Bajaj College of Science, Wardha
(Autonomous College)
Minutes of Board of Studies Department of Zoology
Academic Session 2024-25

The Meeting of academic session 2024-25 has been organized through online/offline blended mode on 12th March ; 2025 at 2:00 pm through Zoom Link:

Topic: BOS Meeting - Zoology
Time: Mar 12, 2025 02:00 PM India
Join Zoom Meeting
https://us06web.zoom.us/j/83183383075?pwd=tuC1Ilb2qE4cHzmr5Ym2kDjNl600y8.1

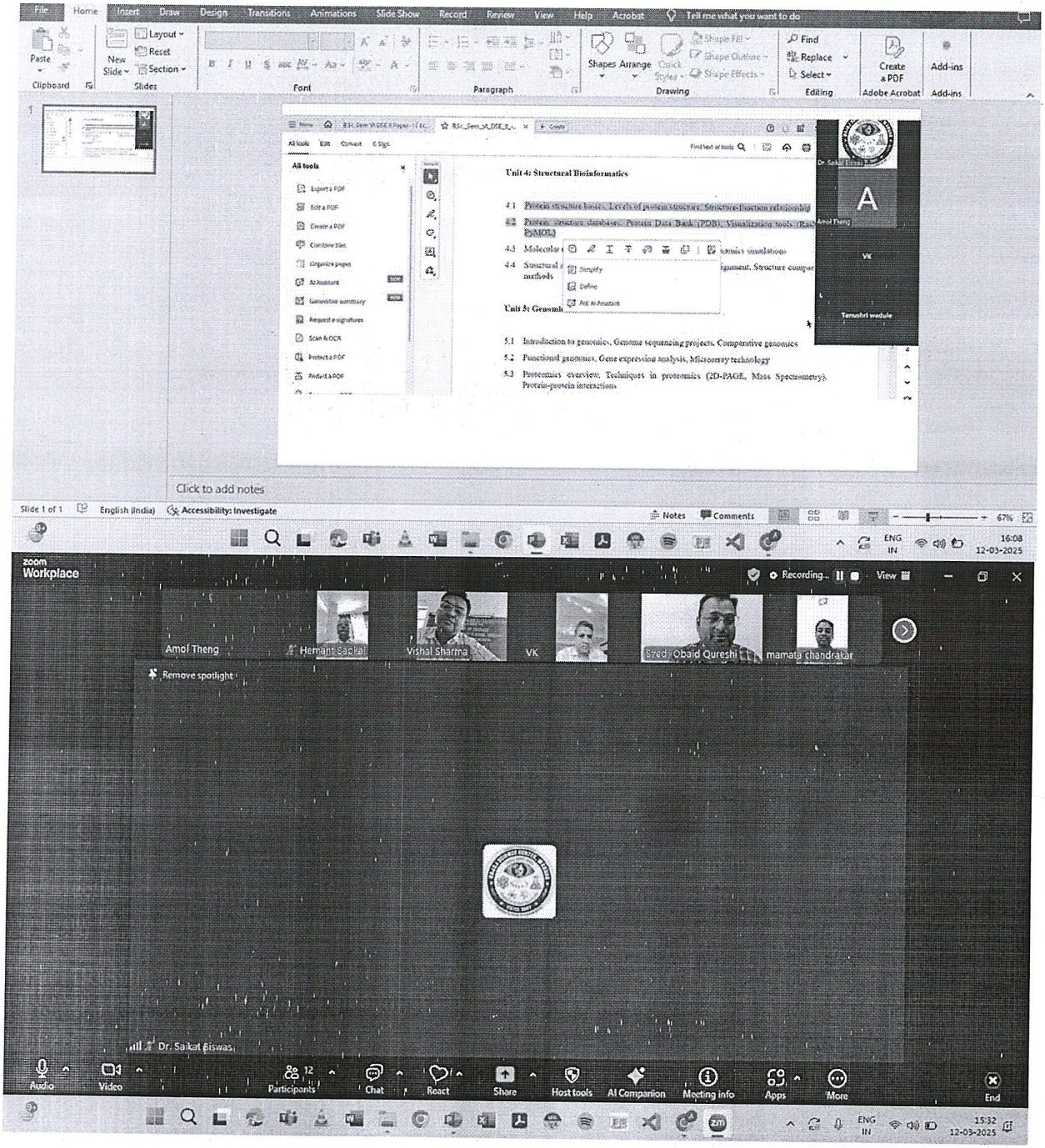
Meeting ID: 831 8338 3075
Passcode: zoology

Agenda of the meeting –

1. Confirmation of minutes of previous BoS meeting (held in the month of August 2024)
2. Approval to the syllabi of B.Sc. Sem V and VI Major and Minor along with Cos and Pos .
3. Panel of examiner and paper setter.
4. Any other point with the permission of the chair.

Following members attended the meeting --

1. Dr. Yogesh Bhute
2. Dr. S.O. Qureshi
3. Dr. H.P. Sapkal
4. Mr. Vivek Khalokar
5. Mr. Tejas Tajane
6. Dr. A. D. Theng
7. Mr. V. P. Khandwekar
8. Dr. V. J. Sharma
9. Dr. S.P. Biswas
10. Mr. Praful Kalwade
11. Miss. Tanushri Wadule
12. Dr. Miss. M. R.Chandrakar


Unit 4: Structural Bioinformatics
Unit 5: Genomic
5.1 Introduction to genomics, Genome sequencing projects, Comparative genomics
5.2 Functional genomics, Gene expression analysis, Microarray technology
5.3 Proteomics overview, Techniques in proteomics (2D-PAGE, Mass Spectrometry), Protein-protein interactions
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Recording...
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Amol Theng
Hemant Sapkal
Vishal Sharma
VK
Syed Obaid Qureshi
mamata chandrakar
Remove spotlight
Dr. Saikat Biswas
Audio
Video
Participants
Chat
React
Share
Host tools
AI Companion
Meeting info
Apps
More
End

Following agenda of meeting has been discussed:

1) Confirmation of the minutes of last meeting –minutes of the last meeting dated 27/8 /2024 has been briefed by Dr. A.D.Theng which has been approved by the panel. Minutes of last BOS attached (Encl- 1).

2) Syllabus structure of B.Sc. Semester V and VI along with Course objectives and course outcome –

- PO after completion of three year B.Sc. Program with major Zoology has been discussed by Dr. M.R. Chandrakar and approved by the panel. (Encl-2)

- Syllabus structure of B.Sc. Semester V and VI which has to be implemented from 2025-26 has been proposed as per following structure----

B.Sc. Sem V and VI – **Two DSC- Discipline specific core Paper,**
One DSE – Discipline specific elective paper has to be opted by student.

