

ADUSUMILLI GOPALAKRISHNAIAH & SUGAR CANE GROWERS SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE, VUYURU-521165, KRISHNA Dt., A.P. (AUTONOMOUS).

NACC reaccredited at 'A' level

Autonomous –ISO 9001-2015 Certified

Title of the Paper: Animal Diversity –I Biology of Non-Chordates

Semester: - II

Course Code	23ZOMAL121	Course Delivery Method	Class Room/Blended Mode - Both
Credits	3	CIA Marks	30
No. of Lecture Hours/ Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2023-2024	Year of Offering 2023-2024	Year of Revision –	Percentage of Revision: 0%

OBJECTIVES

1. Students should be able to classify and identify major groups of non-chordates, understanding the diversity within phyla such as arthropods, mollusks, annelids, echinoderms, and others.
2. Students should comprehend the structural adaptations and physiological processes in non-chordates, including diverse forms of locomotion, feeding strategies, and sensory mechanisms.
3. Develop an understanding of the life cycles, reproductive strategies, and developmental processes of non-chordates, recognizing variations among different taxa.
4. Gain knowledge about the ecological roles non-chordates play in various ecosystems, their interactions with other organisms, and their contributions to nutrient cycling.
5. Understand the evolutionary relationships of non-chordates within the broader context of the animal kingdom, recognizing key adaptations

Learning Out comes:

CO 1	Students should be able to understand the principles of taxonomy and classification and classify different animal phyla and key representatives within each phylum.
CO 2	Students should understand the basic physiological processes in sponges, including filter feeding, gas exchange, and waste elimination.
CO 3	Students should be familiar with the life cycles of major helminthes species, including the stages of development and their transmission between hosts.
CO 4	Students will develop a holistic understanding of the classification, anatomy, physiology, reproduction, conservation significance of Annelida and arthropods.
CO 5	Understanding of the classification, anatomy, physiology, reproduction, conservation implications of mollusks, echinoderms, and hemichordates.

CO-PO MATRIX							
CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1						M	
CO2					L		
CO3					M		
CO4					M		
CO5					H		

Syllabus:

Unit	Learning Units	Lecture Hours
I	1.1 Whittakers five kingdom concept and classification of Animal Kingdom. 1.2 Protozoa General Characters and classification up to classes with suitable examples 1.3 Protozoa Locomotion & nutrition 1.4 Protozoa reproduction	12
II	2.1 Porifera General characters and classification up to classes with suitable examples 2.2 Canal system in sponges 2.3 Coelenterata General characters and classification up to classes with suitable examples 2.4 Polymorphism in coelenterates & Corals and coral reefs.	15
III	3.1 Platyhelminthes General characters and classification up to classes with suitable examples 3.2 Parasitic Adaptations in helminthes 3.3 Nematelminthes General characters and classification up to classes with suitable examples 3.4 Life cycle and pathogenicity of <i>Ascarislumbricoides</i>	12
IV	4.1 Annelida General characters and classification up to classes with suitable examples 4.2 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost 4.3 Arthropoda General characters and classification up to classes with suitable examples 4.4 <i>Peripatus</i> - Structure and affinities	09
V	5.1 Mollusca General characters and classification up to classes with suitable examples 5.2 Pearl formation in Pelecypoda 5.3 Echinodermata General characters and classification up to classes with suitable examples - Water vascular system in star fish 5.4 Hemichordata General characters and classification up to classes with suitable examples - <i>Balanoglossus</i> - Structure and affinities	12

