	K <sub>2</sub>
CO3	To compare the morphogenetic movements with organogenesis and to comprehend the evolutionary changes happened from origin of life to evolution of man	K <sub>2</sub>
CO4	To analyze the role of hormones in reproduction, infertility problems and treatment To develop an idea on the distribution of fauna and their adaptive radiation with geological time scale	K <sub>3</sub>
CO5	To interpret the potentiality of undifferentiated cells in organogenesis with the application of stem cells in treatment of diseases To investigate the major transition in evolution from the origin of life to hominid evolution	K <sub>3</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	M	S

<b>CO2</b>	M	M	S	M	S
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	S	S	S	S
<b>CO5</b>	S	S	S	S	S

S- Strong; M-Medium

## Syllabus

### Unit I

**12 Hrs**

Gametogenesis - Definition, Spermatogenesis-Formation of Spermatid, Spermiogenesis, Structure of sperm. Oogenesis - Previtellogenesis, Vitellogenesis, Structure of mammalian egg. Fertilization - physical, chemical and cytological factors.

### Unit II

**10 Hrs**

Types of egg - Patterns of Cleavage – Blastulation in frog - Gastrulation in frog- Fate map in frog - Development of Eye and Heart in frog. Placentation in mammals.

### Unit III

**13 Hrs**

Menstrual cycle, Pregnancy, Birth and Hormonal regulations. Infertility- Symptoms, Diagnosis, Remedial measures-Intra Uterine Insemination (IUI), *In Vitro* Fertilization (IVF), Gamete Intra fallopian Transfer (GIFT) and Zygote Intra fallopian Transfer (ZIFT).

Stem cells - Importance - Properties - Embryonic and Adult Stem cells. Outlines of Stem Cell Therapy.

### Unit IV

**12 Hrs**

Origin of life - Abiogenesis and Biogenesis. Chemical origin of life. Evolutionary Theories - Lamarckism, Neo-Lamarckism, Darwinism and Neo-Darwinism.

### Unit V

**13 Hrs**

Adaptations - Structural adaptations, Physiological adaptations, Animal association adaptations, Protective Adaptations. Paleontology - Fossils - Formation, Dating, Types and Significance. Geological distribution of Animals. Origin and Evolution of Man.

## Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	<b>Veer Bala Rastogi and Jayaraj M.S.</b>	Developmental Biology	Kedar Nath Ram Nath Educational Publications, NewDelhi	2012 & 1 <sup>st</sup> Edn

2.	<b>Veer Bala Rastogi</b>	Organic Evolution: Evolutionary Biology	Kedar Nath Ram Nath Educational Publications, New Delhi	2017 & 13 <sup>th</sup> Edn
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### Reference Books

Sl. No.	Author Name	Title of the Book	Publisher	Year and Edition
1	<b>Bradley M. Patten and Bruce M. Carison</b>	Foundations of Embryology	Tata McGraw-Hill Publishing company Ltd, New Delhi	1996 & 1 <sup>st</sup> Edn
2	<b>Balinsky.B.I.</b>	An Introduction to Embryology	W.B. Saunders Company, Tokyo, Japan	2012 & 5 <sup>th</sup> Edn
3	<b>Alice Marcus</b>	Human Genetics - An Overview	Narosa Publishing House Pvt Ltd. New Delhi	2010 & 1 <sup>st</sup> Edn
4	<b>Chaudhary B.L.</b>	Organic Evolution	Scientific Publishers India, Jhodpur	2018 & 1 <sup>st</sup> Edn
5	<b>Verma P.S. &amp; Agarwal V.K.</b>	Concept of Evolution	S. Chand & Company Ltd., New Delhi	2005 & 1 <sup>st</sup> Edn
6	<b>Paul Amos Moody</b>	Introduction to Evolution	Palala Press, United States	2015 & 3 <sup>rd</sup> Edn
7	<b>Gopalakrishnan T.S, Itta Sambasivaiah, Kamalakra Rao A. P.</b>	Principles of Organic Evolution	Pearl Publications, Chennai.	1991 & 2 <sup>nd</sup> Edn

### Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar, Models, Specimens, Charts