B.Sc. Sem V

DSC – V - Developmental biology

DSC - VI - Biological Chemistry

DSE – I – Paper I - Applied and Economic Zoology / DSE I – Paper – II - Parasitology

B.Sc. Sem- VI

DSC – VII Mammalian Physiology

DSC – VIII – Basic Immunology

DSE – II – Paper I - Ecology and Evolution / DSE – II – Paper II – Bioinformatics

Paper of DSC – V - Developmental biology has been discussed by Dr. A.D.Theng which has been approved by panel along with CO.

Paper of DSC - VI - Biological Chemistry has been discussed by Dr. S.P.Biswas which has been approved by panel along with CO.

Paper of DSE – I – Paper I - Applied and Economic Zoology has been discussed by Dr. V.J.Sharma which has been approved by panel along with CO.

Paper of DSE I – Paper – II - Parasitology has been discussed by Dr. M.R.Chandrakar which has been approved by panel along with CO.

Paper of DSC – VII Mammalian Physiology has been discussed by Dr. M.R.Chandrakar which has been approved by panel along with CO.

Paper of DSC – VIII – Basic Immunology has been discussed by Sh. V.P.Khandwekar which has been approved by panel along with CO.

Paper of DSE – II – Paper I - Ecology and Evolution has been discussed by Dr. S.P.Biswas which has been approved by panel along with CO.

Paper of DSE – II – Paper II – Bioinformatics has been discussed by Dr. A.D.Theng which has been approved by panel along with CO.

Certain additions / reshuffling of points have been mentioned by Dr. S.O. Qureshi and Dr. H. P. Sapkal which has been accepted and incorporated. Syllabus of all the above papers have been finally approved unanimously by the panel.

Approved syllabus – (Encl – 3)

3. Panel of examiner and paper setter – the previous approved panel will be continued for these papers as well.

4. Any other point-- there was no additional points to discuss. Hence the meeting ended with expressing sincere thanks to the members by Shri. V.P. Khandwekar.

12/3/2025

Dr. M. R. Chandrakar
Head
Department of Zoology
Bajaj College of Science, Wardha

Head / Incharge
Department Of Zoology
Bajaj College Of Science, Wardha

Bajaj College of Science, Wardha
(Autonomous College)
Minutes of Board of Studies Department of Zoology
Academic Session 2024-25

The Meeting of academic session 2024-25has been organized through online/offline blended mode on 27thAugust; 2024 at 2:00 pm through Zoom Link:
Topic: BOS in Zoology

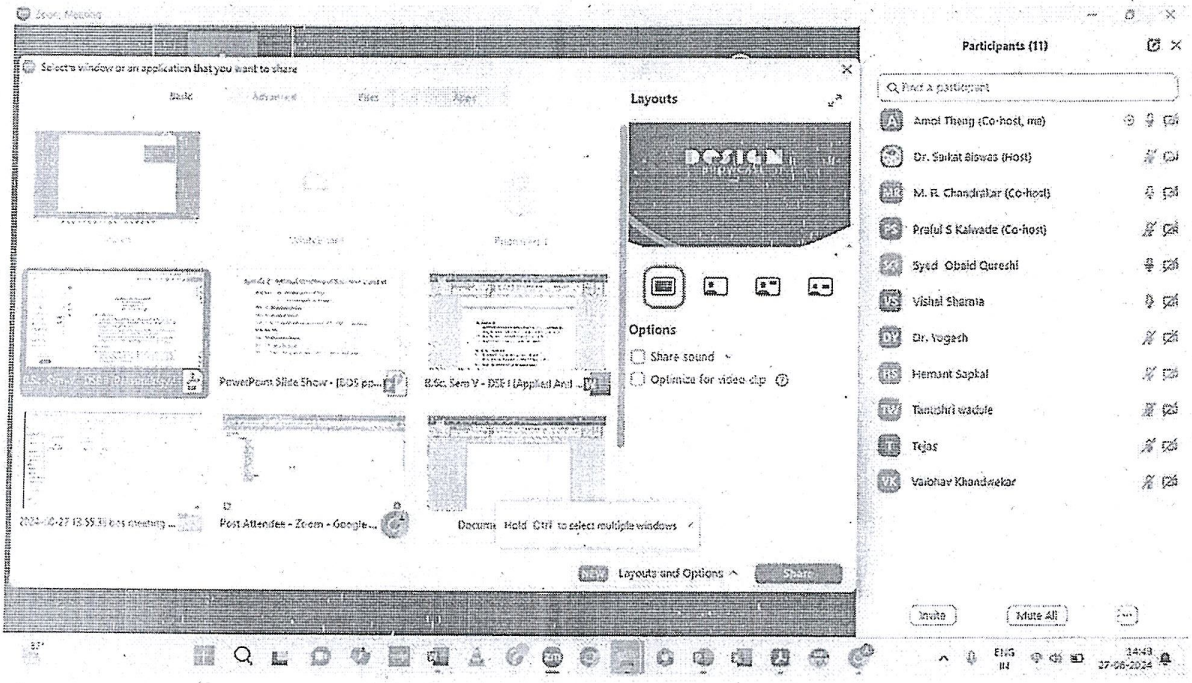
Time: August 27, 2024 2:00 PM India
Link of the meeting was---
https://us06web.zoom.us/j/87130221349?pwd=GiYpMHQl3onwa9INfCFv8bY6E0dBVT.1

The agenda of the meeting. :

1. Confirmation of the minutes of last meeting.
2. Syllabus structure of B.Sc. Semester V and VI
3. Amendment in credit structure of elective paper of B.Sc. Semester V and VI
4. Field project / community services of B.Sc. Semester IV and V
5. Internship in B.Sc. Sem VI of Major subject opted
6. M.Sc. Semester III DSE syllabus modifications and paper pattern
7. Evaluation scheme of projects of M.Sc. Semester III
8. Panel of examiner and paper setter
9. Any other point