References

TEXTBOOKS

1. R.L. Kotpal, Modern Text Book of Zoology - Invertebrates.
2. P.S. Dhama and J.K. Dhama Invertebrate Zoology.

SUGGESTED READINGS

1. L.H. Hyman, 'The Invertebrates' Vol I, II and V. – M.C. Graw Hill Company Ltd.
2. Ruppert, Fox and Barnes, Invertebrate Zoology - A Functional Evolutionary Approach - Thomas Publishers. Indian Edition.
3. E.L. Jordan and P.S. Verma 'Invertebrate Zoology' S. Chand and Company.
4. R.D. Barnes 'Invertebrate Zoology' by: W.B. Saunders CO., 1986.
5. Barrington. E.J.W. 'Invertebrate Structure and Function' by ELBS.
6. Sedgwick. A. 'A Student Text Book of Zoology' Vol-I, II and III – Central Book Depot, Allahabad.
7. Parker. T.J. & Haswell 'A Text Book of Zoology' by, W.A., Mac Millan Co. London.
Examples
Allen, T (1974) Vanishing wildlife of North America, Washington, D.C National Geographic Society

PRACTICAL- I (At the end of II Semester)

Title of the paper: Animal Diversity –I Biology of Non-Chordates

No of Hours: 30
WEF: 2023-2024

Credits: 01
Course Code:23ZOMAP121

OBJECTIVES

1. Students should be able to classify and identify major groups of non-chordates, understanding the diversity within phyla such as arthropods, mollusks, annelids, echinoderms, and others.
2. Students should comprehend the structural adaptations and physiological processes in non-chordates, including diverse forms of locomotion, feeding strategies, and sensory mechanisms.
3. Develop an understanding of the life cycles, reproductive strategies, and developmental processes of non-chordates, recognizing variations among different taxa.
4. Gain knowledge about the ecological roles non-chordates play in various ecosystems, their interactions with other organisms, and their contributions to nutrient cycling.
5. Understand the evolutionary relationships of non-chordates within the broader context of the animal kingdom, recognizing key adaptations.

CO1. Students able to understand proficiency in identifying and classifying diverse protozoan species using microscopic techniques.

CO2. Students able to acquire hands-on skills in collecting, preparing, and examining sponge specimens through microscopic and macroscopic techniques.

CO3. Students' able to developed practical skills in the identification and classification of various cnidarian species.

CO4. Students will learn arthropod & Mollusca identification and gain practical skills in specimen preparation.

CO5. Students Identify and understanding the larval stages of Echinodermata, honing practical skills in specimen observation and microscopic examination.

CO-PO MATRIX

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1						H	
CO2						H	
CO3						H	
CO4						H	
CO5						H	

SYLLABUS:

Study of museum slides / specimens / models (Classification of animals up to orders)

- **Protozoa:** Amoeba, Paramecium, Paramecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax
- **Porifera:** Sycon, Spongilla, Euspongia, Sycon- T.S & L.S, Spicules, Gemmule
- **Coelenterata:** Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula
- **Platyhelminthes:** Planaria, Fasciola hepatica, Fasciolalarval forms – Miracidium, Redia, Cercaria, Echinococcus granulosus, Taenia solium, Schistosoma haematobium
- **Nemathelminths:** Ascaris (Male & Female), Dracunculus, Ancylostoma, Wuchereria
- **Annelida:** Nereis, Aphrodite, Chaetopterus, Hirudinaria, Trochophore larva
- **Arthropoda:** Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly.
- **Mollusca:** Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva
- **Echinodermata:** Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva
- **Hemichordata:** Balanoglossus, Tornaria larva

Dissections:

Computer - aided techniques should be adopted or show virtual dissections Dissection of edible (Prawn/ Pila) invertebrate as per UGC guidelines

An “Animal album” containing photographs, cut outs, with appropriate write up about the above-mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose

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Autonomous –ISO 9001-2015 Certified

Title of the Paper: **Cell & Molecular Biology**

Semester: - II

Course Code	23ZOMAL122	Course Delivery Method	Class Room/Blended Mode - Both
Credits	3	CIA Marks	30
No. of Lecture Hours/ Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2023-2024	Year of Offering 2023-2024	Year of Revision –	Percentage of Revision: 0%

OBJECTIVES:

1. The objectives of cell and molecular biology involve unraveling the intricacies of cellular structures, functions.
2. The molecular processes to comprehend the fundamental mechanisms underlying life. Researchers aim to decode genetic information.
3. Understand cellular pathways, and uncover the molecular basis of diseases, fostering advancements in medicine and biotechnology.
4. Contribute to the development of cutting-edge technologies in microscopy, sequencing, and other experimental techniques.
5. Analysis and interpretation in cell and molecular biology research. Apply molecular biology techniques in biotechnological applications, such as genetic engineering and gene therapy.

