BTY 5105	**CELLAND MOLECULARBIOLOGY** (Credits4;Theory4hrs;Practical3 hrs)
Aim	Tostudyabouttheorganizationofcellandthemoleculesofheredity
Objectives	• Tostudyaboutcellanditscomponents • Tounderstandthemetabolismofvariousnucleicacids • Tounderstandhowgenesareexpressedandregulated • Tostudythebasictechniquesinvolvedincellandmolecularbiology
Learning outcome	Afterthecompletionofthiscourse,thelearnerwill ➢ Understand structural components of cell and molecularbasis for thetransmissionof hereditary traits ➢ Knowhowgenesareexpressedandregulatedinorganisms ➢ Will have the practical skills in basic cell and molecular biologytechniques.
	Theory
1.	**Cell Biology:** Cell structure in eukaryotes and prokaryotes, cell organelles andtheir ultra-structure, functions, cytoskeleton, cytoplasmic streaming and celladhesion,Cellcommunication:junctionsbetweencellsandcellsignaling,Cell membranes:membranedynamicsandsolutetransportacrossmembranes.
2.	**Structuralorganizationofchromosomes:**Structuralorganizationof chromosomes in Prokaryotes and Eukaryotes. Structural hierarchy ofchromosomes.Centromeres and telomeres.
3.	**CellDivision:**CellcycleandRegulation.
4.	**Nucleic acids:** Structural organization of genetic material in Prokaryotes andEukaryotes.Structure, composition and function of DNA and RNA.Differenttypesof RNA- mRNA, tRNA, rRNA, snRNA, snoRNA, miRNA, XistRNA, siRNA,
5.	**Mechanism of DNA replication:** Mechanism of DNA replication, DNApolymeraseI,II,III,DNAgyrases,topoisomerases,ligases,initiationof replication,rolesofRNApolymerase(primase)andreplisomecomplex,current

	conceptofDNAreplicationinprokaryotesandeukaryotes.
6.	**Gene expression:** The genetic code, one gene one enzyme, one gene-onepolypeptide, Mutations and recombination within a gene, Experimentsconductedtodecipherthegeneticcode,salientfeatures,exceptions. **Transcription -** General features of transcription, transcription unit, Currentconcepts of transcription in prokaryotes and eukaryotes, Regulatory sequencesandtranscriptionfactorsinvolved,Post-transcriptionalmodifications. **Translation -** Basic structure of proteins, ribosomes, tRNA. Wobble-hypothesis, Mechanism of translation and factors involved in prokaryotes andeukaryotes,factorsaffectingtranslationaccuracy,non-ribosomalpeptide synthesis.
7.	**Regulation of gene expression:** Regulation in prokaryotes - Constitutive,InducibleandRepressibleexpression,positiveandnegativecontrol.Inductionand catabolite repression in *lac* operon, repression and attenuation in *trp*operon,Translational and posttranslational regulation. Lysogenicandlyticswitchesinlambdaphage. Regulation in Eukaryotes - Regulation at chromatin level, Epigenetic changes atchromosome level, genome imprinting, transcriptional gene regulation,epigenetic mechanisms of transcriptional gene regulation, regulation by *cis*-acting control elements, alternative promoters, trans-acting factors,transcriptionalactivatorproteins,enhancers,silencers,post-transcriptionalgene regulation including alternative splicing, RNA editing, RNA interference,Riboswitches,RNAstability,roleofRNA-decayingfactorsingeneregulation, translational regulation, post-translational control, protein processing,proteosomecomplex and proteindegradation.
S. No.	**Laboratory/Practical**
1.	Mediapreparationforplasmidisolation.
2.	Raising*E.coli*withaplasmid,bystreakingonantibiotic-containingmedia.
3.	Raising*E.coli*liquidcultureforplasmidisolation.
4.	PlasmidDNAisolationusing thealkalinelysismethod.
5.	Gel electrophoresis to see the isolated plasmid, study the DNA stainingprocedureandalternativeformsofplasmidobtainedafterextraction.
6.	MediapreparationforplantDNAisolation.
7.	PlantgenomicDNAisolationfromplanttissuesbyCTABmethod.
8.	Gelelectrophoresistoseetheisolatedplant DNA.
9.	PlantRNAisolation
10.	Gelelectrophoresistoseetheisolatedplant RNA.
11.	QuantificationofDNA/RNA
12.	Exercisesrelevanttotopicssuchas*lac*operon,*trp*operon,etc.

TextBooks:

1. WatsonJD,TaniaAB,StephenPB,AlexanderG,MichaelL,RichardL.2017.MolecularBiologyof theGene, 7th edition. PearsonEducation.
2. KrebsJE,GoldsteinES,KilpatrickST.2017.Lewin'sGENESXII.JonesandBartlett Publishers,Inc.
3. Lodish H, Berk A, Kaiser CA, Krieger M, Bretscher A. 2016. Molecular Cell Biology, 8th edition.WH Freeman & Co.
4. AlbertsB.2014.MolecularBiologyoftheCell,6thedition.GarlandScience.
5. HartlDL,CochraneB.2017.Genetics:AnalysisofGenesandGenomes9thedition.Jones&BartlettLearning.
6. GriffithsAJF,WesslerSR,CarrollSB,DoebleyJ.2015.IntroductiontoGeneticAnalysis,11thedition.W.H. Freeman & Worth Publishers.