Department of Zoology, Basirhat College

Session-2021-2022 (Jan-June)

Lesson Plan -For Even Semesters

Semester: II Honours

Lesson Plan for Course: Non-Chordates II Code…… ZOOACOR03T … Credit……4

- Course coordinator:……**RAJASHREE MALLICK**……
- Course Outcome

1. CO1: Upon completion the course the students will learn different classes of non chordate.
2. CO2: Enhancing their observation power and analyzation ability.
3. CO3: Undarstand many biological process related to different phylum.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
February				ONLINE
	UNIT 1: COELOM	RM	1	ONLINE
	UNIT 2: ANNELIDA	RM	**8**	ONLINE
	annelida classification	RM		ONLINE
	Annelida excretion	RM		ONLINE
March	Annelida excretion	RM		ONLINE
	practical	RM		ONLINE
	Annelida excretion	RM		ONLINE
	Practical	RM		ONLINE
	Class test	RM		ONLINE
	Unit 3: Arthropoda	RM	4	ONLINE
	Practical	RM		ONLINE
		RM		ONLINE
	Metamorphosis in Insects	RM		ONLINE
	Social life in bees and termites	RM		ONLINE
April	UNIT 4 : CLASSIFICATION OF **Onychophora**	RM	3	ONLINE

	General characteristics			
	CLASSIFICATION OF **Onychophora** General characteristics	RM		ONLINE
	CLASS TEST	RM		ONLINE
	Unit 5: Mollusca General characteristics and Classification up to classes	RM	5	ONLINE
	practical			ONLINE
	PRACICAL			ONLINE
	Respiration in Mollusca			ONLINE
	Torsion and detorsion in Gastropoda	RM		ONLINE
May	**Unit 6: Echinodermata INTRODUCTION**	RM	4	ONLINE
	General characteristics and Classification up to classes	RM		ONLINE
	Water-vascular system in Asteroidea	RM		ONLINE
	Larval forms in Echinodermata	RM		ONLINE
June	**Unit 7: Hemichordata** General characteristics of phylum Hemichordata	RM	2	ONLINE
	Phylogenetic relationship with non-chordates and chordates (only recent concept)*	RM	1	ONLINE
	PRACTICAL	RM	2	ONLINE
	Hemichoedata	RM	1	ONLINE
	Question discussion	RM	1	ONLINE
			Total 29	

Resources :

Text Book:

- Biology of the Invertebrates by Jan A Pechenik, Mcgrew-Hill, 2014
- Invertebrates by Brusca and Brusca 2nd Ed, Sinauer Associates

Referrence: • An introduction to Invertebrates by Janet Moore 2nd ed. • Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science • Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson • Chaudhury,S.(2017). Economic Zoology. New Central Book Agency

For CBCS

Lesson Plan for Course: CELL BIOLOGY…… Code: ZOOACOR04T…. Credit: 4….

1. Course coordinator:..**UDAY HOSSAIN**…
2. Course Outcome :
   i) CO1: Can understand the structure and functions of various cell organelles involved in diverse cellular processes.
   ii) CO2: Can comprehend the different phases of cell cycle and cellular death and their importance in maintaining stability of body system.
   iii) CO3: Relate the cellular processes with the process of cell signalling.
   iv) CO4: Perform the laboratory tests for detecting various cellular components and processes.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 1: Overview of cells**	**Uday Hossain**		
	Prokaryotic cell and Eukaryotic cell		1	Theoretical, PPT presentation, Google meet, animation from YouTube
	Virus, Viriods		1	Theoretical, PPT presentation, Google meet
	Mycoplasma, Pirions		1	Theoretical, PPT presentation, Google meet
	Unit 2:Plasma Membrane	**Uday Hossain**		
	Various Models of plasma membrane structure		3	Theoretical, PPT presentation, Google meet, animation from YouTube
	Transport across membranes: Active and passive transport, Facilitated transport		2	Theoretical, PPT presentation, Google meet, animation from YouTube