Learning Outcomes:

CO 1	Students will demonstrate a comprehensive understanding of prokaryotic and eukaryotic cell structures, functions, and processes and membrane-bound organelles
CO 2	. Understanding of the structure and function of major cell organelles, including the endoplasmic reticulum, Golgi apparatus, mitochondria, and lysosomes.
CO 3	Understanding of the mechanisms and regulation of cell division, including mitosis and meiosis and bioenergetics, exploring the pathways involved in cellular energy production, such as glycolysis, Krebs cycle and ETS.
CO 4	Understanding of molecular biology principles, including the structure and function of DNA, RNA, and proteins, translation of molecular mechanisms of protein synthesis from mRNA templates
CO 5	Understanding of the structure, function, and classifications of major bio-molecules including proteins, nucleic acids, lipids, and carbohydrates

CO-PO MATRIX							
CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1						M	
CO2					L		
CO3						M	
CO4						M	
CO5					H		

Unit	Learning Units	Lecture Hours
I	UNIT – I Cell Biology-I 1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma 1.2 Electron microscopic structure of animal cell. 1.3 Plasma membrane –Models and Fluid mosaic model 1.4 Transport functions of plasma membrane-Active – passive- facilitated.	12
II	UNIT – II Cell Biology-II 2.1 Structure and functions of Golgi complex & Endoplasmic Reticulum 2.2 Structure and functions of Lysosomes & Ribosomes 2.3 Structure and functions of Mitochondria & Centriole 2.4 Structure and functions of Nucleus & Chromosomes	12
III	UNIT – III Cell Biology-III 3.1 Cell Division- mitosis, meiosis 3.2 Cell cycle – stages- check points- regulation 3.3 Abnormal cell growth- cancer- apoptosis 3.4 Bio energetics- Glycolysis-Krebs cycle-ETS	15
IV	UNIT IV: Molecular Biology-I 4.1 Central Dogma of Molecular Biology 4.2 Basic concepts of - DNA replication – Overview (Semi-conservative mechanism, Semi- discontinuous mode, Origin & Propagation of replication fork) 4.3 Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications (basics) 4.4 Translation – Initiation, Elongation and Termination	09
V	UNIT V: Molecular Biology-II 5.1 Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes 5.2 Biomolecules- Carbohydrates (Glucose- structure-properties- biological importance only) 5.3 Biomolecules- Protein (Amino acid- structure- properties- biological importance only) 5.4 Biomolecules- Lipids (Fatty acid- structure - properties- biological importance only)	12

REFERENCES

1. Gerard J., Tortora, Berdell R. Funke, Christine L. Case., 2016. Microbiology: An Introduction. 11th Edition. Pearson publications, London, England.
2. Micale, J. Pelczar Jr., E.C.S. Chan., Noel R. Kraig., 2002. Pelczar Microbiology. 5th Edition. McGraw Education, New York, USA.
3. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
4. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
5. R.C. Dubey, 2014. Advanced Biotechnology. S. Chand Publishers, New Delhi, India.
6. Colin Ratledge, Bjorn, Kristiansen, 2008. Basic Biotechnology. 3rd Edition. Cambridge Publishers.

