

KUVEMPU UNIVERSITY
B.Sc. DEGREE – ZOOLOGY Semester scheme (SEP)
VI semester syllabus
Title–Genetics &Animal Biotechnology (Paper -7)

Program Name	B.Sc	Semester	VI
Compulsory Course	Genetics and Animal Biotechnology		
Course Code	_	No. of Credits	03
Contact hours	4 hrs./ week	Duration of SEA/Exam	3hrs
Formative assessment marks	20	Summative assessment marks	80

Objectives:

- This course covers genetics, the science of heredity from its basic principles to the most recent advances in the field.
 - Imparts basic knowledge of classical (transmission) and molecular genetics.
- Learning Outcomes:
- To introduce students to the principle, practices and application of biotechnology.
 - To familiarize the students with the basic concept of genetic engineering.
 - To enable students to solve problems focusing on health, medicine, agriculture and environment etc.

Learning Outcomes:

- Comprehensive, detailed understanding of the chemical basis of heredity.
- Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms.
- Execute the application of recombinant DNA technology in designing research project.
- Acquire technical skills required for joining research labs/industry/institute/pharmaceutical etc. including entrepreneurship

Genetics – Theory

UNIT - 1

1. **Mendelism:** Mendel's experiments on garden peas - Monohybrid and Dihybrid cross, Mendel's Laws, test cross, back cross and reciprocal cross.
2. **Interaction of genes:** Allelic: Incomplete dominance (Undulation in fowls). Co-dominance (coat colour in Cattle), Lethal gene- dominant (Creeper gene in chickens) and recessive (Cystic Fibrosis in man). Non allelic – Complementary gene (Comb pattern in fowls), Supplementary gene (Coat colour in mice), Epistasis gene - dominant (Plumage in poultry and recessive – Coat colour in mice). Duplicate genes, mention one example. Modifying genes, Polygenic inheritance- skin colour inheritance in man.
3. **Nature and Nurture:** Definition of norm of reaction, experiments on Himalayan albino rabbit and human twins. Phenocopy, penetrance and expressivity with examples.

UNIT - 2

4. **Multiple alleles:** Coat colour in rabbits. Human blood groups and its inheritance- ABO blood group system, Rh factor, erythroblastosis foetalis, MN and Bombay Blood groups (in brief). Isoalleles and pseudo alleles with examples.
5. **Sex Linkage:** Linkage – Definition complete and incomplete linkage in drosophila, significance of linkage, linkage maps - Construction of chromosome maps, two-point test cross & three-point test.
6. **Sex-Linked Inheritance:** Types of sex-linkage - X linked inheritance (eye colour in drosophila, colour blindness and hemophilia in humans), Y linked genes (hypertrichosis). Sex limited genes (beard in man) and sex influenced genes (inheritance of baldness in man).
7. **Mutation:** Types of mutations - somatic, germinal, spontaneous, induced, autosomal and allosomal mutation. ClB technique for detection of mutation.

UNIT - 3

8. **Sex Determination:** Chromosome theory of sex determination (autosome and sex chromosomes), male heterogamy and female heterogamy, (xx-xY, xx-xO, ZZ-ZW, ZZ-ZO). Genic balance theory of bridges. Barr bodies, Lyon's hypothesis, gynandromorphism in drosophila, hormonal (free martin in calf) and environmental (Bonellia) influence on sex determination

- 9. Human Genetics:** Human karyotype, idiogram, pedigree analysis, common human chromosomal syndromes - Klinefelter's and Turner's Syndromes, Down's syndrome, Inborn errors of metabolism – Albinism, Phenylketonuria, Alkaptonuria, Sickle cell anemia, Thalassemia, Huntington's chorea, Prenatal diagnosis - Amniocentesis, chorionic villus sampling; Genetic counseling.

