



Bharatiya Vidya
Bhavan
Bhavan's Vivekananda College
of Science, Humanities and Commerce
Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-'20
Program: BSc. (Mb/Bt/G/C)
Course Title: GT132: Transmission Genetics

Name of the faculty: Dr Jyothi Nayar	Department: Genetics & Biotechnology	Year/Semester: I/I	No. of classes per week: 2
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Learning objectives: To explain the genetics of cell division and chromosome segregation. To understand the fundamentals of recombination and gene mapping.

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 3 rd week	II	Cell Division and Chromosome Segregation. Objectives and outcomes of Transmission Genetics. Introduction to cell cycle		Chalk & Board	Understanding the objectives and outcomes of Transmission Genetics.
2	June 4 th week	II	Phases of cell cycle and genes determining the cell cycle	Cytoplasmic rhythms correlating and differentiating it with cell cycle	Chalk & Board	Understanding the different phases of cell cycle and the checkpoint that control the cell cycle.
3	July 1 st week	II	Role of p ⁵³ . Mitotic cell division	Tumor suppressor gene p ^{RB} and its role. Inhibitory proteins of cyclins and CDKs	Chalk & Board	Understanding the role of p ⁵³ and other tumor suppressor genes in cell cycle. Preparing and observing the slides of onion root tips to understand the different stages of mitosis in plant cells.
4	July 2 nd week	II	Meiosis and its stages		Chalk & Board	Understanding and observing the different stages of meiosis and the cells in which meiosis occurs
5	July 3 rd week	II	Significance of Meiosis; Synaptonemal complex and Kinetochores.	Position of the kinetochores in determining whether the chromosomes separate or the chromatids that ultimately results in reduction or equational division	Chalk & Board	Understand the significance of meiosis in maintaining the chromosome number and in the evolution and genetic variation.
6	July 4 th week	II	Gametogenesis Spermatogenesis		Chalk & Board	Understand the process of spermatogenesis
7	August 1 st week	II	Spermiogenesis		Chalk & Board	Understand the process of sperm formation and to differentiate the process involved in animals and human

8	August 2 nd week	II	Oogenesis		Chalk & Board	Understand the process involved in the formation of the ovum and its maturation. To differentiate the process involved in animals and human
9	August 3 rd week	II	Gametogenesis in plants – micro sporogenesis & gametogenesis and mega sporogenesis & gametogenesis		Chalk & Board	Understand the process involved in the formation and development of pollen and ovule in plants.
10	August 4 th week	IV	Linkage, Recombination and Mapping of Genes in Eukaryotes Discovery of Linkage and phases of linkage. Definition of linkage & types.		Chalk & Board	To understand that the II law of Inheritance given by Mendel is not universal.
11	August 5 th week	IV	Crossing over and cytological proof for CO in <i>Drosophila</i> . Cytological proof of CO in Maize	CO involving non-sister chromatids lead to recombination while CO between sister chromatids does not lead to recombination	Chalk & Board	Understanding that crossing over involves exchange of chromosomal segments using heteromorphic X-chromosomes in <i>Drosophila</i> and heteromorphic 9th-chromosomes in Maize.
12	September 1 st week	IV	Linkage map 2-point test cross & 3-point test cross		Chalk & Board/ICT	Solving problems using 2 –point and 3-point test cross to map the genes in eukaryotes.
13	September 2 nd week	IV	Interference and co-efficient of co-incidence. Tetrad analysis – Ordered tetrad.	Probability-product rule and sum rule	Chalk & Board/ICT	Understanding the effect of a CO on the frequency of CO in the adjacent regions of the chromosome. To map the genes using ordered tetrad data in <i>Neurospora</i> .
14	September 3 rd week	IV	Tetrad Analysis - Unordered		Chalk & Board	Solve problems involving mapping of genes in <i>Neurospora</i> using unordered tetrad data
15	September 4 th week	IV	Mitotic Recombination in <i>Aspergillus</i> .		Chalk & Board	Understanding that recombination can also occur during mitosis.