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PRACTICAL- II (At the end of II Semester)

Title of the paper: Cell & Molecular Biology

No of Hours: 30

WEF: 2023-2024

Credits: 01

Course Code: 23ZOMAP122

SYLLABUS:

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis with prepared slides
3. Observation of various stages of Meiosis with prepared slides
4. Mounting of salivary gland chromosomes of Chironomus
5. Test for carbohydrate in given biological sample (Benedicts test)
6. Test for Protein in given biological sample (Nitric acid test -white ring)
7. Test for lipid in the given biological sample (Saponification test)

REFERENCE WEB LINKS:

- <https://cbi-au.vlabs.ac.in/>
- <https://www.youtube.com/watch?v=xhnUZAYNdQk>
- https://www.youtube.com/watch?v=l8LXQq5_VL0
- <https://www.labster.com/simulations>
- <https://www.sciencecourseware.org/BiologyLabsOnline/protected/TranslationLab/index.php>
- <https://virtual-labs.github.io/exp-analysis-of-carbohydrates-au/procedure.html>
- https://www.labxchange.org/library/items/lb:LabXchange:f10fd7ad:lx_simulation:1
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

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Title of the Paper: **Embryology, Animal Physiology and Ecology**
Semester: - IV

Course Code	ZOOT41A	Course Delivery Method	Class Room/Blended Mode - Both
Credits	4	CIA Marks	30
No. of Lecture Hours/ Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2021-22	Year of Offering:2023-24	Year of Revision :2022-23	Percentage of Revision:20%

OBJECTIVES

- The study of fundamentals of embryology
- The study of functional aspects of the body.
- Understanding the mechanism of homeostasis
- Understanding the mechanism of coordination in the body.
- Understanding the structural and functional aspects of an ecosystem.
- Understanding the dynamics of populations

Learning Outcomes:

CO 1	Comprehend and describe the process of formation and fusion of gametes and appraise the significance of foetal membranes and placenta in the formation of an embryo
CO 2	Understand the mechanism of functioning of the different organ systems of a vertebrate and analyse their coordination in adapting the animal to the changing environment
CO 3	Identify and describe the histology of various organs of a mammal and developmental stages of chick embryo at different hours of incubation.
CO 4	Develop skill in conducting tests for identification of the presence of biomolecules and excretory products and estimating various water parameters..
CO 5	Acquaint with the structural and functional aspects of an ecosystem, concept of community and population - their characteristics and interactions and analyse the adaptations of animals to specific habitat and explain peculiarities in their distribution in different zoogeographical realms.

Syllabus
Course Details

Unit	Learning Units	Lecture Hours
I	Embryology Spermatogenesis, oogenesis and Fertilization. Types of eggs Types of cleavages Development of frog up to gastrulation and formation of primary germ layers Foetal membranes and their significance in chick embryo Placenta in mammals: types and functions	14
II	Physiology - I Digestive system: process of digestion Absorption of digested food Respiratory system - Pulmonary ventilation, transport of oxygen and Carbon dioxide Circulatory system - Structure and functioning of heart, Cardiac cycle. Excretory system - Structure of nephron, urine formation, and counter current Mechanism	14
III	Physiology - II Nerve impulse -Resting membrane potential, origin and propagation of action potentials along myelinated and non- myelinated nerve fibres Muscle contraction - Ultra structure of muscle fibre, molecular and chemical basis of muscle contraction Endocrine glands - Structure, secretions and the functions (of hormones) of pituitary, thyroid, parathyroid, adrenal glands and pancreas Hormonal control of reproduction in human being	12
IV	Ecology I Physical and chemical factors of an ecosystem Pressure Atmospheric gases: oxygen and carbon dioxide. Functional aspects of an ecosystem Biogeochemical cycles: nitrogen cycle, phosphorus cycle and carbon cycle Animal communities Types of communities Community structure Ecotone and edge effect, Community interactions Prey-predator relationships Competition	11
V	Ecology - II Habitat Ecology and adaptations Ecological habitat and niche Desert adaptations Pelagic adaptations , Population Ecology Characteristics of animal populations Zoogeography Zoogeographical regions: Study of physical and faunal peculiarities of Oriental, Australian and Ethiopian regions.	9

