| BTY 5104 | **GENETICS**(Credits4;Theory4hrs;Practical3hrs) |
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| **Aim** | Tostudytheconceptsingenetics |
| **Objectives** | • TostudythebasicclassicalMendeliangeneticsanditsdeviations<br>• Understanding chromosomal basis of inheritance and its application inlinkage,mapping and cytogenetics<br>• Tostudythenewemergingconceptsingeneticsandheredity<br>• Tostudygeneticsofapopulation |
| **Learning outcome** | Afterthecompletionofthiscourse,thelearnerwillhave<br>➢ Knowledge on the principles of genetics and different types of heritabletraits<br>➢ Knowledgeonthemechanismofextrachromosomalandepigenetic inheritance.<br>➢ The ability to applythe knowledge to understand various traits inindividualsandpopulationsofmicrobes,plantsandanimals. |
| | **Theory** |
| **1.** | **Principles of heredity:** Mendelian principles, laws of probability, binomialtheorem,Chi- square analysis, pedigreeanalysis. |
| **2.** | **Deviations from Mendelian inheritance:** Incomplete Dominance,Codominance, Lethal Alleles, Hierarchy of Dominance, Multiple Alleles,Pleiotropy, Polygenic inheritance, Quantitative trait loci (QTL), Statistics ofquantitativegenetics,Testforallelism,Environmentaleffect,Penetrance, Expressivity,Epistasis. |
| **3.** | **Chromosomal Basis of Inheritance:** Chromosomal theory of inheritance,Sex-linked traits, Pedigree analysis of linked traits, Activation andinactivationofX-chromosome,Sex-influencedtraits,Sex-limitedtraits,Sex Determination. |
| **4.** | **Cytogenetics:** Eukaryotic chromosomes-structure, classification andorganization,Banding,karyotyping,MolecularCytogenetics(FISH,GISH, FIBER-FISH,FlowCytogenetics,Flow karyotyping),Chromosomal aberrations. |
| **5.** | **Linkage and Mapping:** Linkage, Crossing over, Evolutionary significance ofrecombination, Two-point test cross, Three-point test cross, Genetic Mapping,GeneticmappinginDrosophila,Linkageandmappingusingtetrads,Physical mapping,Applicationofmapping. |
| **6.** | **Extra chromosomal inheritance:** Cytoplasmic inheritance, MitochondrialDNA, interplay between mitochondria and nuclear gene products, ChloroplastDNA,chloroplastbiogenesis,Originandevolution ofmitochondriaand chloroplast,Maternaleffect. |
| **7.** | **IntroductiontoEpigeneticinheritance:**Epigeneticinheritance,Genomic ImprintingandAnticipation. |
| **8.** | **Population genetics:** Migration, mutation, selection, genetic drift, Estimatingallele frequency, Nonrandom mating and genotype frequency, evolution ofgenomes,Inbreeding and co-ancestry. |
| **S. No.** | **Laboratory/Practical** |
| **1.** | Karyotyping |

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| **2.** | Workingoutonproblemsrelatedtoconcernedtopicssuchas<br>1. Classicalgenetics<br>2. Probability<br>3. DeviationsfromMendeliangenetics<br>4. Polygenicinheritance<br>5. MultipleAlleles<br>6. Chi-squareanalysis<br>7. Pedigreeanalysis<br>8. Sex-linkedtraits<br>9. Genemapping<br>10. Allelefrequency<br>11. Populationgenetics |

**TextBooks:**


1. SnustadPD,SimmonsMJ.2015.PrinciplesofGenetics,7th edition.Wiley.
2. KlugWS,CummingsMR,SpencerCA,PalladinoMA,DarrellKillian.2018.ConceptsofGenetics,12th edition. Pearson.
3. GriffithsAJF,WesslerSR,CarrollSB,DoebleyJ.2015.IntroductiontoGeneticAnalysis,11thedition. W.H. Freeman & Worth Publishers.
4. PierceBA.2016.Genetics:AConceptualApproach6th edition.W.H.Freeman.
5. HartwellL,GoldbergML,FischerJ,HoodL.2017.Genetics:FromGenestoGenomes6th edition.McGraw-Hill Education.
6. HartlDLandJonesEW.2011.Genetics:AnalysisofGenesandGenomes,7thedition.USA:Jonesand Barlett Publishers.
7. MathewPM.Fundamentalsofpopulationgeneticswithemphasisonhumaninbreedings,1st edition.Southern book star.
8. StrickbergerMW.2015.Genetics,3rd edition.Pearson.
9. SamuelsML,WitmerJA,SchaffnerA.2015.StatisticsfortheLifeSciences,5th edition.Pearson.
10. BrookerR.2017.Genetics:AnalysisandPrinciples,5th edition.McGraw-HillHigherEducation
11. TamarinR,7th edition.2017.PrinciplesofGenetics.McGrawHillEducation.
12. ElrodS,StansfieldW.2010.Schaum'sOutlineofGenetics,5th edition.McGraw-HillEducation.
13. HartlDL,ClarkAG.2006.PrinciplesofPopulationGenetics4th edition.SinauerAssociatesisanimprint of Oxford University Press.
14. CrowJF,KimuraM.2009.AnIntroductiontoPopulationGeneticsTheory.TheBlackburnPress.
15. HedrickPW.2010.GeneticsofPopulations,4th edition.Jones&BartlettLearning.

1. GriffithsAJF,GelbartWM,LewontinRC,MillerJH.2002.ModernGeneticAnalysis :IntegratingGenes and Genomes2nd edition. W. H.Freeman.
2. StryerL,BergJM,TymoczkoJL,GattoGJJr.2019.Biochemistry9thedition.W.H.Freeman.
3. KarpG,IwasaJ,MarshallW.2015.Karp'sCellandMolecularBiology:Conceptsand Experiments,8th edition. Wiley.
4. RobertisDe.2010.CellandMolecularBiology,8thedition.LippincottWilliams&Wilkins.
5. KarpG.2013.CellBiology,7thedition.Wiley.
6. RussellPJ.2011.iGenetics:AMolecularApproach,3rdedition.Pearson.