Animal Biotechnology – Theory

UNIT - 4

- 1. Introduction to Animal Biotechnology:** Aim and scope; Concept of genetic engineering.
- 2. Basic Tools for Gene Manipulation:** Cloning vectors - Plasmids, Cosmids, Lambda bacteriophage. Enzymes of genetic engineering-Restriction enzyme, ligase enzyme and polymerase enzyme. Basic principles of cloning.
- 3. Animal Cell culture:** Equipment and materials for animal cell culture; Applications of cell culture techniques. Recombinant DNA technology: with an example of human insulin production and applications of Recombinant DNA Technology.
- 4. Molecular techniques:** PCR, Gel electrophoresis, Southern and northern Blotting, DNA sequencing (Sanger method) and DNA finger printing.
- 5. Gene transfer technique:** Transfection method, Electroporation, shot gun method and liposome mediated method.
- 6. Transgenesis – Methods of Transgenesis.** Production of cloned and transgenic animals, nuclear transplantation, retroviral method and DNA micro injection method. Application of Transgenic animals: Pharmaceuticals, donor organs and Knock – out mice. Stem cells –types and their applications.
- 7. Bioinformatics:** Introduction, Definition, importance and role of Bioinformatics in life sciences.

References

- Gardner, J.E., Simmons, J.M and Snustad D.P. (2007). Principles of Genetics (8th edn.). John Wiley and Sons, India.
- Klug, W.S and Cummings, M.R. (2011). Concepts of Genetics (7th edn). Pearson Education Inc. India.

3. Benjamin Pierce, (2015) Genetics- A Conceptual Approach, 5th edition, WH Freeman publication
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5. C.Winter G.I, Hickey and H.L Fletcher (2003) Genetics viva books private limited.
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7. Eldon John Grdner and Michael J. Simmons et al., (2012) Principles of genetics
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11. P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003).
12. B.D. Singh: Biotechnology, Kalyani publishers, 1998 (Reprint 2001).
13. Mount, D.W. (2006) Bioinformatics (2nd edition) CBS.
14. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009). An Introduction to Genetic Analysis. IX Edition. Freeman and Co., N.Y., USA.
15. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
16. Rastogi et al., (2004). Bioinformatics Methods and Applications, Prentice Hall of India Pvt Ltd.
17. R.C Dubey (2007) A text book of biotechnology, S Chand publication
18. V. Kumaresan (2010) biotechnology, Saras publication

KUVEMPU UNIVERSITY
B.Sc. DEGREE – ZOOLOGY Semester scheme (SEP)
VI semester syllabus
Title –Evolution & Zoogeography (Paper – 8)

Program Name	B.Sc	Semester	VI	
Compulsory Course	Evolution & Zoogeography (Paper -6)			
Course Code	-	No. of Credits		03
Contact hours	4hrs./ week	Duration of SEA/Exam		3hrs
Formative assessment marks		20	Summative assessment marks	80

Objectives of the course

- To get an exhaustive knowledge of organic evolution with special reference to man.
- To enhance the student's concept of nature and her resources and appreciating the process and product of organic evolution
- To study the distribution of animals in different geographical regions.

Course Outcomes:

- Acquire knowledge about the evolutionary history of earth - living and non-living.
- Knowledge about the distribution of animals on earth, its pattern, evolution and causative factors.
- Knowledge on principles of inheritance and variation.
- To obtain knowledge on molecular basis of inheritance and on the mechanism and factors affecting evolution.
- Evaluate evolution. concepts and theories of evolution
- Understand adaptations of animals to various environment.
- Identify zoogeographical realms, endemic species, distribution patterns of animals in each realm and types of continents.

Evolution – Theory

UNIT - 1

1. **Origin of Life-** Panspermia theory, Theory of creation (Abiogenesis), biogenesis theory, chemical evolution theory, Urey and miller's experiment.
2. **Theories of organic evolution:** - Lamarckism and its Criticism, neo lamarkisim, Weismann's germplasm theory, Darwinism and its Criticism, Neo-Darwinism, Mutation theory of De Vries.
3. **Evidences from organic evolution-** Evidences from comparative morphology, anatomy, embryology, physiology and bio-chemistry.

UNIT - 2

4. **Population genetics and evolution:** Hardy-Weinberg Equilibrium, gene pool, gene frequency. Factors that upset Hardy-Weinberg Equilibrium, Effects of genetic drift on population: Bottleneck effect and founder effect. Natural selection: types of selection (brief account of the observation in Biston betularia),
5. **Species and Speciation:** Species concept, subdivisions of species (sub species, sibling species, cline and deme), Speciation - Sympatric speciation , allopatric speciation, parapatric speciation, peripatric speciation, Hybridization, adaptive radiation with special reference to Darwin's finches.
6. **Isolation and isolating mechanisms:** Types of isolating mechanisms, pre and post isolating mechanism. Role of isolating mechanisms in evolution. Microevolution, macroevolution, mega evolution and punctuated equilibrium.