	Cell Junctions: Tight junctions, Gap junctions, Desmosomes,		2	Theoretical, PPT presentation, Google meet, notes in Google classroom
May	**Unit 2:Plasma Membrane**	**Uday Hossain**		
	Extracellular matrix cell interaction		1	Theoretical, PPT presentation, Google meet, notes in Google classroom
	Unit 3: Endomembrane System	**Uday Hossain**		
	Structure and functions: Endoplasmic reticulum		2	Theoretical, PPT presentation, Google meet, notes in Google classroom, animation from YouTube
	Golgi apparatus		1	Theoretical, PPT presentation, Google meet, notes in Google classroom
	Lysosomes		1	Theoretical, PPT presentation, animation from YouTube, Google meet, notes in Google classroom
	Class Test		1	In Google classroom
	Unit 4: Mitochondria and Peroxisomes	**Uday Hossian**		
	Mitochondria: structure, Semi-autonomous nature		2	Theoretical, PPT presentation, Google meet, animation from YouTube, notes in Google classroom
	Endosymbiotic hypothesis		1	Theoretical, PPT presentation, Google meet, notes in Google classroom

	Mitochondrial respiratory chain		2	Theoretical, PPT presentation, Google meet, animation from YouTube, notes in Google classroom
June	**Unit 4: Mitochondria and Peroxisomes**	**Uday Hossian**		
	Chemi-osmotic hypothesis		1	Theoretical, PPT presentation, Google meet, notes in Google classroom
	Peroxisomes		2	Theoretical, PPT presentation, Google meet, notes in Google classroom
	Unit 5: Cytoskeleton	**Uday Hossain**		
	Structure and function: Microtubules		2	Theoretical, PPT presentation, Google meet, notes in Google classroom
	Microfilament		1	Theoretical, Google meet, PPT presentation, notes in Google classroom
	Intermediate filaments		1	Theoretical, PPT presentation, Google meet notes in Google classroom
	Unit 6: Nucleus	**Uday Hossain**		
	Structure of Nucleus		1	Theoretical, PPT presentation, Google meet notes in Google Classroom, animation from YouTube
	Nuclear Envelope		1	Theoretical, notes in Google classroom

	Nuclear pore complex, Nucleolus		1	Theoretical, PPT presentation, Google meet notes in Google Classroom, animation from YouTube
	Euchromatin and heterochromatin		1	Theoretical, PPT presentation, Google meet notes in Google classroom
	Chromatin packaging(nucleosome)		2	Theoretical, PPT presentation, Google meet animation from YouTube, notes in Google classroom
	Class test		1	In Google classroom
			Total: 34 Hrs	

Resources :

1. Books: Lodish 7th edition, The cell (Cooper 4th edition),Karp 6th edition, The molecular biology of the cell (Alberts 5th)
2. Other resources : Youtube animation links, Wikipedia, some ebooks

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms)

Semester:...IV

Lesson Plan for Course: Comparative Anatomy... Code..... ZOOACOR08T ...Credit.....4

- Course coordinator:·····**RAJASHREE MALLICK**···.

Course Outcome :

- ✓ CO1:Upon completion the course the students will learn different aspect of comparativeaccount of animal.
- ✓ CO2: Understand evolution of different anatomy in animal.
- ✓ CO3: Learn about different skeletal system.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
February	**Unit 1: Integumentary System** **introduction**	RAJASHREE MALLICK	**1**	ONLINE
	Structure of integument in mammals	RM	2	ONLINE
	function and derivatives of integument in mammals	RM	2	ONLINE
	practical	RM	2	ONLINE
	Unit 2: Skeletal System 6 Overview		1	ONLINE
	Jaw suspension		1	ONLINE
	Jaw suspension	RM	1	ONLINE
	Practical	RM	2	ONLINE
March	**Unit 3: Digestive System**	RM		ONLINE
	Comparative anatomy of stomach	RM	2	ONLINE
	Comparative anatomy of stomach	RM	2	ONLINE
				ONLINE
	dentition in mammals	RM	2	ONLINE
	Unit 4: Respiratory System	RM		ONLINE
	Respiratory organs in birds	RM	2	ONLINE
	Respiratory organs in birds	RM	2	ONLINE
April	**Unit 5: Circulatory System**	RM		ONLINE
	Comparative account of heart		2	ONLINE
	Comparative account of aortic arches	RM	2	ONLINE