Following members attended the meeting online --

1. Dr. Yogesh Bhute
2. Dr. S.O. Qureshi
3. Dr. H.P. Sapkal
4. Mr. Vivek Khalokar
5. Mr. Tejas Tajane
6. Dr. A. D. Theng
7. Mr. V. P. Khandwekar
8. Dr. V. J. Sharma
9. Dr. S.P. Biswas
10. Mr. Praful Kalwade
11. Miss. Tanushri Wadule
12. Dr. Miss. M. R.Chandrakar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Participants (11)
Find a participant
Amol Theng (Co-host, me)
Dr. Saikat Biswas (Host)
M. R. Chandrakar (Co-host)
Praful S Kalwade (Co-host)
Syed Obaid Qureshi
Vishal Sharma
Dr. Yogesh
Hemant Sapkal
Tanushri wadule
Tejas
Vaibhav Khandvekar
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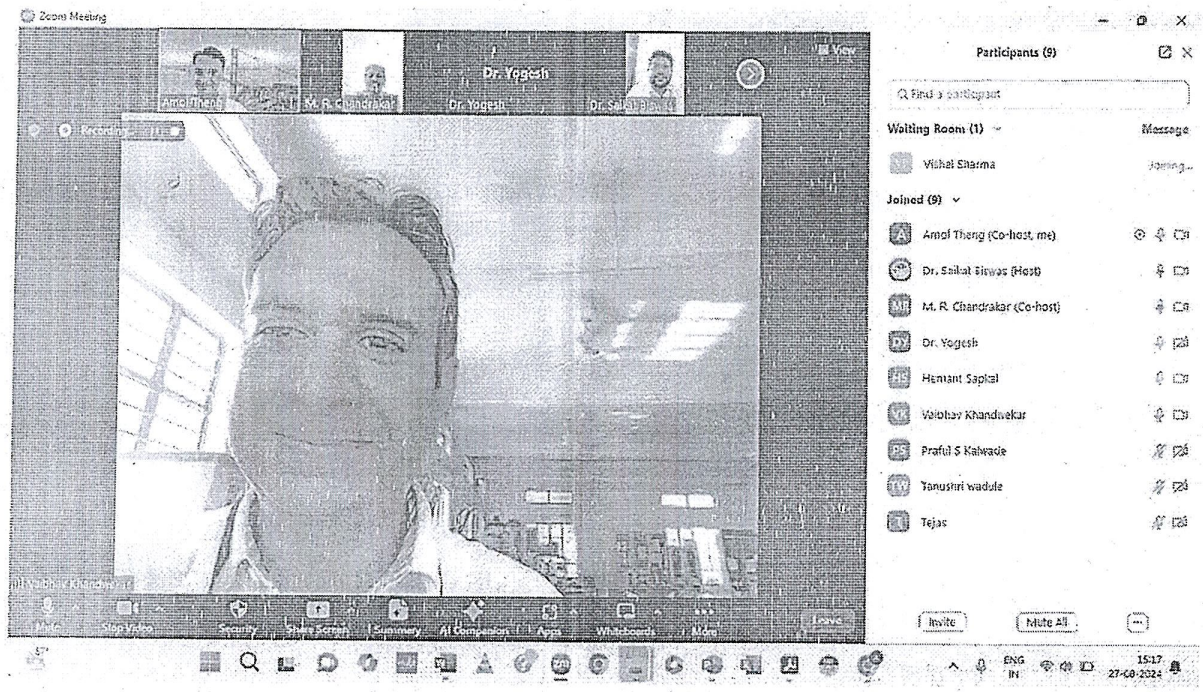
Zoom Meeting
Amol Theng
M. R. Chandrakar
Dr. Yogesh
Dr. Saikat Biswas
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Vishal Sharma
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Joined (9)
Amol Theng (Co-host, me)
Dr. Saikat Biswas (Host)
M. R. Chandrakar (Co-host)
Dr. Yogesh
Hemant Sapkal
Vaibhav Khandvekar
Praful S Kalwade
Tanushri wadule
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27-08-2024

Following agenda of meeting has been discussed:

1) Confirmation of the minutes of last meeting –minutes of the last meeting dated 28/3 /2024 has been briefed by Dr. M. R. Chandrakar which has been approved by the panel. Minutes of last BOS attached (Encl- 1).

2) Syllabus structure of B.Sc. Semester V and VI - Syllabus structure of B.Sc. Semester V and VI which has to be implemented from 2025-26 has been proposed as per following structure----

B.Sc. Sem V and VI – **Two DSC- Discipline specific core Paper,**
One DSE – Discipline specific elective paper has to be opted by student.

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DSC – V - Developmental biology

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DSE – I – Paper I - Applied and Economic Zoology / DSE I – Paper – II - Parasitology

B.Sc. Sem- VI

DSC – VII Mammalian Physiology

DSC – VIII – Basic Immunology

DSE – II – Paper I - Ecology and Evolution / DSE – II – Paper II – Bioinformatics

The proposed syllabus has been attached. Certain corrections have been mentioned by Dr. Yogesh Bhute, Dr. S.O. Qureshi and Dr. H.P. Sapkal which has been accepted and modifications will be incorporated.

Proposed syllabus – Encl – 2

2. Amendment in credit structure of elective paper of B.Sc. Semester V and VI-

It has been informed to the members of BOS that credit structure of elective paper has been amended as follows--

B.Sc. Semester V

Previous :

S N	Course Category	Name of Course	Course Code	Teaching Scheme (Hrs.)			Total Credits
				TH	TU	PR	
3	DSE - I	Elective – I		3	-	2	4

Amended :

S N	Course Category	Name of Course	Course Code	Teaching Scheme (Hrs.)			Total Credits
				TH	TU	PR	
3	DSE - I	Elective – I		4	-	-	4

B.Sc. Semester VI

Previous

S N	Course Category	Name of Course	Course Code	Teaching Scheme (Hrs.)			Total Credits
				TH	TU	PR	
3	DSE - II	Elective – II		3	-	2	4

Amended

S N	Course Category	Name of Course	Course Code	Teaching Scheme (Hrs.)			Total Credits
				TH	TU	PR	
3	DSE - II	Elective – II		4	-	-	4

It is approved by panel.

Details enclosed (Encl- 3).

3. Field project / community services of B.Sc. Semester IV and V - Students of B.Sc. Sem IV and V have to do project and submit the report at the end of the semester. Projects can be done individually or in group. Teaching faculty of Zoology will supervise and topics for Field Projects / projects based on community services will be allotted to the students opting major subjects - Zoology. This has to be implemented from academic session 2024-25. Detailed guidelines enclosed (Encl- 4).

S N	Course Category	Name of Course	Course Code	Teaching Scheme (Hrs.)			Total Credits
				TH	TU	PR	
6	FP/CEP	Field Project/Community Service		-	-	4	2

It is approved by the panel unanimously.

4. **Agenda 5 : Internship in B.Sc. Sem VI of Major subject opted**

Students who have opted Zoology as major subject have to complete internship program. It will be implemented from the academic session 2025-26.

S N	Course Category	Name of Course	Course Code	Teaching Scheme (Hrs.)			Total Credits
				TH	TU	PR	
6	OJT	Internship (Related to DSC)		-	-	8	4

5. M.Sc. Semester III syllabus modifications –
Correction in credit system of M.Sc. Sem III - DSE – 3 consisting of theory paper of three units and practical based on DSE – 3 has been introduced. Credit structure & Syllabus attached (Encl- 5). It has to be implemented from the current 2024-25 session. Panel approved this correction.