UNIT - 3

7. **Geological timescale-** Eras with their fauna, study of fossils, dating of fossils and preservation of fossils. mass extinction-types, causes and impact.
8. **Evolution of Horse-** Place of origin, time of origin, evolutionary trends, hyracotherium, Meshippus, miohippus, parahippus, Merychippus, hipparion, Pliohippus, equus, orthogenesis in horse evolution
9. **Evolution of man:** Trends in human evolution, fossil men, brief accounts of Parapithecus, Propliopithecus, Dryopithecus, Ramapithecus, Australopithecus, Neanderthal, Cromagnon and Modern man.

Zoogeography –Theory

UNIT - 4

1. **Animal Distribution:** Geographic distribution of animals-cosmopolitan distribution, discontinuous distribution, bipolar distribution and isolated distribution, factors affecting animal distribution, barriers to animal distribution- physical and biological barriers.
2. **Zoogeographical Realms:** (brief account of each realm mention the areas included, physical features and fauna) Palaearctic region, Australian region, Ethiopian region, Nearctic region, Oriental region and Neotropical region. Biogeographical classification of India- Western Ghats, Eastern Ghats and Himalayas. Insular Fauna: Brief account of oceanic islands and continental islands (with one example each)

References

1. Andrews M.I. and Joy K.P. (1989). Ecology Evolution and Zoogeography. RobertsK, Kerieyer Pubo., New York
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B.Sc. Zoology III year Practical syllabus
Semester-VI
Discipline specific core course- (Paper-7&8)
GENETICS & BIOTECHNOLOGY
&
EVOLUTION & ZOOGEOGRAPHY
PRACTICALS

Single Practical/ week	Duration-4 hours	No of Practical's- 15
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GENETICS

Sl. No	Experiment name	No Of Practical
1	Genetic problems on Monohybrid, Dihybrid Crosses and sex-linked inheritance (two problems from each),**Study of monohybrid cross by bead method to verify Mendel's law.	1
2	Study of ABO and Rh systems of blood grouping.	1
3	Study of drosophila mutant	1
4	Study of normal male and female human karyotype (use photographs or Xerox copies).	1
5	Study of human karyotypes and numerical alterations (Down syndrome, Klinefelter syndrome and Turner syndrome) through charts.	1
6	Study of Barr body and its significance (in stained buccal epithelial cells).	1
7	Pedigree analysis of some human inherited traits and solving related problems-examples X-linked recessive & autosomal recessive disorder.	1
8	Study of Dermatoglyphics (finger printing patterns) significance and comment.	1
9	Study of colour blindness by Ishihara test.	1
BIOTECHNOLOGY		
10	Study of DNA finger printing, and PCR. (Principle and application) through photograph.	1
11	Study of plasmids and Cosmides (Through photograph).	
12	Application of DNA finger printing in criminology (photograph of electrophoretic pattern to be given for interpretation by the students) at least four problems worked out in record	1

BIO INFORMATICS		
13	Perform a basic sequence alignment using tools like BLAST and FASTA	
EVOLUTION		
14	Study of homology and analogy from suitable specimens/ pictures a. Fore limb skeleton of frog and pigeon b. Wing of bird and insects Study of vestigial organs a. Vermiform appendix b. Coccyx c. Molar teeth d. Study of fossils- Casts and moulds	1
15	Study of dinosaurs – Tyrannosaur's, Brontosaurus, Pterosaurs and Ichthyosaurs	1
16	Study of Archaeopteryx	
17	Problems on Hardy-Weinberg Law	1
ZOOGEOGRAPHY		
18	Identification of Zoogeographical realms using map	1
19	providing a map mark any two continental/oceanic islands-green land , Madagascar, New zeland, New guinea, Maldives, Iceland and Hawaii (any two).	
20	Contributions of scientists (showing photos) – Any four	

FIELD STUDY/STUDY TOUR- Study tour/field study- visit to research institute and various places of zoological importance. A study tour is compulsory. (Students are expected to visit research institutes and various places of zoological importance).