May	**Unit 6: Urinogenital System**	RM		ONLINE
	Succession of kidney	RM	1	ONLINE
	practical	RM	2	ONLINE
June	**Unit 7: Nervous System**	RM		ONLINE
	Comparative account of brain, in mammals	RM	2	ONLINE
	Comparative account of Cranial nerves in mammals	RM	**2**	ONLINE
	Unit 8: Sense Organs	RM		ONLINE
	practical	RM	2	ONLINE
	Classification of receptors	RM	2	ONLINE
	practical	RM	2	ONLINE
	Class test	RM		ONLINE
	practical	RM	1	ONLINE
			TOTAL 35	

Resources:

Text Book:

1. Comparative Anatomy of the Vertebrates 9th Ed (2015) by Kent; McGrew-Hill
2. Elements of Chordate Anatomy by Weichert and Presch, 2017, Amazon.in

References:

- Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons
- Kardong, K. V. (2002). Vertebrates: Comparative anatomy, function evolution. McGraw Hill 4th Ed. 2005.

Lesson Plan for Course:…Physiology: Life Sustaining system..Code… ZOOACOR09T……..
Credit……04…

Course coordinator:……**Arpita Mondal**……

- Course Outcome

  - CO1: To understand the digestion process, the components of food and their proper absorption in the proper organs.
  - CO2: To analyse the proper physiological importance and the proper work of many digestive enzymes.
  - CO3: To learn the information about the respiratory process and the O2 and CO2 transportation in the body with complete illustration.
  - CO4: To understand the main components of blood with their work in the body.
  - CO5: To know the Blood group of our body and the Rh factor of the blood.
  - CO6: To learn the process of cardiac cycle with systematic impulse.
  - CO7: To learn the excretory process, Urine formation with acid base balance.

Course planner

Month	Course Topic	Teacher	Classhour	Remarks*
Feb	Unit-1: Physiology of Digestion. 1. Mechanical and chemical digestion of food.	AM	02	Offline Lecture Method, PPT Presentation.
	2. Absorption of Carbohydrates, Lipids, Proteins.	AM	02	Offline Lecture Method, PPT Presentation. You Tube animation.
	3. Digestive enzymes.	AM	02	PPT presentation, Offline lecture method.
	4. An exam on Unit-1	AM	01	An exam held on the topic of Unit-1 in classroom.
	Unit-2: Physiology of Respiration. 1. Mechanism of Respiration.	AM	01	Offline Lecture Method, PPT presentation, You Tube Animation.
	2. Respiratory volume and capacities.	AM	01	PPT presentation. Direct question answering section.
May	3. Transport of oxygen and carbon dioxide in blood , Dissociation curves and the factors influencing it.	AM	02	Offline Lecture Method, PPT presentation, You Tube Animation.
	4. An exam held on the topic of Unit-2	AM	01	An online exam occurred in the topic of Unit-2.

For CBCS

	Unit-3: Physiology of Circulation: 1. Components of Blood and their function. 2. Structure	AM	02	Offline Lecture Method, PPT presentation. You Tube animation .
	3. Blood clotting system	AM	01	PPT presentation, Offline lecture method.
	4. Blood groups : ABO and RH factor.	AM	01	Offline Lecture Method, PPT presentation, A question answer section held in classroom.
	Unit-4:Physiology of Heart 1. Structure of mammalian Heart. 2. Origin and conduction of cardiac impulses.	AM	02	Offline Lecture Method, PPT Presentation.
	3. Cardiac Cycle and Cardiac output. 4. Blood pressure and its regulation.	AM	02	Offlinee Lecture Method, PPT presentation, You Tube Animation.
Jun	5. An online exam held on the topic of Unit-4.	AM	01	An offline exam occurred in the topic of Unit-4.
	Uniit-5: Thermoregulation & Osmoregulation. 1. Physiological classification based on thermal biology. 2. Thermal biology of endotherms	AM	02	Offline Lecture Method, PPT Presentation. Problem solution.
	3. Osmoregulation in aquatic vertebrates.	AM	01	Offline lecture method.
	Unit-6: Renal Physiology. 1. Structure of Kidney and its functional unit.	AM	01	Offline Lecture Method.
	2. Mechanism of Urine formation. 3. Regulation of acid – base balance.	AM	02	Offline Lecture Method, PPT Presentation.
	4. An online exam on the topic of Unit-5 and Unit-6.	AM	01	An online exam occurred in the topic of Unit-5 and Unit-6.
MID SEMESTER EXAMINATION/INTERNAL ASSESSMENT FOR SEMESTER II, IV, VI.				