Sr. No.	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)		Total Credit	Examination Scheme				
								Max. Marks			Minimum Passing Marks
				Theory	Practical		Duration	External Marks	Internal Asse	Total Marks	
1	DSC – 9	Parasitology and Immunology		4		4	3 hrs.	60	40	100	50
2	DSC – 10	Animal physiology -1 Physiology of digestion and excretion		4		4	3 hrs.	60	40	100	50
3	DSC – 11	Animal Physiology-2 Physiology of circulation		4		4	3 hrs.	60	40	100	50
4	DSC – 12	Practical I based on Parasitology and Immunology & Animal physiology -1 Animal physiology -2			4	2	6 hrs.	25	25	50	25
5	DSE – 3	Elective - I Biotechnique -1 Elective – II - Economic Aquaculture		2		2	3 hrs.	25	25	50	25
6	DSE – 3 P	Practical based on Elective - I / II		-	4	2	6 hrs	25	25	50	25
7	RP	Research Project			8	4				150	75
Total				14	16	22				600	

DSE Paper Pattern - Theory question paper pattern, practical 50 marks (25 Internal assessment, 25 Practical examination) has been approved by the panel.

6. Evaluation scheme of projects of M.Sc. Semester III – as per the directions of BOE (Encl – 6), following evaluation scheme has to be followed for projects. It is also implemented from current session 2024-25. Panel approved the evaluation scheme.

For project M.Sc. Sem III

Sr. No.	Evaluation type	Marks
1	Synopsis	50
2	Internal assessment by supervisor	50
3	Presentation and viva-voce	50

For project M.Sc. Sem IV

Sr. No.	Evaluation type	Marks
1	Dissertation	100
2	Internal assessment by supervisor	50
3	External viva-voce	50

7. Panel of examiner and paper setter – the previous panel which was approved by panel of examiner and paper setter will be continued for this session as well.

8. Any other point- there was no additional points to discuss. Hence the meeting ended with expressing sincere thanks to the members by Dr. S.P. Biswas.

27/8/2024

Dr. M. R. Chandrakar
Head
Department of Zoology
Bajaj College of Science, Wardha

Program Outcome (PO) for a **B.Sc. (Zoology) three-year course**

- Develop a strong foundation in zoology, including animal physiology, genetics, evolution, ecology, and taxonomy.
- Apply zoological knowledge to fields such as environmental conservation, biotechnology, and human health.
- Analyze biological data, interpret scientific results, and apply problem-solving techniques in research and field studies
- Integrate knowledge from allied sciences chemistry to develop a holistic understanding of life sciences.
- Evaluate evolutionary principles and ecological balance to understand biodiversity and conservation.
- Develop hands-on skills in microscopy, biochemical analysis, and ecological surveys.
- Utilize bioinformatics and data interpretation.
- Acquire skills in applied zoology sectors such as aquaculture, sericulture.

Syllabus for B.Sc. Zoology(NEP)
Credit Based System
B.Sc. Semester – V
DSC – V

Developmental Biology

Course Objectives

1. To impart knowledge about fundamental developmental processes such as fertilization, cleavage, and organogenesis.
2. To enable students to analyze the role of genetic and environmental factors in development.
3. To train students in experimental techniques and research methodologies related to developmental biology.

Course Outcomes (COs)

Upon successful completion of this course, students will be able to:

CO1: Demonstrate an in-depth understanding of key developmental processes such as fertilization, cleavage, gastrulation, and organogenesis by illustrating their cellular and molecular mechanisms. *(L3)*

CO2: Investigate the influence of genetic, environmental, and epigenetic factors on development by analysing experimental data and generating hypotheses. *(L4)*

CO3: Construct models depicting major developmental pathways, integrating concepts from morphogenesis, differentiation, and pattern formation. *(L4)*

CO4: Evaluate the role of developmental genes and signalling pathways using comparative analysis in model organisms like Drosophila, Xenopus, and Zebrafish. *(L4)*

CO5: Design and conduct experiments related to developmental biology techniques such as embryo dissection, in situ hybridization, and immunostaining to demonstrate practical understanding. *(L4)*

CO6: Assess the mechanisms of aging and regeneration by examining cellular processes and identifying potential therapeutic interventions. *(L4)*

Paper V:- Developmental biology

UNIT – I:- **(12Periods)**

Gametes to fertilization in Frog

1.1 Spermatogenesis:-Process of hormonal control, structure of sperm.

1.2 Oogenesis : Mechanism and hormonal control, egg structure

1.3 Sperm egg recognition and fusion : Chemotaxis , acrosome reaction and fusion.

1.4 Post fertilization events (prevention of polyspermy, fast block slow block rearrangement of egg cytoplasm)

UNIT – II:- **(12Periods)**

Early embryonic development in frog:

2.1 Embryonic Cleavage : Cleavage properties, Types of egg based on yolk content, factor affecting cleavage, Type of cleavage.

2.2 Blastula of frog : Formation and structure

2.3 Gastrulation of frog : Cell movement in gastrulation, Process of formation of gastrula.

2.4 Germ layer formation : Cell specification, commitment and differentiation

UNIT – III:- **(12Periods)**

Axis specification in embryo:

3.1 Embryonic organizer in frog: Concept of induction, Spemann-Mangold experiment, primary organizer.

3.2 Cell cell communication : concept of cell signalling, types of signalling, basic concept of cell receptors.

3.3 Concept of morphogen gradient:

3.4 Basics of axis specification in *Drosophila*.

UNIT – IV:- **(12Periods)**

Gene and development:

4.1 Sex determination in bird and human

4.2 Dosage compensation : heterochromatinization, mechanism and significance

4.3 Cloning by nuclear transfer in mammals.

4.4 Teratogens : Effect on development of embryo, alcohol and retinoic acid as teratogen.

UNIT – V:- **(12Periods)**

Techniques in developmental biology:

5.1 Multiple ovulation.

5.2 IVF,ICSI.

5.3 *In situ hybridization*: Principle, types and application.

5.4 Cryopreservation : Principles mechanism and application (gametes & embryos).

UNIT – VI:- **(12Periods)**

Developmental biology in human welfare:

6.1 Model organisms with examples *Drosophila & C.elegans*

6.2 Transgenic animals with examples

6.3 Sources & Basics of stem cells culturing with examples of application.

6.4 Induced Pluripotency Basics and genes involved.

Practical based on Developmental Biology–

1. Study of permanent slides of Frog embryology : T.S. Blastula, T.S.Gastrula, T.S. Neurula, T.S. tadpole passing through internal and external gill stage.
2. Study of permanent slides of chick embryology W.M.: 18hrs,24hrs,

