IV Semester, B.Sc, (Hons) Zoology

Course Title: **Gene Technology Immunology and Computational Biology**	Course Code:**DSCC5ZOOT4**
Course Type: **Discipline Core Theory, L-T-P: 4-0-0**	Course Credits: **4**
Total Contact Hours: **56**	Duration of ESA: **2Hrs.**
Formative Assessment Marks:**40**	Summative Assessment Marks:**60**

At the end of the course the student should be able to:

1. Acquaint knowledge on versatile tools and techniques employed in genetic engineering and recombinant DNA technology.
2. An understanding on application of genetic engineering techniques in basic and applied experimental biology.
3. To acquire a fundamental working knowledge of the basic principles of immunology.
4. To understand how these principles, apply to the process of immune function.
5. Use, and interpret results of, the principal methods of statistical inference and design; helps to communicate the results of statistical analyses accurately and effectively; helps in usage of appropriate tool of statistical software.

Course Content	Hrs.
Unit I	**14**
Chapter 1: Principles of Gene Manipulation ● Recombinant DNA Technology: Introduction, steps involved. ● Restriction Enzymes and Ligases and Nucleic acid modifying enzyme. ● Gene cloning Vector: Concept of plasmids-pBR322, Lamdaphage vectors, cosmids ● Gene transfer techniques (Direct and indirect). ● Screening and selection of recombinant colonies	07
Chapter 2:Applications of Genetic Engineering • Transgenic animals (Transgenic cow, Transgenic Fish); Transgenic plants (cryprotein); Gene silencing (Knockout and Knock in mouse). ● Production of Human Recombinant insulin and ● Hybridoma technology: Synthesis and applications of Monoclonal antibodies ● Gene Therapy (SCID) ● Biosensors and its applications	07
Unit II	**14**

Chapter3:IntroductiontotheImmuneSystem • Defense against diseases: Introduction, First and second line of defense, Innate and acquired immunity; Antigen presenting cells (APC's), Role of Band T-lymphocytes (humoral immunity and cell mediated immunity), primary and secondary immune response. • Types of immunity • Functional aspects of organs of the Immune system-Thymus and bone Marrow, spleen, Lymph Node, Small intestine and Liver (Peyer's patches and Von Kupffer cells).	07 07
Chapter 4: Antigens and Antibodies • Antigens and haptens: Properties (foreignness, molecular size, heterogeneity). • Band T cellepitopes. • Structure of Ig Gandfunctions of different classes of immune globulins. • Major histo compatibility complex –Structure of MHCI&II.	
Unit III	**14**
Chapter5: Clinical Immunology • Immunity against diseases of viral, bacterial and protozoan infections. • Vaccines: Types and Uses-Immunization schedule for children. • Transplantation immunology: Transplantation of organ- Types, graft rejection and Immuno-suppressors.	07
Chapter6:Bioinformatics • Databases:Sequence and structural • Sequence analysis (homology):Pair wise and Multiple Sequence alignment-BLAST, CLUSTALW, Sequence alignment-FASTA. • Scope and applications of Bioinformatics.	07
Unit-IV	**14**
Chapter7:BiostatisticsI • Measures of central tendency: Mean, Median, Mode. • Data summarizing: Frequency distribution, Graphical presentation - bar diagram, pie diagram, histogram. • Elementary idea of probability and its applications.	07
Chapter8:BiostatisticsII • Measures of dispersion: Range, Standard Deviation, Variance. • Correlation and Regression. • Tests of significance-test,ANOVA,t-test and Chisquare test.	07

Topics Suggested for Assignment/Formative Assessment:

1. Q/A, Short Question, Quiz, MCQ, Assignment etc.

Recommended Books:

1. Primrose & Twyman.Principles of Genome Analysis and Genomics. Blackwell (2003).
2. Hartl&Jones.Genetics: principles&AnalsysisofGenes&Genomes.Jones&Bartlett (1998).
3. Sambrook*etal*.Molecular Cloning Vols I, II, III.CSHL (2001).
4. Primrose.Molecular Biotechnology.Panima (2001).
5. Clark & Switzer.Experimental Biochemistry.Freeman (2000)
6. Sudbery.Human Molecular Genetics. Prentice-Hall (2002).
7. Wilson.ClinicalGenetics-AShort Course, Wiley (2000).
8. Pasternak. An Introduction to Molecular Human Genetics.Fritzgerald (2000).
9. Biostatistical Analysis (Fourth Edition) by Jerrold H.Zarr,Pearson Education Inc.,Delhi.