	Assessment: End-term Test		Total: 28 Hrs	

Resources :

Books:

1. CC Chatterjee's Human Physiology. (Thirteenth Edition)
2. HUMAN PHYSIOLOGY(AN INTEGRATED APPROACH) by Pearson.

3. Other resources : Internet sources such as Wikipedia. Some links like ocw.mit.edu

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

Lesson Plan for Course: Immunology……Code: ZOOACOR010T…. Credit: 4….

Course coordinator:..**UDAY HOSSAIN**…

Course Outcome :

3. CO1. Can appreciate the basic mechanism and interplay of innate and adaptive immunity with relation to cells and organ to immune system.
4. CO2. Can realise the cellular and molecular pathways that leads to humoral and cell-mediated immunity including role of MHC.
5. CO3. Understand the controlling of immune system by chemokines, cytokines and other inflammatory mediators.
6. CO4. Understand the developmental pathways of cells of humoral and cellular immunity.
7. CO5. Can relate the immunity related diseases with molecular biological events of immune system.
8. CO6. Understand the basic principle of laboratory techniques using immunological events.
9. CO7. Perform simple laboratory experiments related to immunology like ABO group determination, WBC count etc.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 1: Overview of Immune System**	**Uday Hossain**		
	Basic concepts of health and diseases, Historical perspective of Immunology,		2	Theoretical, PPT presentation, animation from YouTube
	Organs (Primary & Secondary lymphoid organs and its importance) and Cells of the Immune system,		2	Theoretical, PPT presentation
	Concept of Haematopoiesis and development of progenitor cells of the Immune system		2	Theoretical, PPT presentation,
	Unit 2: Innate and Adaptive Immunity	**Uday Hossain**		
	Principle of Innate and Adaptive Immunity.		2	Theoretical, PPT presentation, animation from YouTube
	Components of innate immunity – Epithelial barriers (skin and mucosal membranes [concept])		2	Theoretical, PPT presentation, animation from YouTube
	Cellular mechanisms (phagocytes, NK cells, mast cells, eosinophils, inflammation [concept])		2	Theoretical, PPT presentation,

March	Humoral mechanisms (complement, cytokines, chemokines etc. [concept])		2	Theoretical, PPT presentation, notes given
	Components of adaptive immunity – Cellular mechanisms (Cell-Mediated Immune System (CMIS) or T-Cell Immunity [concept])		3	Theoretical, PPT presentation, animation from YouTube
	Humoral mechanisms (Formation of Plasma B cells and Memory B cells [concept])		2	Theoretical, PPT presentation, animation from YouTube
	Unit 3: Antigen, Antigen presentation & MHC	**Uday Hossain**		
	Concept of Antigen, Immunogen, Allergen & Pathogen. Adjuvants and haptens, Factors influencing immunogenicity, Epitope. Types of Antigen Presenting Cells (APC),		3	Theoretical, PPT presentation, notes given
	Structure of Major Histocompatibility Complex (MHC) molecules.		2	Theoretical, PPT presentation, animation from YouTube,
	Mechanism of antigen presentation and involvement of MHC molecules (both MHC-I & MHC-II) in details.		3	Theoretical, PPT presentation, animatio n from YouTube
	Co-stimulatory molecules on APC.			Theoretical, PPT presentation, animation from YouTube
May	**Unit 3:T cell Development**	**Uday Hossian**		
	Structure of T cell receptors, Co-stimulatory molecules on T cells		2	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom

	Concept of synapse between APC & T cells (between MHC≈TCR & between Co-stimulatory molecules) in details.		2	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
	Central differentiation of T cells; T cell selection in thymus Peripheral differentiation of T cells; Th1 & Th2		2	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
	Class test		1	online
	Unit 4: Immunoglobulins	**Uday Hossian**		
	Structure and functions of different classes of immunoglobulins, Antigen- antibody interactions		3	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
	Immunoassays (ELISA and RIA), Hybridoma technology, Monoclonal antibody production		2	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
				Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
	Unit 6: Cytokines & Chemokines	**Uday Hossain**		
	Brief concept on types of Cytokines & Chemokines		2	Theoretical, PPT presentation, Google meet animation from