### You tube Video Links:

<https://www.youtube.com/watch?v=evH0I7Coc54>

<https://www.youtube.com/watch?v=i2pyDBMglfM>

<https://www.youtube.com/watch?v=zMOwyBEJmMU>

<https://www.youtube.com/watch?v=goQf5p64xRk>

<https://www.verywellfamily.com/what-does-in-vitro-mean-1960211>

CODE	COURSE TITLE
18ZOUC405	ENVIRONMENTAL BIOLOGY AND ANIMAL BEHAVIOUR

Category	CIA	ESE	L	T	P	Credit
Core V	25	75	55	5	-	4

### Preamble

To understand about the coexistence of flora and fauna in different habitats, their adaptations and to study the behavioural aspects of animals and human being

### Course Outcomes

On the successful completion of the course, students will be able to understand and comprehensively analyze the ecological concerns, distribution, relationship of animals with the environment, the hypothesis of animal behaviour and their effective communications.

CO Number	CO Statement	Knowledge Level
CO1	To understand and identify distinguishing attributes in various types of fauna present in different habitats	K <sub>1</sub>
CO2	To describe the specific characteristics, adaptations, organization and inter-specific relationship among the species	K <sub>2</sub>
CO3	To analyze and compare the animal behaviour and their response to different instincts	K <sub>2</sub>
CO4	To envision the behavioural manipulations and habitat requirements of various species in the ecological hierarchy	K <sub>3</sub>
CO5	To interpret the affinities of animals and their relationships with respect to structural ecosystem in conservation practices	K <sub>3</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	S	M	M	S	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium

## Syllabus

### **Unit I** **14** **Hrs.**

**Terrestrial Ecology** - Forest, Desert and Cave Biome - Characteristics, Flora, Fauna and Adaptations.

**Freshwater Ecology** - Pond and River - Characteristics, Flora, Fauna and Adaptations.

### **Unit II** **12** **Hrs.**

**Marine Ecology** - Pelagic, Intertidal, Coral Islands and Deep Sea - Characteristics, Flora, Fauna and Adaptations.

Mangroves - Characteristics, Flora and Fauna.

**Estuarine Ecology** - Characteristics, Flora, Fauna and Adaptations.

### **Unit III** **10** **Hrs.**

**Space Ecology** - Environmental problems and physiological changes in space travel - life support systems.

**Animal relationship** - Inter-specific relationship - Mutualism, Commensalism and Parasitism.

Intra-specific relationship - Predation and Competition.

### **Unit IV** **12** **Hrs.**

**Approach to Behavioural Study** - Patterns of Behaviour - Feeding Behaviour, Play Behaviour, Predatory Behaviour, Aggressive Behaviour, Migratory Behaviour, Reproductive Behaviour and Parental care, Learning Behaviour, Stereotyped Behaviour, Rhythmic Behaviour and Biological clocks.

### **Unit V** **12** **Hrs.**

**Communication among animals** - Olfactory - Optic - Acoustic - Tactile - Honey bee dance.

**Pheromones and behaviour** - Definition - Types - Signaling Pheromones - Primer Pheromones and Insect Pheromones.

**Methods of studying Behaviour** – Neuro physiological approach and Psychological approach.

**Social Behaviour** - Honey bees - Primates - Altruism in animals.

#### Text Books

S. No	Authors	Title of the Book	Publishers	Year of Publicatio
1	Veer Bala Rastogi and Jayaraj M.S.	Animal Ecology and Distribution of Animals	Kadarnath Ramnath Publications	1998 & 8 <sup>th</sup> Edn
2	Agarwal V.K.	Animal Behaviour	S.Chand &Company Ltd	2010 &1 <sup>st</sup> Edn

#### Reference Books

No	Authors	Title of the Book	Publishers	Year of Publicatio
1	Kotpal R.L and Bali N.P.	Concepts of Ecology	Vishal Publications	2018 & 2 <sup>nd</sup> Edn
2	Eugene P. Odum, Murray Barrick and Gary W. Barret	Fundamentals of Ecology	Oxford and IBH Publishing Co.Pvt.Ltd	2017 & 3 <sup>rd</sup> Edn
3	Sharma P.D	Ecology and Environment	Rastogi Publication	2011 & 7 <sup>th</sup> Edn
4	Verma P.S. and Agarwal V.K.	Principles of Ecology	S.Chand & Co., New Delhi	2000 & 4 <sup>th</sup> Edn
5	Aubrey Manning and Marian Stamp Dawkins	An Introduction to Animal Behaviour	Cambridge University Press	2012 & 4 <sup>th</sup> Edn
6	Reena Mathur	Animal Behaviour	Rastogi Publication	2014 & 3 <sup>rd</sup> Edn
7	Ranga. M. M	Animal Behaviour	Agrobios, India	2005 & 2 <sup>nd</sup> Edn
8	Sanjib Chattopadhyay	Evolution, Adaptation and Ethology	Books and Allied (P) Ltd, Kolkata.	2014 & 3 <sup>rd</sup> Edn