   36 Hrs, 72hrs. 96 hrs.
3. Semen analysis : Motility and Sperm count (Source of semen : Government artificial insemination centre).
4. Sperm vitality study using suitable stains (Source of semen : Government artificial Insemination centre).
5. Study of any model organism –Lifecycle stages.
6. Study of Egg Structure (Avian Egg)
7. Study of teratogenic effects of various chemicals/teratogens on *Drosophila*/chick development
8. Histology of male and female reproductive organs (Testis, Ovary, Uterus, Fallopian tube and accessory reproductive glands) With the help of already available permanent slides/ ICT tools/ charts/ photographs etc.
9. Demonstration of Barr body
10. Submission of Field report / Diary on Congenital disorders / Birth defects / Life Cycles of Animals in your surroundings

	Distribution of Marks–	Total Marks	30
1.	Identification and Comment on spots (2 Slides on Frog embryology, 2 Slides on chick Embryology, 1 Slides on Reproductive Histology)		10
2.	Experiment on Sperm Count/Hypo-osmotic test for Fertility		04
3.	Experiment on Sperm Vitality/Preparation of Slides of Barr Body		04
4.	Submission of Field diary		04
5.	Submission of certified practical record		04
6.	Viva voce		04

References Books:-

1. Leon W. Browwer – Developmental Biology. 2nd Edition. Saunders College publishing.
2. R. A. Pedersen and G.P. Schatten – Current Topics in Developmental Biology eds.
3. S.C. Goel-Principles of animal developmental biology, Himalaya Publishing House.
4. S.F.Gilbert- Developmental Biology, 4th Edn. Sinauer Associates Inc.Publishers.
5. D.A. Ede – An Introduction to Developmental Biology.
6. Paul Weiss- Principles of developmental: edited by Hafner publishing company New York.
7. John Philip Trinkaused. Tom Aloisi – Cells into organs. 2nd Edition. The forces that shape the Embryo.
8. Lewis Wolpertetal.- Principles of development, Oxford University Press.
9. B.M. Patten & B.M. Carlson – Foundations of Embryology. Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
10. Balinsky(1981) 5thEd- An Introduction to Embryology,(CBS College Publishing).
11. Austin and Short – Embryonic and foetal development. Cambridge University Press by, 1982, 1994 2nd Ed.
12. Marshall's Physiology of Reproduction Longmont, Green and Co.LondonVol.1&2. Lamming 1984, 2000.

Syllabus for B.Sc. Zoology (NEP)
Credit Based System
B.Sc. Semester – V
DSC – VI - Biological Chemistry

Course Objectives

CO 1: To introduce students to the fundamental concepts and scope of biological chemistry.

CO 2: To provide an understanding of the properties of water and its role in biological systems.

CO 3: To explore the structure, classification, and functions of biomolecules, including carbohydrates, proteins, lipids, and nucleic acids.

CO 4: To explain the principles of bioenergetics, thermodynamics, and metabolism in living organisms.

CO 5: To describe the role of ATP in energy transfer and enzyme functions in biochemical reactions.

Course Outcome

1. Define fundamental concepts of biological chemistry, including the properties of water, acids, bases, and buffers.
2. Identify the classification, structure, and functions of carbohydrates, proteins, lipids, and nucleic acids.
3. Explain the properties and classification of amino acids and their role in protein structure.
4. Describe the principles of bioenergetics, thermodynamics, and metabolism in living systems.
5. Illustrate the structure and significance of ATP in energy transfer.
6. Explain enzyme properties, classification, and the mechanism of enzyme action.
7. Apply basic biochemical concepts to understand metabolic reactions and enzyme activities.

Unit I

1.1 Introduction to Biological Chemistry: Definition, Scope and History
1.2 Physical Properties of Water, Water as a Polar molecule, Hydrophobic substances and hydrophilic substances
1.3 Chemical Properties of water: Ionization of water, pH
1.4 Acid, Bases and Buffers

Unit 2

2.1 Carbohydrates: Definition and Function of Carbohydrates
2.2 Classification of carbohydrates:
2.3 Monosaccharides and Disaccharides: examples, structures, properties and uses
2.4 Oligosaccharides and Polysaccharides: examples, structures and functions.

Unit 3

3.1 Proteins: Definition and functions
3.2 Amino acids: Nomenclature, Physical and Chemical properties of amino acids.
3.3 Classification of amino acids
3.4 Structure of Proteins: Primary, Secondary, Tertiary and Quaternary structure.

Unit 4

4.1 Lipids: Definition, Properties and functions
4.2 Classification of lipids
4.3 Nucleic acids: Definition and functions
4.4 Structure and components of nucleic acids

Unit 5

5.1 Bioenergetics: Concept and definition
5.2 Thermodynamics: First and Second law of thermodynamics
5.3 Metabolism: Catabolic and Anabolic reactions with examples
5.4 Adenosine triphosphate (ATP): structure and uses of ATP

Unit 6

6.1 Enzymes: Definition, History and functions
6.2 Nomenclature, classification and properties of enzymes
6.3 Mechanism of enzyme action: Enzyme-substrate complex theory, Lock and Key Theory, Induced Fit Model
6.4 Factors affecting enzyme activity

Practical :

1. Preparation of normal and molar solutions
2. Preparation of Buffers: Phosphate and Acetate buffers
3. Qualitative tests of functional groups in carbohydrates
4. Qualitative tests of functional groups in proteins
5. Qualitative tests of functional groups in lipids.
6. Quantitative Estimation of sugars
7. Quantitative estimation of proteins
8. Paper chromatography of amino acids.
9. Action of salivary amylase under optimum conditions.
10. Effect of pH, temperature and inhibitors on the action of salivary amylase.

Suggested Readings:

1. Nelson & Cox: Lehninger's Principles of Biochemistry: McMillan (2000)
2. Zubayet al: Principles of Biochemistry: WCB (1995)
3. Voet&Voet: Biochemistry Vols 1 & 2: Wiley (2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd.,U.K.
6. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R. (2008). Molecular Biology of the Gene, VI Edition, Cold Spring Harbor Lab. Press, PearsonPub.

Syllabus for B.Sc. Zoology (NEP)
Credit Based System
B.Sc. Semester – V
DSE - I :Paper I - Applied and Economic Zoology

Course Objectives :

- Students acquires the knowledge and skills related to applied zoological fields
- Students acquires comprehensive understanding of varied applied and economic zoology fields
- To encourage the students to set up their own small scale establishment
- Students can train other job seekers by providing training thus recalling and spreading the knowledge they have acquired

Course Outcome :

CO 1 Remember, Recall and Communicate the knowledge of Beekeeping and Honeybees

CO 2 Identify, Analyze and Apply the knowledge of Apiculture for Human Welfare

CO 3 Understand, Analyze and Apply the knowledge of Vermiculture in Agriculture

CO 4 Describe and Apply the knowledge of Prawn culture and set up establishment

CO 5 Memorize, describe and demonstrate the knowledge of Pearl culture and set up establishment