				YouTube, notes in google classroom
	Cytokines (source & function of IL-1, IL-2, IL-4, IL-5, IL-6, IL-8, IL-10, IL-12, Interferons, Tumor Necrosis Factors, Tumor Growth Factors, GM-CSF, M-CSF).		2	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
	Chemokines **(**source & function of CCL2, CCL3, CCL4, CCL5, CxCL8, CxCL10)		2	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
	Unit 7: Complement System	**Uday Hossain**		
	Components and pathways of complement activation.		3	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
June	**Unit 8: Hypersensitivity**	**Uday Hossain**		
	Gell and Coombs' classification and brief description of various types of hypersensitivities.		4	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
	Unit 9: Immunology of diseases	**Uday Hossain**		
	Malaria, Visceral Leishmaniasis, Filariasis, Dengue and Tuberculosis		4	Theoretical, PPT presentation, Google meet animation from YouTube, notes in google classroom
	Unit 10: Vaccines	**Uday Hossain**	4	
	Various types of vaccines. Active & passive immunization (Artificial and natural).			Theoretical, PPT presentation,

				Google meet animation from YouTube, notes in google classroom
			Total: 60 Hrs	

Resources :

Books:

3. Kuby Immunilogy, Campbell's Biology, 11th Edition by Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Jane B. Reece , Published by Pearson Copyright
4. Other resources : Youtube animation links, Wikipedia, some ebooks

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms)

Semister- 6th SEM Honours

Lesson Plan for Course: Developmental Biology… Code: ZOOACOR13T…. Credit: 4….

- Course coordinator:..**UDAY HOSSAIN**…
- Course Outcome :
  - ii) CO1. Develop critical understanding of the basic processes of differential gene expression, cellular interaction and movement that leads to the embryo formation.
  - iii) CO2. Can appreciate and recognize the details of sperm and egg formation and different aspects of fertilization in chordates.
  - iv) CO3. Compare the process of early and late embryonic development processes in frog and chick and can realize the basic similarity of processes followed n diverse organism.
  - v) CO4. Develop the understanding of organ formation from germ layers and importance of regeneration process.
  - vi) CO5. Understand the structure, types and function of placenta in mammals.
  - vii) CO6. Understand the relevance of developmental biology in medicine or its role in development of congenital abnormalities and diseases.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 1: Introduction**	**Uday Hossain**		
	Phase of development		1	Theoretical, PPT presentation, Black board
	Cell-cell interaction		1	Theoretical, PPT presentation,
	Differentiation and growth		1	Theoretical, PPT presentation,
	Differential gene expression		1	Theoretical, PPT presentation, animation from YouTube, Notes given
March	**Unit 2:Early embryonic development**	**Uday Hossain**		
	Spermatogenesis		2	Theoretical, PPT presentation,
	Oogenesis		1	Theoretical, PPT presentation, animation from YouTube
	Types of egg, egg membrane		1	Theoretical, PPT presentation, animation from YouTube, notes given
	Fertilization: Changes in gamates		1	Theoretical, PPT presentation, notes given
	Block to polyspermy		1	Theoretical, PPT presentation, notes given
	Planes and patterns of cleavage		2	Theoretical, PPT presentation, animation

				from YouTube, notes given
	Types of Blastula		1	Theoretical, PPT presentation, animation from YouTube, notes given
	Fate Maps		1	Theoretical, PPT presentation, animation from YouTube, notes given
	Early development of frog and chick up to gastrulation		2	Theoretical, PPT presentation, animation from YouTube, notes given
	Embryonic induction and organizers		2	Theoretical, PPT presentation, animation from YouTube, notes given
April	**Unit 3: Late embryonic development**	**Uday Hossain**		
	Fate of germ Layers		1	Theoretical, PPT presentation, animation from YouTube, notes given
	Extra embryonic membranes in birds		2	Theoretical, PPT presentation, notes given
	Implantation of embryo in humans		2	Theoretical, PPT presentation,
	Placenta Structure		1	Theoretical, PPT presentation, animation from YouTube,
	Types and function of Placenta		2	Theoretical, PPT presentation, animation from YouTube, notes given
	Class test		1	In Google classroom
May	**Unit 4: Post embryonic development**	**Uday Hossain**		
	Development of Brain		2	Theoretical, PPT presentation,