Textbooks

1. A.K. Berry, *A Text Book of Animal Physiology*, Delhi
2. Subrahmanyam N.S. & Sambamurthy A.V.S.S, *Ecology*, Narosa Publishing House, New Delhi

Suggested Readings

1. Gerard J. Tortora and Sandra Reynolds Garbowski *Principles of Anatomy and Physiology*, Tenth Ed., John Wiley & Sons
2. Arthur C. Guyton MD, *A Text Book of Medical Physiology*, Eleventh ed., John E. Hall, Harcourt Asia Ltd.
3. William F. Ganong, *A Review of Medical Physiology*, 22 ed, McGraw Hill, 2005
4. Sherwood, Klandrof, Yanc, *Animal Physiology*, Thompson Brooks/Coole, 2005.
5. Sherwood, Klandrof, Yanc, *Human Physiology*, Thompson Brooks/Coole, 2005.
6. Knut Schmidt-Nielsen, *Animal Physiology*, 5thed, Cambridge Low Price Edition.
7. Roger Eckert and Randal, *Animal Physiology*, 4thed, Freeman Co, New York.
8. Balinisky B.I. *An introduction to Embryology*, 5thed, Thompson Brook, Coole.
9. McEwen, R.s. *Vertebrate Embryology*, Oxford and IBH Publishing Co. New Delhi.
10. M.P. Arora, 'Ecology' Himalaya Publishing company.
11. P.D. Sharma, *Environmental Biology*'.
12. P.R. Trivedi and Gurdeep Raj. 'Environmental Ecology'
13. Buddhadev Sarma and Tej Kumar, *Indian Wildlife Threats and Preservation*
14. Chapman J.L. and Reiss M.J, *Ecology Principles and Applications*, Second Ed., Cambridge University Press, London.
15. Benny Joseph, *Environmental Studies*, TATA McGraw Hill Com., New Delhi.
16. Eugene P. Odum, *Fundamentals of Ecology* Third Ed., Natara J Publishers, Dehradun.
17. Balinisky B.I. *An introduction to Embryology*, 5thed, Thompson Brook, Coole.
18. McEwen, R.s. *Vertebrate Embryology*, Oxford and IBH Publishing Co. New Delhi.

Course Delivery method: Face-to-face / Blended.

Course has focused on: Foundation

Weblinks

<https://www.youtube.com/watch?v=4Q43dqaIvnc>

<https://www.youtube.com/watch?v=7LqQYmgMqLk>

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

CO-CURRICULAR ACTIVITIES

- Chart on cardiac cycle, human lung, kidney/nephron structure etc.
- Working model of human / any mammalian heart.
- Chart of sarcomere/location of endocrine glands in human body
- Chart affixing of photos of people suffering from hormonal disorders
- Student study projects such as identification of incidence of hormonal disorders in the local primary health center, studying the reasons thereof and measures to curb or any other as the lecturer feels good in nurturing health awareness among students
- Preparation of models of different types of eggs in animals
- Chart on frog embryonic development, fate map of frog blastula, cleavage etc.

Paper Title Embryology, Animal Physiology and Ecology.

Code: ZOOP41A
MAX.MARKS: 40.
Credits: 02

(3hrs/week)
(30 hrs)

PRACTICAL SYLLABUS

OBJECTIVES

- Identify the different stages of development of a vertebrate embryo
- Analyze the presence of various substances of metabolism
- Estimate the amount of chemical parameters of a water body
- Maintain a neat, labelled record of work done in the laboratory

Syllabus:

I. Embryology

1. Study of T.S. of testis, ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8 cell stages)
3. Construction of fate map of frog blastula
4. Study of chick embryos of 18 hours, 24 hours, 33 hours and 48 hours of incubation

II. Physiology

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Qualitative tests for identification of ammonia, urea and uric acid
3. Study of activity of salivary amylase under optimum conditions
4. Study of prepared slides of T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage of a mammal

III. Ecology

1. Determination of pH of given sample.
2. Estimation of dissolved oxygen of given sample.
3. Estimation of total alkalinity of given sample.
4. Estimation of salinity of given sample.