CO 6 Understand, describe and demonstrate the knowledge of Sericulture

Unit I :Apiculture

1.1 History of Beekeeping in India, Father of Modern bee science, Langstroth Bee Hive

1.2 Honey Bee – Life cycle of Indian bee, Common domesticated honey bee species

1.3 Honey Bee – Bee hive organisation, Castes and duties, Royal Marriage

1.4 Honey Bee– Pests, parasites, Diseases and their management

Unit II :Apiculture Industry

2.1 Honey – Formation, Types, Physical and Chemical Properties, Uses

2.2 Honey – Harvesting, & Processing Equipments

2.2 Honey Bee – Products and their importance to Mankind

2.4 Honey Industry – Scope, Methods of Beekeeping

Unit III : Vermicomposting

3.1 Earthworm – Life cycle, Prominent species

3.2 Vermicomposting –Types, Processing, Benefits and uses

3.3 Vermicompost Industry – Scope and Future, Small and Large scale Culture

3.4 Earthworm - Pests and Diseases

Unit IV : Prawn Culture Industry

4.1 Introduction – Prawn farming in India

4.2 Prawn – Life cycle, Culture of Fresh Water Prawn

4.3 Indian Prawn Industry – Production, Economic Importance

4.4 Prawn Culture – Diseases and health management

Unit V : Pearl Culture Industry

5.1 Introduction and History of Pearl Culture, distribution

5.2 Indian Pearl Oyster – Life Cycle of *Pinctada vulgaris,*Pearl farming

5.3 Pearl formation, Physical/Chemical properties of Pearl, Pearl quality improvement methods

5.4 Indian Pearl Industry – Scope, Products and Economic Importance

Unit VI: Sericulture

5.1 Introduction and History of Sericulture, Seri products for Value addition

5.2 Silkworm *Bombyxmori*, Life Cycle and Biology, Structure of Silkgland

5.3 Silk – Nature,Properties, Processing and Management, Central Silk Board

5.4 Diseases of Silkworm and their Management

Suggested Reference Books :

1. Economic Zoology – Sagarika Chaudhari, NCBA, New Delhi/Kolkata
2. Economic Zoology - Gaurav Tyagi, Sonali Publications, New Delhi
3. Economic Zoology - Shukla and Upadhyay, Rastogi Publications, Meerut
4. Economic Zoology - Sarkar, Kundu and Chaki, NCBA, Kolkata

List of Books for reference

Parasitology

1. Brock Biology of Microorganisms (Ed. IX) M. T. Madigan J. M. Martinko and J.Parker. Prentice Hall International Publication.
2. The Nematode Parasite in Vertebrate, W. Youle and Maplestone.
3. General Parasitology, V. A. Dogiel.
4. Helminthology, E. C. Fausy.
5. Platyhelminthes and Parasitisium, D.R.Birt.
6. Animal Parasite- O.W. Aisen
7. Parasitic Protozoa, J.P. Kreier and J.R. Baker. Allen and Unwin Press.
8. Medical and Veterinary Protozoology M. G. Kathering , A. James paul and V. Zaman. Churchill Livingstone

Syllabus for B.Sc. Zoology (NEP)
Credit Based System
B.Sc. Semester – VI
DSC VII
Mammalian Physiology

Theory – 100 =70 exam + 30 internal

Course objectives ---

- Able to recall the physiological processes of mammal.
- Analyze Physiological Processes and Adaptations:Assess how different physiological systems interact to maintain homeostasis
- Apply Knowledge to Clinical and Practical Situations:Apply knowledge of physiological mechanisms to develop and recommend appropriate interventions for managing health conditions, including respiratory disorders, blood disorders, and hormonal imbalances.

Course outcome

- Recall the structure of the respiratory organs and list the mechanisms involved in breathing.
- Explain the functions of blood, the process of blood coagulation, and the significance of different blood groups and the Rh-factor. Describe the structure of the human heart, its pacemaker, and the cardiac cycle.
- Apply the sliding filament theory to analyze how changes in muscle structure affect muscle contraction. Use knowledge of neuron structure to assess the impact of myelination on nerve conduction.
- Able to describe overall process of digestion and excretion.
- Identify and describe the structure and functions of major endocrine glands.
- Explain how hormonal regulation affects reproduction and lactation.

UNIT I : Respiratory Physiology

1.1 Respiration: Structure of respiratory organs: Lungs , mechanism of breathing

1.2 Respiratory volume and capacities

1.3 Transport of gases: O_2 and CO_2 Transport, Haemoglobin

1.4 Neurophysiologic control of respiration

UNIT II: physiology of circulation

2.1 Circulation: Blood : Definition and its constituents, functions of blood.

2.2 Blood coagulation factors, extrinsic, intrinsic pathways, blood groups ABO system and Rh-factor.

2.3 Heart: Structure of human heart, pace maker, Cardiac cycle.

2.4 Lymph : composition and functions , location of lymph nodes

UNIT III: Muscle and Nerve physiology

3.1 Muscle Physiology: Types of Muscles: striated, non-striated and cardiac muscles

3.2 E.M. Structure and Chemical Composition of striated muscle. Mechanism of muscle contraction (Sliding filament theory).

3.3 Nerve Physiology: Neuron: E.M. Structure of neuron and Types : Myelinated and non Myelinated nerve fibres,

3.4 Resting potential, Action potential, saltatory nerve impulse conduction. Synapse and synaptic transmission(with acetyl choline as an example)

UNIT IV: Digestive and Excretory Physiology

4.1 Nutrition and Digestion: Structure and functions of digestive system and associated glands;

4.2 Digestion and absorption of proteins, carbohydrates and lipids.

4.3 Excretion:Structure of excretory system, Uriniferous tubule ;

4.4 Mechanism of urine formation ; normal and abnormal constituent of urine; concept of dialysis

UNIT V : Endocrinology

5.1 Endocrine system: Hormones and their classification

5.2 Structure & Functions of Endocrine Glands : Pineal Gland, Hypothalamus,

5.3 Pituitary Gland, Thyroid Gland, Parathyroid Gland,

5.4 Adrenal Gland, Islets of Langerhans

UNIT VI : Reproductive Physiology

6.1 Reproductive Physiology:Estrous and menstrual cycle.

6.2 Hormonal control of Reproduction in males and female.

6.3 Structure and Physiology of Human Placenta

6.4 Physiology of Lactation

Practical :

1. Estimation of hemoglobin percentage with the help of haemometer.
2. Preparation of Haemin crystals.
3. Blood group detection
4. R.B.C. count.
5. W.B.C. count.
6. Measurement of blood pressure.
7. Action of salivary amylase on starch.
8. Qualitative detection of nitrogenous waste products (Ammonia, urea, uric acid) in given sample.
9. Estimation of glucose.
10. Qualitative analysis of carbohydrate, lipid and protein.
11. Field Report / Diary on disorders / Diseases observe in your surrounding (Survey Report)

11. Study of histological slides of Mammal – T.S. kidney, pituitary, thyroid, adrenal, testis, ovary; uterus, placenta, medullated and non medullated nerve fiber, smooth and striated muscle

Distribution of Marks –

Total Marks 50 ---15 internal (Record – 10 + internal viva -5)+ 35 external exam

1. Physiological Expt.	10
2. Physiological Expt.	05
3. Spotting (A To E)	05
4. Submission of Diary	05
5. Viva - voce	10

Reference Books—

Guyton and Hall-Textbook of Medical Physiology

Lauralee Sherwood - Human Physiology: From Cells to Systems

Chatterjee, C.C, - Human Physiology Vol-l and II

Best and Taylor - Physiological basis of Medical practice

Prosser and Brown - Comparative Animal Physiology

Hoar, W.S. - General And Comparative Physiology..