## **Pedagogy**

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar, Models, Specimens, Charts

### **You tube videos links:**

[https://www.youtube.com/watch?v=LU\\_KD1enR3Q](https://www.youtube.com/watch?v=LU_KD1enR3Q)

[https://www.youtube.com/watch?v=7KUN\\_X2GUAA](https://www.youtube.com/watch?v=7KUN_X2GUAA)

<https://www.youtube.com/watch?v=cwTZhyA57mA>

<b>CODE</b>	<b>COURSE TITLE</b>
<b>18ZOUCP02</b>	<b>CORE PRACTICAL II</b>

<b>Category</b>	<b>CIA</b>	<b>ESE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
Practical	40	60	-	-	60	4

### **Preamble**

To enhance the practical skills in environmental biology and to observe the developmental stages, behavioural patterns, relationship and evolutionary significance of animal and habitat adaptations

### **Course Outcomes**

On the successful completion of the course, the students will be able to get hands on experience in the field of environmental biology, appreciate faunal diversity through habitat study and analyze the stages of embryonic development and animal adaptations

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
CO 1	To observe and identify the ecological instruments, different stages of development of frog embryo, planktons and fossils	K <sub>2</sub>
CO 2	To estimate the physiochemical parameters of water samples and to assess the their quality To examine and distinguish faunal adaptations to various ecological conditions	K <sub>3</sub>
CO 3	To categorize local Avian fauna with their salient features and the adaptation of animals with the evolutionary significance	K <sub>3</sub>

### **Mapping with Programme Outcomes**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
CO1.	S	S	S	S	S
CO2.	S	S	S	S	S
CO3.	S	S	S	S	S

S- Strong



## **Syllabus**

### **DEVELOPMENTAL BIOLOGY**

Study of different types of eggs - Insect, Frog, Chick (slides/specimen)

Embryology of Frog – Slides

Placenta of Mammals – Sheep and Man

### **EVOLUTION**

Study of any six fossils

### **ENVIRONMENTAL BIOLOGY**

Estimation of dissolved Oxygen (Pond and Polluted water)

Estimation of Salinity „

Estimation of pH using pH paper „

Estimation of free Carbon dioxide „

Estimation of Carbonates „

Estimation of Bicarbonates „

Estimation of Calcium „

Study of Intertidal fauna - Rocky, Muddy and Sandy shore

Analysis of Zooplankton in given water sample

Study of Animal relationship - Commensalism, Mutualism and Parasitism

Ecological field visit to Sea shore / Pond / Wetland / Zoological Park / Wild life Sanctuary /

Biosphere reserves - A report to be submitted

A field visit to Local polluted site / Solid waste management unit / Sewage treatment plant -

A report to be submitted

### **ANIMAL BEHAVIOUR**

Social behaviour - Honey Bees

Observation of nesting behaviour in Birds

## **SPOTTERS:**

### **A. Descriptive notes:**

Hygrometer, Anemometer, Rain gauge, Mercury Barometer, DO meter and pH meter

### **B. Draw labeled sketch:**

Freshwater/Marine plankton - Nauplius larva, Zoea larva, Mysis larva, Daphnia, Cyclops, and Salpa

### **C. Stages of development /Embryological Importance:**

Egg- Insect, Frog and Hen

Frog embryology - 2 celled stage, 4 celled stage, Blastula and Gastrula

Placenta of Sheep and Man

### **D. Ecological Adaptations and Animal relationship:**

Intertidal fauna - Mytilus, Balanus, Hippa, Solen, Nereis and Starfish,

Animal relationship - Sea anemone and Hermit crab, Shark and Suckerfish, Ascaris

### **E. Evolutionary Significance:**

Fossils - Arca, Nautilus, Natica, Turrilites, Dentalium and Micraster