REFERENCE BOOKS:

1. Harper's Illustrated Biochemistry
2. Cell and molecular biology: Concepts & experiments. VI Ed. John Wiley & sons. Inc.
3. Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
4. Laboratory techniques by Plummer

Course Delivery method: Face-to-face / Blended.

Course has focused on: Skill Development

Weblinks

<https://www.youtube.com/watch?v=4Q43dqaIvnc>

<https://www.youtube.com/watch?v=7LqQYmgMqLk>

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

CO-CURRICULAR ACTIVITIES

- Chart affixing of photos of people suffering from hormonal disorders
- Student study projects such as identification of incidence of hormonal disorders in the local primary health center, studying the reasons thereof and measures to curb or any other as the lecturer feels good in nurturing health awareness among students
- Preparation of models of different types of eggs in animals
- Chart on frog embryonic development, fate map of frog blastula, cleavage etc.

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Title of the Paper: Immunology and Animal Biotechnology

Semester: - IV

Course Code	ZOOT01	Course Delivery Method	Class Room/Blended Mode - Both
Credits	4	CIA Marks	30
No. of Lecture Hours/ Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2021-22	Year of Offering:2023-24	Year of Revision	Percentage of Revision: 0%

OBJECTIVES

- To understand the different types of immunity in man and different cells and organs of immune system
- To understand the different types of antigens and antibodies
- To analyze the role of immunity in health and disease management and get acquainted with the concept of vaccination
- To understand the mechanism of techniques in r DNA technology and the concept of animal cell technology.
- To study the reproductive technologies and different aspects of industrial biotechnology.
- To be aware of the ethical, legal, and social issues related to genetically modified organisms.

Learning Outcomes:

CO 1	Understand the basic concepts of immune system and hypersensitivity reactions and apply the same in identification of diseases and describe the triggering and regulation of immunological response.
CO 2	Acquire basic knowledge in r DNA technology and acquaint with the techniques of PCR, hybridization and DNA sequencing.
CO 3	Comprehend Animal Cell Culture technology, Reproductive technologies and techniques.
CO 4	Apply the techniques of animal biotechnology in various fields like industry, medicine, animal husbandry etc., for improving the quality of life.
CO 5	Acquaint with safety measures in using the techniques and develop skills in handling and maintaining laboratory equipment.

Syllabus
Course Details

Unit	Learning Units	Lecture Hours
I	Immunology – I (Overview of Immune system) Introduction to basic concepts in Immunology Innate and adaptive immunity Vaccines and Immunization programme Cells of immune system Organs of immune system	14
II	Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity) Antigens: Basic properties of antigens B and T cell epitopes, haptens and adjuvants Factors influencing immunogenicity Antigen – antibody reactions Antibodies Structure of antibody Classes and functions of antibodies Structure and functions of major histocompatibility complexes Exogenous and Endogenous pathways of antigen presentation and processing Hypersensitivity – Classification and Types Basic properties and functions of cytokines	17
III	Biotechnology – I (Techniques of Recombinant DNA technology) .Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery PCR: Principle, procedure and advantages of PCR DNA Sequencing: Maxam Gilbert and Sanger’s methods of DNA sequencing- traditional and automated sequencing Hybridization techniques: Southern, Northern and Western blotting	11
IV	Biotechnology – II (Cell culture techniques) Animal Cell, Tissue and Organ culture media: Natural and Synthetic media Cell cultures Establishment of cell culture: Primary culture, Protocols for Primary Cell Culture and Secondary culture Types of cell lines: Continuous and Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero) Organ culture; Cryopreservation of cultures Stem cells: Types of stem cells and applications Hybridoma Technology: Production & applications of Monoclonal antibodies(mAb)	11
V	Biotechnology – III (Applications of Animal Biotechnology) Transgenesis: Production of Transgenic animals: sheep and fish .Ethical, Legal, Social and Disposable issues of Genetically Modified Organisms Manipulation of reproduction in animals: Artificial Insemination, <i>In vitro</i> fertilization, super ovulation, Embryo transfer, Embryo cloning Applications in Industry: Fermentation: Different types of Fermentation and Downstream processing	8