Syllabus for B.Sc. Zoology (NEP)
Credit Based System
B.Sc. Semester – VI
DSC – VIII
Basic Immunology

Course Objective

1 The course provides students with a comprehensive understanding of the fundamental concepts of immunology, including its historical development and key principles of the innate and adaptive immune systems.

2 The course introduces students to the structure, function, and interaction of the cells, organs, and molecules involved in the immune response, including antigens, antibodies, and major histocompatibility complexes.

3 This course equips students with practical skills in immunological assays and techniques, such as ELISA, Western blotting, and antigen-antibody interactions, enabling them to apply these methods in various practical settings for analysis.

4 The course enhances students' ability to analyse and interpret the role of the immune system in health and disease, including hypersensitivities, immunodeficiencies, autoimmune diseases, and the principles of vaccination and immunotherapy.

Course Outcome

1 Understanding and remembering the basic concepts and components of the immune system, including its cells, organs, and mechanisms of action.

2 Discrimination and identifying differences between the innate and adaptive immune systems, including primary and secondary immune responses.

3 Demonstrating the ability to investigate blood groups and other immunological aspects by applying techniques such as ELISA and Western blotting in practical settings.

5 Recognisation and interpretation on implications of immune system dysfunctions, including hypersensitivities and autoimmune diseases, on human health.

6 Analysing the role of immunological principles, such as vaccination and immune modulation, in disease prevention and treatment.

UNIT I:

1.1 Introduction to Immunology: Historical perspective. Definition of Immunity and Immunology. Overview of Immune System.
1.2 Innate immune system: Definition, Anatomical and physiological barriers to Infection.
1.3 Inflammation: Cardinal signs of inflammation
1.4 Adaptive Immunity: Definition, Characteristic Attributes, Humoral and Cell mediated Immunity

UNIT II:

2.1 Hematopoietic stem cells and Haematopoiesis. Cells of the myeloid and Cells of the lymphoid lineage.
2.2 Cells of the immune system: Macrophages, Neutrophils, Eosinophil, Basophil, NK Cells, B- Lymphocytes, T- Lymphocytes, helper T (TH) cells, cytotoxic T (TC) cells.
2.3 Organs of the Immune system: Introduction to Primary Lymphoid Organs, Thymus and bone marrow.
2.4 Introduction to Secondary Lymphoid Organs, Lymph nodes.

UNIT III:

3.1 Antigens: Properties (foreignness, molecular size,heterogeneity) and haptens.
3.2 Antibody: Basic structure of Antibodies, Classes of Antibodies
3.3 Antigen-Antibody interaction, Antigen-Antibody principle of interaction, Precipitation reaction, Agglutination reaction.
3.4 Major histocompatibility complex - Structure of MHC I & II.

UNIT IV:

4.1 Antigen Processing and Presentation: Antigen presenting cells, Role of antigen presenting cells.
4.2 Exogenous and endogenous antigen processing and presentation pathways: Cytosolic Pathway and Endocytic Pathway.
4.3 Introduction to the Complement system, Functions of the complement system,componentsof the complement system.
4.4 Classical and alternative Pathwayof complement activation.

UNIT V

5.1 Cytokines: Basic properties and functions of cytokines.
5.2 Hypersensitivity (HS): Type I: Allergies and anaphylaxis – IgE, Mast cell degranulation, biologically active agents released in reactions, Clinical manifestations.

5.3 Type II: Antibody mediated HS reactions; Mechanism, Haemolytic-disease of new born (HDN).

5.4 Type III: Hypersensitivity: Immune complex mediated Hypersensitive reactions: Mechanism &pathogenicity of type III. Type IV: Delayed type (or) cell-mediated HS reactions.

UNIT VI

6.1 Immune Deficiencies: basic primary and secondary deficiencies.

6.2 Acquired Immunodeficiency Syndrome (AIDS): HIV structure and life cycle.Preventive measures.

6.3 Introduction to Autoimmune Diseases, Organ-Specific Autoimmune Diseases, Type 1 diabetes mellitus.

6.4 Vaccines: Whole-Organism Vaccine, Purified Macromolecules as Vaccines.

Reference Books

1. **Kuby Immunology**
   - Authors: Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne
   - Publisher: W. H. Freeman
2. **Janeway's Immunobiology**
   - Authors: Kenneth Murphy, Casey Weaver
   - Publisher: Garland Science
3. **The Immune System**
   - Authors: Peter Parham
   - Publisher: Garland Science
4. **Basic Immunology: Functions and Disorders of the Immune System**
   - Authors: Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai
   - Publisher: Elsevier
5. **Roitt's Essential Immunology**
   - Authors: Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt
   - Publisher: Wiley-Blackwell
6. **Cellular and Molecular Immunology**
   - Authors: Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai
   - Publisher: Elsevier
7. **Immunology: A Short Course**
   - Authors: Richard Coico, Geoffrey Sunshine
   - Publisher: Wiley-Blackwell
8. **Clinical Immunology: Principles and Practice**
   - Editors: Robert R. Rich, Thomas A. Fleisher, William T. Shearer, Harry W. Schroeder Jr., Anthony J. Frew, Cornelia M. Weyand
   - Publisher: Elsevier
9. **Basics of Immunology:**
   - Girish L Bhoosreddy and Bharat Wadher, Himalaya Publishing house.

Syllabus for B.Sc. Zoology (NEP)
Credit Based System
B.Sc. Semester – VI
DSE – II– Paper – I - Ecology and Evolution

Course Objectives

CO 1: To introduce the fundamental concepts of ecology and its significance in understanding ecosystems.
CO 2: To explain biogeochemical cycles, energy flow, and species interactions in ecological systems.
CO 3: To provide knowledge about population dynamics, ecological succession, and environmental pollution.
CO 4: To emphasize the importance of wildlife conservation and biodiversity, with a focus on Indian biodiversity hotspots.
CO 5: To explore various theories related to the origin of life and experimental evidence supporting them.
CO 6: To understand the major theories of evolution and the scientific evidence that supports evolutionary processes.