	Development of Eye in vertebrate		2	Theoretical, PPT presentation,
	Regeneration: Mode of regeration		2	Theoretical, PPT presentation,
	Epimorphosis, Morphallaxis		2	Theoretical, PPT presentation,
	Compensatory regeration		2	Theoretical, PPT presentation,
	Class test		1	Theoretical, PPT presentation,
	Unit 5: Implications of Developmental Biology	Uday Hossain		
	Teratogenesis		2	Theoretical, PPT presentation,
	Teratogenic agents and their effects ion embryonic development		3	Theoretical, PPT presentation,
June	In vitro fertilization		3	Theoretical, PPT presentation,
	Stem cell(ESC)		2	Theoretical, PPT presentation,
	Amniocentesis		2	Theoretical, PPT presentation,
			Total:50 Hrs	

Resources :

1. Books: Developmental Biology (Gilbert 9th edition), Developmental biology(Sastry and Sukla), Fertilization the beginning of life (Brian Dale), Anatomy and physiology of placenta (John O'Reilly)
2. Other resources : Youtube animation links, Wikipedia, some ebooks

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

Lesson Plan for Course:…Evolutionary Biology…… Code…ZOOACOR14T.. Credit……04…

- Course coordinator:……**Arpita Mondal**…….
  - Course Outcome
    - ✓ CO1: To know about the origin of life , major precursor of earliest life and their effect on earth.
    - ✓ CO2: To understand the many theories of life formation and their proper evidences or proof of forming life.
    - ✓ CO3: To analyse the mathamatical problems of population genetics and gene frequencies and their mutation drift etc.
    - ✓ CO4: To learn the information about the fossils their characteristics with the proper geological time scale of our earth.
    - ✓ CO5: To understand the molecular clock , molecular evolution and their effect of the important element of living organism.

Course planner

Sl	Course Topic	Teacher	Classhour	Remarks*
Apr	Unit-1: ORIGIN OF EARLIEST LIFE 1. Chemogeny, 2. RNA World 3. Biogeny	AM	01	Offline Lecture Method, PPT Presentation.
	4. Origin of Photosynthesis, 5. Evolution of Eukaryotes. 6. Three domains of life..	AM	01	Offline Lecture Method, PPT Presentation. You Tube animation
	Unit 1 Examination	AM	01	Question answer regarding Unit-1
Apr	Unit-2: HISTORICAL REVIEW OF EVOLUTIONARY CONCEPT. 1. Pre-Darwinian concepts and theories inciluding Lamarkism. 2. Darwinian theory and Neo-Darwinian synthesis.	AM	02	Offline Lecture Method, PPT presentation, You Tube Animation.
	Unit 2 examination	AM	01	Offline Lecture Method, PPT presentation. You Tube animation

	Unit-3: Evidences in favour of Evolution. 1. Fossil record: types of fossils.	AM	01	Offline lecture method.
	2. Geological time scale. 3. Transitional forms.	AM	01	Ppt presentation , lecture method.
	Unit-5: Population genetics. 1. Concept of population and calculation of allele frequencies in a population.	AM	01	Offline Lecture Method, PPT presentation, A question answer section wil be held in classroom.
May	2. Hardy-Weinberg Law and equilibrium (derivations, applications of law to find gene and genotype frequencies in human populations) .	AM	02	PPT presentation. Lecture method and calculative maths.
	3. Evolutionary forces disrupting H-W equilibrium.	AM	01	
	4. Natural selection, concept of Fitness, selection coefficient.	AM	01	Offline Lecture Method, PPT Presentation.
	5. Types of natural selection with example- Disrupting, stabilization, Directional.	AM	01	Offline Lecture Method, PPT presentation, You Tube Animation.
	6. Genetic Drift- outline of its mechanism, basic concepts of founder's effect, bottle neck phenomenon.	AM	01	Offline Lecture Method, PPT Presentation. Problem solution.
	Exam on Unit 3 and Unit 5	AM	01	An offline exam held in classroom