TEXT BOOKS:

1. B.D.Singh, Biotechnology, Kalyani Publishers, 1998 (reprint 2001)
2. Armugam, A Text Book of Immunology, Saras Publications

REFERENCE BOOKS

1. Immunology by Ivan M. Riott
2. Immunology by Kubey
3. Sree Krishna V. 2005. *Biotechnology –I, Cell Biology and Genetics*. New Age International Publ. New Delhi, India.

Course Delivery method: Face-to-face / Blended.

Course has focused on: Foundation

CO-CURRICULAR ACTIVITIES:

- Organizing awareness on immunization importance in local village in association with NCC and NSS teams
- Charts on types of cells and organs of immune system
- Student study projects on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc., as per the creativity and vision of the lecturer and students
- Visit to research laboratory in any University as part of Zoological tour and exposure and/or hands-on training on animal cell culture.
- Visit to biotechnological laboratory in university or any central/state institutes and create awareness on PCR, DNA finger printing and blot techniques or Visit to a fermentation industry

Weblinks:

<https://www.youtube.com/watch?v=EfNY0aiYRIE>

<https://www.youtube.com/watch?v=R69M7NuBNBA>

<https://www.youtube.com/watch?v=hqs57VsSk7s>

<https://www.youtube.com/watch?v=8rAgLPb85N0>

Code: ZOOP01

Immunology and Animal Biotechnology

MAX.MARKS: 40.

(3hrs/week)

Credits: 02

(30 hrs)

PRACTICAL SYLLABUS

Objectives

- Acquaint with immunological techniques vis-à-vis theory taught in the class room
- Interconnect the theoretical and practical knowledge of immunity with the outer world for the development of a healthier life.
- Demonstrate basic laboratory skills necessary for Biotechnology research
- Apply the lab techniques for taking up research in higher studies

SYLLUBUS:

I. IMMUNOLOGY

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of
 - a. ELISA - Pregnancy Test and HBs Ag,
 - b. Immunoelctrophoresis - Malarial parasite (cells) and VDRL

II. ANIMAL BIOTECHNOLOGY

1. Preparation of culture media.
2. DNA quantification using by agarosegel electrophoresis (by using Lambda DNA as standard) Method.
2. Techniques: Western Blot, Southern Hybridization,
3. study of the following techniques through
 - A. Paper chromatography
 - B. Thin layer chromatography.
4. Cleaning and sterilization of glass and plastic wares for cell culture.
5. Project work.

SUGGESTED MANUALS

1. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. Julie Jameson
2. Practical Immunology A Laboratory Manual; LAP LAMBERT Academic Publishing
3. Manual of Laboratory Experiments in Cell Biology - Edward, G
4. Laboratory Techniques – Plummer

Course Delivery method: Face-to-face / Blended.

Course has focused on: skill development

CO CURRICULAR ACTIVITIES

- Charts on types of cells and organs of immune system
- Student study projects on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc., as per the creativity and vision of the lecturer and students
- Visit to research laboratory in any University as part of Zoological tour and exposure and/or hands-on training on animal cell culture.
- Visit to biotechnological laboratory in university or any central/state institutes and create awareness on PCR, DNA finger printing and blot techniques or Visit to a fermentation industry

WEBLINKS:

<https://www.youtube.com/watch?v=Svoipy16IRc>

https://www.youtube.com/watch?v=I_CAmtiwmyQ

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

<https://www.youtube.com/watch?v=4srp4ooLYNg>

https://www.youtube.com/watch?v=_rp4mAHeYmE