Course Outcomes

1. Define key ecological concepts, including ecosystems, biogeochemical cycles, and energy flow.
2. Explain species interactions, population dynamics, and ecological succession.
3. Describe environmental pollution, its sources, effects, and control measures.
4. Identify the importance of wildlife conservation, biodiversity, and biodiversity hotspots in India.
5. Summarize the historical perspectives and theories on the origin of life.
6. Explain major theories of evolution and the evidence supporting evolutionary processes.
7. Illustrate the concepts of microevolution, macroevolution, and types of isolation in evolutionary biology.

Unit - I

1.1. Ecology: Definition of ecology, historical background of ecology.

1.2. Significance of ecology

1.3. Ecosystem: Concept and types of ecosystem

1.4. Structure of Ecosystem: Abiotic factors and Biotic factors

Unit - II

2.1 Biogeochemical cycles - Nitrogen, Carbon, Phosphorus and Water.

2.2 Food chain, food web and ecological pyramids.

2.3 Energy flow in the ecosystem.

2.4 Animal Associations - Mutualism, commensalism, parasitism, competition, predation.

Unit - III

3.1 Concept of Species, Population dynamics and Growth curves.

3.2 Ecological Succession: Causes, Types and General process of Succession

3.3 Environmental Pollution – Sources, Effect and Control measures of Air Pollution and Water Pollution

3.4 Environmental Pollution – Sources, Effect and Control measures of Soil and Noise pollution

Unit - IV

4.1 Wildlife of India: Reasons for the depletion of wildlife. Concept of threatened and endangered species.

4.2 Wildlife conservation –the necessity of Wildlife conservation: National parks and Sanctuaries of India

4.3 Biodiversity: Concept and definition

4.4 Biodiversity hot spots: Definition. Biodiversity hotspots of India

Unit - V

5.1 Concept of evolution;a preview of evolution; certain misconceptions of evolutionarybiology; the significance of evolutionary biology.

5.2 Origin of life: Historical and theories: special creation theory, theories of spontaneous generationor abiogenesis, the decline and fall of the theory of spontaneousgeneration. Hypothesis of panspermia, theory ofchemical evolution and spontaneous origin of life.

5.3 Oparin's hypothesis about origin of life. Experimental proof of Oparin's hypothesis- Miller's Experiment.

5.4 Origin and evolution of RNAworld, origin and evolution of ribonucleoprotein (RNP)

Unit - VI

6.2 Theories of evolution - Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism,Modern synthetic theory.

6.1 Evidence of Evolution: Fossil record (types of fossils, transitional forms,geological time scale

6.3 Mechanisms of Evolution, Isolation and Speciation

6.4 Microevolution, macroevolution — Evolution of human.

Suggested Readings:

- Colinvaux,P.A.(1993).Ecology. II Edition.Wiley, Johnand Sons, Inc.
- Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
- Odum,E.P.,(2008).Fundamentals of Ecology. Indian Edition.
- Brooks/Cole Robert Leo Smith Ecology and field biology Harperand Row publisher
- Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres
- Lull, R.S. 1976. Organic Evolution. Light & Life Publisher.
- Moody: Introduction to Evolution (1978, Kalyani).
- Savage: Evolution (1963, Holt, Reinhart and Winston)
- Rastogi: Organic Evolution (1988, Kedarnath & Ramnath)
- Strickberger: Evolution (2004, Jones & Bartlett)

Syllabus for B.Sc. Zoology (NEP)
Credit Based System
B.Sc. Semester VI –
(DSE-II, Paper II) Bioinformatics

Course Objectives

1. Introduce fundamental concepts of bioinformatics and its role in biological research.
2. Familiarize students with biological databases and sequence analysis.
3. Explain theoretical principles behind sequence alignment, structural bioinformatics, and genomics.
4. Highlight ethical considerations and emerging trends in bioinformatics.

Course Outcomes (COs)

After completing this course, students will be able to:

1. Understand the basic principles and applications of bioinformatics.
2. Describe the types and uses of biological databases.
3. Explain sequence alignment techniques and their significance.
4. Understand the theoretical aspects of protein structure and modeling.
5. Discuss genomic and proteomic approaches in biological research.
6. Recognize ethical aspects and advancements in bioinformatics.

Unit 1: Introduction to Bioinformatics

1.1 Definition and scope of bioinformatics, importance in biological studies.

1.2 History, milestones, and evolution of bioinformatics.

1.3 Applications in healthcare, agriculture, and environmental sciences.

1.4 Overview of bioinformatics resources (GenBank, PDB, BLAST).

Unit 2: Biological Databases

2.1 Types of biological databases – nucleotide and protein databases.

2.2 Methods for searching and retrieving biological data.

2.3 Sequence data formats (FASTA, GenBank) and their importance.

2.4 Basics of data organization, storage, and annotation.

Unit 3: Sequence Alignment

3.1 Importance of sequence alignment in bioinformatics.

3.2 Pairwise sequence alignment – concepts, scoring matrices.

3.3 Multiple sequence alignment – overview and tools (ClustalW).

3.4 Phylogenetic analysis – basics and tree construction methods.

Unit 4: Structural Bioinformatics

4.1 Basic concepts of protein structure and function.

4.2 Protein structure databases and visualization tools (RasMol, PyMOL).

4.3 Principles of molecular modelling and homology modelling.

4.4 Introduction to structural comparison and alignment techniques.

Unit 5: Genomics and Proteomics

5.1 Fundamentals of genomics and genome sequencing.

5.2 Functional genomics – gene expression and microarrays.

5.3 Basics of proteomics and protein analysis techniques (2D-PAGE).

5.4 Applications in biotechnology and medicine.

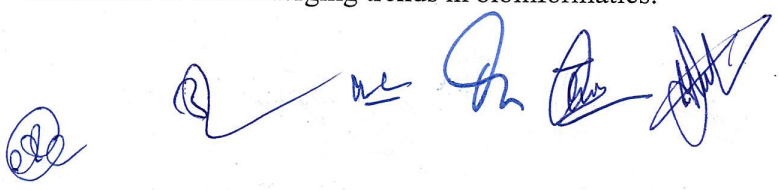
Unit 6: Bioinformatics Tools and Trends

6.1 Overview of common bioinformatics tools and software.

6.2 Basic concepts of data mining and machine learning in bioinformatics.

6.3 Introduction to next-generation sequencing (NGS).

6.4 Ethical issues and emerging trends in bioinformatics.



Reference Books

1. "Bioinformatics: Sequence and Genome Analysis" – David W. Mount
2. "Introduction to Bioinformatics" – Arthur M. Lesk
3. "Bioinformatics: Principles and Applications" – H.J.N.M.D.B.H.L. Murthy
4. "Fundamentals of Bioinformatics" – K.J. Rao