	Unit: 6- Products of evolution 1. Inter population variations: clines, races, species concept and mode of speciation (outlines of Allopatric Sympatric).	AM	03	Offline Lecture Method, PPT Presentation.
	2. Isolating mechanisms Adaptive radiation.	AM	01	Offline lecture method
June	Unit-8: Origin and evolution of man. 1. Unique hominin characteristics contrasted with primate characteristics (including social and cultural ones),	AM	02	Study through e-book (pdf format). PPT presentation. Lecture Method.
		AM	01	A question answer section will be held on Unit 6.
	2. Molecular evidences of human origin and migrations.(brief outline)	AM	01	PPT presentation and Offline Lecture Method.
	Unit:9- Molecular Phylogeny 1. Neutral theory of molecular evolution. 2. Molecular clock.	AM	02	Lecture Method. PPT presentation. You Tube Animation.
	3. Example of evolution in vertebrate genes.	AM	01	A question answer section will be held on Unit8 and Unit9.
MID SEMESTER EXAMINATION/ INTERNAL ASSESSMENT for SEMESTER II, IV, VI.				
	TOTAL CLASS		28	

Resources :

1. Books: ON THE ORIGIN OF SPECIES by Charles Darwin.
2. THE MISMEASURE OF MAN. By STEPHEN JAY GOULD.

3. Other resources : Internet sources such as Wikipedia.

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

Lesson Plan for Course: FISH AND FISHERY...Code: ZOOADSE04T…. Credit: 4….

- Course coordinator:..**CHINMAY GHOSH**…
- Course Outcome :
  - i) CO1: After completion of the course the students will be able to: Acquire knowledge of physiology, reproduction of fishes.
  - ii) CO2: Analyse different kinds of water and identify/differentiate different kinds of fishes.
  - iii) CO3: Procure pure fish seed by artificial procedures such as artificial and induced breeding which can learn by visiting any fish farm or demonstrated in research labs in college/Departments
  - **iv)** CO4: Become aware and gain knowledge of Inland and marine Fisheries in India and how it contributes to Indian economy.
  - v) CO5: Know about different kinds of fishing methods and fish preservation which can be employed for export and storage of commercial fishes
  - vi) CO6: Find the reasons behind the depletion of fisheries resources.
  - vii) CO7: Develop skills for entrepreneurship or self-employment in their own fisheries-related business.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
FEB	**Unit 1: Introduction**	**CHINMAY GHOSH**		
	General description of fish		1	Theoretical, PPT presentation, animation from YouTube
	Feeding habit, habitat and manner of reproduction		2	Theoretical, PPT presentation, animation from youtube
MAR	Classification of fish (up to Subclasses) with important examples		3	Theoretical, PPT presentation, Google meet, animation from youtube
	Unit 2: Morphology and Physiology	**CHINMAY GHOSH**		
	Types of fins and their modifications; Locomotion in fish; Hydrodynamics;		3	Theoretical, PPT presentation, Google meet, animation from YouTube
	Types of Scales, Use of scales in Classification and determination of age of fish;		3	Theoretical, PPT presentation, animation from YouTube

	;Gills and gas exchange; Swim Bladder: Types and role in Respiration, buoyancy; Osmoregulation in Elasmobranchs;		6	Theoretical, PPT presentation, animation from YouTub
APRIL	Reproductive strategies (special reference to Indian fish); Electric organ, Bioluminescence		3	Theoretical, PPT presentation, animation from YouTub
	Unit 3 Fisheries	**CHINMAY GHOSH**		
	Inland Fisheries; Marine Fisheries;		2	Theoretical, PPT presentation, notes in Google classroom
	Environmental factors influencing the seasonal variations in fish catches in the Arabian Sea and the Bay of Bengal		2	Theoretical, PPT presentation, animation from YouTub
	Fishing crafts and Gears		2	Theoretical, PPT presentation, animation from YouTub
	Depletion of fisheries resources;		1	Theoretical, PPT presentation, animation from YouTub
MAY	Application of remote sensing and GIS in fisheries		2	Theoretical, PPT presentation, animation from YouTub
	Fisheries law and regulations		1	Theoretical, PPT presentation, animation from YouTub
	Unit 4: Aquaculture	**CHINMAY GHOSH**		Theoretical, PPT presentation, animation from YouTub
	Sustainable Aquaculture; Extensive, semi-intensive and intensive culture of fish		3	Theoretical, PPT presentation, animation from YouTub
	Pen and cage culture; Polyculture; Composite fish culture;		3	Theoretical, PPT presentation, animation from YouTube
	Brood stock management; Induced breeding of fish; Management of finfish hatcheries; Preparation and maintenance of fish aquarium; Preparation of compound diets for fish;		4	Theoretical, PPT presentation, Google meet, notes in Google classroom