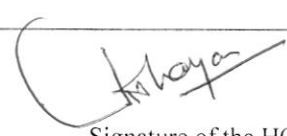
Learning outcomes:

On completion of the course the students will get an in-depth view of the molecular mechanisms in cell cycle and chromosomal segregation. Solving problems using recombination and crossing over help them understand the process of gene transmission and mapping of genes.

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TEACHING PLAN: 2019-'20

Program: BSc. (Mb/Bt/G/C)

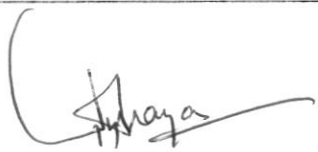
Course Title: **GT332: Gene Structure, Organisation and Expression.**

Name of the faculty: Dr. Jyothi Nayar	Department: Genetics & Biotechnology	Year/Semester: II/III	No. of classes per week: 2
Learning objectives: To understand the detailed structure of nucleic acids - DNA and RNA. To learn the different types of sequences in the Eukaryotic genome and understand the dynamics of Reassociation Kinetics.			

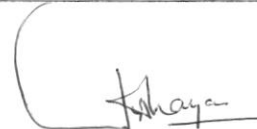
S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 2 nd week	I	Nucleic Acids: Objectives and outcomes of the course. Introduction to the Nucleic acids. Primary structure of DNA - structure of phosphate, deoxyribose sugar and nitrogenous bases	Alternate names of the nitrogenous bases that helps in drawing their chemical structures.	Chalk & Board	Understanding the objectives and outcomes of Gene structure, organization and expression. Draw the chemical structures of sugar and nitrogenous bases.
2	June 3 rd week	I	Secondary structure of the DNA – formation of polynucleotide structure and H-bonds between the bases to form ds structures		Chalk & Board	Draw the polynucleotide structure with bonds between PO ₄ , sugar and bases, H-bonds between the bases to form ds structures.
3	June 4 th week	I	Watson and Crick model and alternate forms of the DNA. Structure of eukaryotic m-RNA		Chalk & Board	Understanding the Watson and crick model of the DNA double helical structure and to differentiate the alternate forms of the DNA. Draw the structure of m-RNA
4	July 1 st week	I	r-RNA and t-RNA		Chalk & Board	Draw the structure of r-RNA; primary, secondary and tertiary structures of t-RNA. To differentiate between the three types of RNA. Assignment: sn-RNA, mi-RNA and i-RNA
5	July 2 nd week	I	Experiments to prove DNA and RNA as genetic material.	Properties required for DNA/RNA/proteins to be considered as	Chalk & Board	Understanding the principles involved in the experiments to prove that DNA

				genetic material		is the genetic material in most organisms and RNA in some. To estimate the amount of DNA in the given sample by DPA method and RNA by Orcinol method.
6	July 3 rd week	I	DNA replication- Messelson and Stahl's experiment to prove semi-conservative method of replication; Replication initiation process.	Harlequin chromosomes to prove semi-conservative method of DNA replication.	Chalk & Board	Understanding the different methods of DNA replication and the experiment to prove the semi-conservative method. To understand the process of replication initiation.
7	July 4 th week	I	DNA replication - Chain elongation, editing and termination		Chalk & Board	Understanding the process involved in chain elongation – leading and lagging strands, editing, termination and unlinking to separate the two DNA double helices.
8	August 1 st week	I	Replication of Eukaryotic DNA and the enzymes involved.		Chalk & Board	To understand the difference in the process of DNA replication of eukaryotes and prokaryotes.
9	August 2 nd week	I	Enzymes involved in the replication of prokaryotic DNA.		Chalk & Board	Understand the functions of the enzymes involved in DNA replication. Draw the structure of DNA pol. III.
10	August 3 rd week	II	Genome Organisation: Definition, size and number of genes in eukaryotic genome.	Experiments (<i>Drosophila</i> and yeast genome) to prove how many genes are essential and how many are non essential in the eukaryotic genome.	Chalk & Board	To understand the modern definition of a gene; determine the size and number of genes expected in a eukaryotic genome
11	August 4 th week	II	Benzer's functional units of the gene Cistron, Muton and Recon. Types of genes.		Chalk & Board	Understanding the different types of genes in the eukaryotic genome.
12	August 5 th week	II	Prokaryotic and eukaryotic genome organization. Dissociation / Reassociation and Denaturation / Renaturation of DNA. Melting temperature T _m of the DNA.		Chalk & Board	To differentiate between eukaryotic and prokaryotic genome organization. Understanding the difference between