10. Statistical Methods (Eighth Edition) by G. W. Snecdecor and W.G. Cochran, Willey Blackwell
11. Biostatistics (Tenth Edition) by W.W.Danieland C. L.Cross,Wiley
12. Introductory Biological Statistics (Fourth Edition) by John E. Havel, Raymond E.Hampton and Scott J.Meiners
13. Westheadetal Bioinformatics:InstantNotes.VivaBooks (2003)
14. Genetic engineering:Sandhya Mitra BITS,Pilani
15. Principles of Biostatistics Khan and Khan am
16. Transgenic animals:Ranga

Web Sources:

Semester: IV

Course Lab Content

Course Title: **Gene Technology, Immunology and Computational Biology**	CourseCredits:**02**
Course Type: **Minor Discipline Core Practical, L-T-P:0-0-4**	CorseCode:DSCC5ZOOP4
Total Contact Hours: **56**	DurationofESA:4**Hours**
Formative Assessment Marks:**25**	Summative Assessment Marks: **25**

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Accurately, safely and appropriately use all the equipment regularly used in Molecular Biology (DNA manipulation, including balances, pipettes, electrophoresis and centrifuges).
2. Prepare chemical solution and reagents to the precision appropriate to the task.
3. Demonstrate knowledge of the biochemical basis underpinning the molecular biology techniques.

Lab IV Course Content

List of labs to be conducted	Hours 56
1. Calculate the mean, median, mode and standard deviation (Measurement of pre and post clitellar lengths (with suitable examples).	2 2
2. Measure the height and weight of all students in the class and apply statistical measures.	1
3. Determination of ABO Blood group and Rh factor.	1
4. To study Restriction enzyme digestion using teaching kits (Demonstration only).	2
5. To detect genetic mutations by Polymerase Chain Reaction (PCR) using teaching kits (Demonstration only).	2
6. Demonstration of agarose gel electrophoresis for detection of DNA.	
7. Demonstration of Polyacrylamide Gel Electrophoresis (PAGE) for detection of proteins.	1
8. To calculate molecular weight of unknown DNA and protein fragments from gel pictures.(https://youtube/mCiCiO0cfbg)	1
9. To learn nucleotide sequence database.	1
10. To learn sequence alignment: Pairwise alignment (Protein/DNA).	1

Open Elective Course Content

Semester: IV Zoology

Course Title: **Animal Behaviour** CourseCode:**OEC5ZOOT4**	CourseCredits:**3**
TotalContactHours**:42**	DurationofESA:2Hours
Formative Assessment Marks: **40**	SummativeAssessmentMarks:**60**
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the students will be able to:

1. Examine and critically to evaluate the emergence of ideas that have shaped how we observe and collect data on animal behavior.
2. Understandthemainhistoricalideasthatunderpinanimalbehaviourtheory
3. Critically review hypotheses to explain animal behavior
4. Understand different methods for collecting data on animal behaviour
5. Have advanced their written and oral presentation skills.

Course Content

Content	42Hrs
Unit– 1	
Chapter1.: Introduction to Animal Behaviour • Brief contributions of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, NikoTinbergen. • Proximate and ultimate causes of behaviour. **Chapter2.PatternsofBehaviour** • Stereotyped Behaviors- Orientation and Reflex. • Individual Behavioural patterns: Instinct and Learned Behaviour • Associative learning, classical and operant conditioning, Habituation, Imprinting.	**14**
Unit–2	**14**
Chapter3.SocialBehaviour: • Social organization in termites and honeybees. • Social behaviour: Altruism. • Conflict behaviour. **Chapter4.SexualBehaviour** • Sexual dimorphism, Mate choice in peacock. • Intra-sexual selection (male rivalry in red deer). • Kinship theory: Relatedness & inclusive fitness. • Parental care in fishes (Nest Building & cost benefit)	
Unit– 3	**14**

Chapter5.Chronobiology • Brief historical developments in chronobiology. • Adaptive significance of biological clocks. • Biological Rhythms **Chapter6:Communicationsinanimals** • Bioluminescence in deep sea fishes and insects • Territoriality in Monkeys and Dogs • Role of pheromones in animal communication- Insects and Vertebrates, • Communication in Honeybees (Waggle Dance)	

Suggested Readings:

1. Animal Behaviour by Drickamar.
2. John Alcock, Animal Behaviour, Sinauer Associate Inc., USA.
3. Paul W. Sherman and John Alcock, Exploring Animal Behavior, Sinauer Associate Inc.,Massachusetts,USA.
4. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey(ed).2004, Sinauer Associates, Inc.Publishers, Sunderland,MA,USA
5. Insect Clocks D.S. Saunders, C.G.H. Steel, X., Afopoulou (ed.) R.D. Lewis. (3rdEd) 2002 Barens and Noble Inc. New York, USA
6. Biological Rhythms: Vinod Kumar (2002) Narosa Publishing House, Delhi/Springer-Verlag, Germany.