	Role of water quality in aquaculture;			
	Fish diseases: Bacterial, viral and parasitic; Preservation and processing of harvested fish, Fishery by-products		3	Theoretical, PPT presentation, animation from YouTub
JUNE	Unit 5: Fish in research		2	Theoretical, PPT presentation, animation from YouTub
	Transgenic fish ,Zebra fish as a model organism in research		2	Theoretical, PPT presentation, animation from YouTub
	Class Test		1	IN CLASSR OOM
	TOTAL CLASS IN HOURS		48	

Resources :

- D. H. Evans and J. D. Claiborne, The Physiology of Fishes, Taylor and Francis Group, CRC Press,
- von der Emde, R.J. Mogdans and B.G. Kapoor. The Senses of Fish: Adaptations for the Reception of Natural Stimuli, Springer, Netherlands
- C.B.L. Srivastava, Fish Biology, Narendra Publishing House J.R. Norman, A history of Fishes, Hill and Wang Publishers
- S.S. Khanna and H.R. Singh, A text book of Fish Biology and Fisheries, Narendra Publishing House

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms)

Lesson Plan for Course:… Parasitology……. Code: ZOOADSE02T Credit……04

- Course coordinator: **Subharaj Paul**
- **Course Outcome:**

➢ **CO1**: The basic objective of this DSE is to deliver the information to students on parasite and host with emphasis on morphology, life cycle, prevalence, epidemiology, pathogenicity, diagnosis, prophylaxis and treatment.

➢ **CO2**: help to understand the life cycle stages of different parasites from different group.

➢ **CO3**: Students learn the concepts of host parasite interaction.

➢ **CO4**: Students also learn about ectoparasite and myiasis and zoonosis.

Course planner:

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit**1: Introduction to Parasitology Brief introduction of Parasitism and other animal associations, Parasite, Parasitoid and Vectors (mechanical and biological vector) Host parasite relationship and zoonosis	SP	04	Offline classroom method and PPT presentation, youtube video- https://www.youtube.com/watch?v=4j6jikayKZA
Mar	**Unit** 2 & 3:			
	Entamoeba histolytica,	SP	02	Providing .pdf notes in google classroom, lecture in classroom https://www.youtube.com/watch?v=-EGTyu8nD34
	Giardia intestinalis,	SP	01	Study through E-Book (pdf format)
	Leishmania donovani,	SP	01	Classroom Lecture method and PPT presentation.
	Plasmodium vivax	SP	02	Classroom Lecture method and PPT presentation.
	Fasciola hepatica,	SP	01	Classroom Lecture method and PPT presentation.
	Schistosoma haematobium,	SP	01	Classroom Lecture method and PPT presentation.
	Taenia solium	SP	02	Classroom Lecture method and PPT presentation.
	Schedule for class exam on 28th May on **Unit**-2 and 1 in Google		02	Qu- Answer method.

For CBCS

	classroom.			
April	**Unit 4**			
	Ascaris lumbricoides,	SP	02	Study through E-Book (pdf format) https://www.youtube.com/watch?v=J1v0VHKTjZM
	Wuchereria bancrofti	SP	02	Lecture method and PPT presentation. https://www.youtube.com/watch?v=9zMdg9PFCW0
	Meloidogyne	SP	02	Lecture method and PPT presentation.
	Unit-5: Biology, importance and control of Mosquitos		03	Lecture method and PPT presentation.
	Schedule for class exam on 21st april on **Unit**-1 and 2 in classroom.		02	Qu- Answer method in google classroom.
May	Biology, importance and control of ticks,	SP	02	Lecture method and PPT presentation.
	Mites	SP	02	Lecture method and PPT presentation.
	Pediculus humanus (head and body louse),	SP	02	Lecture method and PPT presentation.
	Myiasis	SP	02	Lecture method and PPT presentation.
	Schedule for class exam on 26th MAy on **Unit**-5 in Google classroom.		02	
	Mid-term test		02	Qu- Answer method in google classroom.
June	Internal exam		02	
	Assessment: End-term Test		**Total: 40 Hrs**	

Resources:

- Chatterjee K.D. (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBS Publishers & Distributors (P) Ltd.
- Parasitology by Fatik Baran Mondal.
- Rattan Lal, Ichhpujani and Rajesh Bhatia. Medical Parasitology, III Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi
- Other resources: internet source such as- Wikipidia, www.britannica.com, youtube.com

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).

- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).