						Dissocaiton and Denaturation; Reassociation and Renaturation. Melting temperature based on denaturation.
13	September 1 st week	II	Properties of DNA affected by denaturation. Renaturation factors.	Techniques to measure the amount of DNA reassociated.	Chalk & Board	Understanding hyper and hypo chromic effect of DNA due to denaturation; factors that influence the process of renaturation
14	September 2 nd week	II	C- value, C-value paradox; Reassociation Kinetics, Cot values and Cot curves. Kinetic complexity of the genome – kinetic components		Chalk & Board	To determine the Reassociation kinetics of the DNA based on the II order Kinetics; to differentiate the kinetic components of the DNA based on Reassociation kinetics and to establish the kinetic complexity.
15	September 3 rd week	II	Kinetic classes of the DNA- Unique sequences, Moderately repetitive sequences- tandem and interspersed	Tri-nucleotide repeats and their effect on human diseases- FRAXA and Huntington's disease.	Chalk & Board	To differentiate the different kinetic classes or the DNA – characteristic features of single/unique sequences and MRS.
16	September 4 th week	II	Highly repetitive sequences, Satellite DNA Organisation of the eukaryotic gene	Palindromic repeats	Chalk & Board	To understand the features of HRS and satellite DNA. Determine the location of Satellite DNA in the genome Differentiate between the eukaryotic and prokaryotic gene structure.
Learning outcomes: On completion of the course the students will have an in-depth knowledge of the structure of the nucleic acids that forms the basis of molecular biology. The study helps them to understand the Reassociation Kinetics of the DNA, the kinetic classes and other sequences in the eukaryotic genome.						



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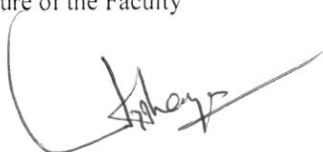
Bhavan's Vivekananda College
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TEACHING PLAN: 2019-20
Program: BSc. (Mb/Bt/G/C)
Course Title: GT232: Genetic Analysis

Name of the faculty: Dr Jyothi Nayar	Department: Genetics & Biotechnology	Year/Semester: I/II	No. of classes per week: 2
Learning objectives: To understand the significance of Cytogenetics in detecting chromosomal anomalies. Recombination and Gene mapping Procedures in Bacteria and Viruses.			

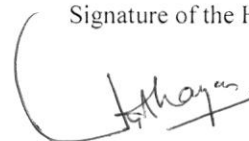
S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 4 th week	II	Chromosome structure, chromatin organization and variation Chromosome morphology- size and shape; Euchromatin	Karyotyping and Karyogram	Chalk & Board	Understanding the chromosome morphology and preparation of the karyotype
2	December 1 st week	II	Heterochromatin Components of chromatin: Histone Proteins. Nucleosome Model	Histones as landmark proteins	Chalk & Board	Understanding the chemical composition of the chromosome
3	December 2 nd week	II	Nucleosome model: Higher level organization. Specialised chromosomes: Polytene and Lampbrush		Chalk & Board	Understanding the packing of the DNA into the chromatin to form the highly condensed metaphasic chromosome. Differentiate the different types of specialized chromosomes Dissecting the <i>Drosophila</i> larvae for Polytene chromosomes (Salivary gland)
4	December 3 rd week	II	Chromosome variation- Structural aberrations: Deletions and Duplications		Chalk & Board	Understand the chromosomal modifications and their genetic implications
5	December 4 th week	II	Structural aberrations: Inversions and Translocations	Maintenance of mutant <i>Drosophila</i> stocks in the lab Balanced lethals Position Effect : CML and ALL	Chalk & Board	Understand the chromosomal modifications and their genetic implications
6	January 1 st week	II	Numerical aberrations: Euploidy - Autopolyploidy		Chalk & Board	Understand the chromosomal modifications and

						their genetic implications
7	January 2 nd week	II	Numerical aberrations: Allopolyploidy , Aneuploidy		Chalk & Board	Understand the chromosomal modifications and their genetic implications Assignment : Human diseases and Chromosomal aberrations
8	January 3 rd week	IV	Recombination and mapping of genes in Bacteria and Viruses Bacterial Conjugation		Chalk & Board / ICT	Understand the 3 process of conjugation
9	January 4 th week	IV	Conjugation Mapping of genes	mapping of closely linked genes	Chalk & Board	Mapping of bacterial gene by conjugation using time interval, frequency of gene transfer
10	January 5 th week	IV	Transformation and Mapping	Transformation in <i>B. subtilis</i> & <i>H. influenzae</i>	Chalk & Board / ICT	Understanding the process of Transduction in <i>S pneumoniae</i> . Mapping of genes by transformation
11	February 1 st week	IV	Transduction and Mapping		Chalk & Board / ICT	Understanding the process of Generalised and Specialized Transduction. Mapping of genes by generalised transduction
12	February 2 nd week	IV	Recombination in Viruses		Chalk & Board/ICT	Understanding the types of Viral mutants; intragenic and intergenic recombination
13	February 3 rd week	IV	Extra chromosomal Inheritance- Maternal Inheritance; Chloroplast Inheritance		Chalk & Board	Understanding the mode of extra chromosomal inheritance – maternal and chloroplast with examples
14	February 4 th week	IV	Extra chromosomal Inheritance-Mitochondrial Inheritance		Chalk & Board	Understanding mitochondrial inheritance pattern with examples
Learning outcomes: On completion of the course the students will get an in-depth view of the structure of the chromosome and chromosomal aberrations leading to various disorders. Recombination and gene mapping procedures help them understand the underlying principles of Genetic Analysis.						

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TEACHING PLAN: 2018-19
Program: BSc. (Mb/Bt/G/C)
Course Title: GT432: Molecular Genetics

Name of the faculty: Dr. Jyothi Nayar	Department: Genetics & Biotechnology	Year/Semester: II/IV	No. of classes per week: 2
Learning objectives: To understand the effect of mutagenic agents and gene mutations at the molecular level; DNA repair mechanisms. To study the role of transposable genetic elements on mutations.			

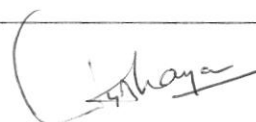
S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 3 rd week	III	Gene Mutations: Types of mutations. Spontaneous and Induced and other types	Other types – Somatic/Germinal/ Conditional/lethals	Chalk & Board/ICT	Understanding the different types of mutations
2	November 4 th week	III	Mutations at molecular level. Transitions and Transversions		Chalk & Board/ICT	Understanding the mutations at the molecular level- changes that damage the DNA
3	December 1 st week	III	Effect at the protein level. Frameshift . Spontaneous Lesions	Spontaneous Lesion- deamination and depurination	Chalk & Board/ICT	Understanding the effect of mutations at the protein level
4	December 2 nd week	III	Mutagenic Agents: Base analogs, Alkylating agents		Chalk & Board/ICT	Understanding the effect of chemical mutagens on the DNA
5	December 3 rd week	III	Acridines, Deaminating agents and Hydroxylating agents. Physical Mutagens – X-Rays	Chemical Mutagens: Acridines, Deaminating agents and Hydroxylating agents.	Chalk & Board/ICT	Understanding the effect of X-rays on the DNA and its mutagenic effect
6	December 4 th week	III	Physical mutagens- UV rays		Chalk & Board /ICT	Understanding the effect of UV-rays on the DNA and its mutagenic effect
7	January 1 st week	III	Test for Mutagens- Prokaryotes Ames test. Eukaryotes – Russel's Test in mice	Replica plating technique in prokaryotes.	Chalk & Board	Understanding the tests for the detection of mutations in Prokaryotes
8	January 2 nd week	III	DLTS test in mice. SLRL- CIB test and attached – X test in <i>Drosophila</i> .		Chalk & Board	Problem solving in detecting mutations in

						<i>Drosophila</i>
9	January 3 rd week	III	Revision of Unit III			Understand the 3 process of conjugation
10	January 4 th week	IV	DNA Damage and Repair Mechanisms; Transposable Elements Bacterial Transposons – IS elements, Composite, Tn3 elements	Mechanism of transposition- conservative and replicative	Chalk & Board	Mapping of bacterial gene by conjugation using time interval, frequency of gene transfer
11	January 5 th week	IV	Maize- Ac and Ds elements		Chalk & Board	Understanding the process of Transduction in <i>S pneumoniaea</i> . Mapping of genes by transformation
12	February 1 st week	IV	Maize Spm system		Chalk & Board	Understanding the process of Generalised and Specialized Transduction. Mapping of genes by generalised transduction
13	February 2 nd week	IV	<i>Drosophila</i> : P-elements		Chalk & Board	Understanding the types of Viral mutants; intragenic and intergenic recombination
14	February 3 rd week	IV	Yeast – Ty elements Plasmids. DNA Repair Mechanism: Photo-reactivation, Excision repair.		Student Seminar (DNA Repair)	Seminar to be given by the students
15	February 4 th week	IV	SOS repair, Recombination repair and Error prone repair.		Student Seminar	Seminar to be given by the students
Learning outcomes: On completion of the course the students will have an in-depth knowledge of the molecular basis of mutations and the mode of action of physical and chemical mutagens. The study helps them to understand the different types of DNA repair mechanisms and the consequences of the defects of the repair process.						

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TEACHING PLAN: 2019-20
Program: BSc. (MbGC & BtGC)
Course Title: GT532: Population Genetics

Name of the faculty: Dr. B Kalpana	Department: Genetics & Biotechnology	Year/Semester: III / V	No. of classes per week: 3
<p>Learning objectives: To understand core concepts of Population Genetics like Genetic equilibrium, Hardy Weinberg Law, applications of Hardy Weinberg law, role of micro evolutionary forces - Mutation, Selection, Migration and Drift in altering gene frequencies, to apply theoretical concepts to derive mathematical formulae and solve numerical problems to understand genetic equilibrium and causes for genetic disequilibrium.</p>			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 2 nd week	I	Structure of Populations and Genetic Equilibrium: Concept of Genetic/Mendelian population	Levels of hierarchy in a population: Individual, family groups, Demes and Local Population; Random mating	Chalk & Board	Understanding the concept of a Genetic population as compared to a Population in demographic context
2	June 3 rd week	I	Genetic composition of a population and attributes of a population	Gene, Genotype frequencies and Genetic equilibrium; Size, Density, Growth rate, Birth rate, Death rate, Age structure, Survival curve of a population	Chalk & Board	Solving problems on gene and genotypic frequencies of a population; Understanding the attributes of a population
3	June 4 th week	I	Genetic Equilibrium- Hardy Weinberg Law; Snyder's Ratios and its application	Attainment of equilibrium for a diallelic locus showing co dominance; Snyder's ratios- S_1 , S_2 , S_3	Chalk & Board	Drawing graph to understand the relation between gene and genotype frequencies in a population in Hardy-Weinberg Equilibrium (HWE) and solving numerical problems to understand attainment of equilibrium for a diallelic locus; Deriving Snyder's

						ratios mathematically
4	July 1 st week	II	Applications of Hardy Weinberg Law (HWL); Mutation: Application of HWL for an autosomal locus showing complete dominance, X-linked locus and multiple allelic locus	Frequency of carriers in the whole population (H) and among the dominant individuals (H ₁); attainment of equilibrium for a sex-linked gene, calculation of gene frequencies for a multiple allelic locus- Eg: locus coding for Isozymes, ABO locus	Chalk & Board	Solving problems on frequency of carriers and understanding the significance of carriers in case of Recessive Genetic disorders; Drawing graph to understand the attainment of equilibrium for a sex-linked locus and solving problems on calculation of gene frequencies for a multiple allelic locus
5	July 2 nd week	II	Application of HWL for Multiple Loci	Linkage equilibrium and Disequilibrium	Chalk & Board	Understanding the reasons for linkage disequilibrium with respect to two loci
6	July 3 rd week	II	Micro Evolutionary processes- Mutation	Irreversible and Reversible mutation, significance of mutation	Chalk & Board	Deriving equations for allele frequency changes due to mutation and mutational equilibrium gene frequencies
7	July 4 th week	III	Selection: Introduction	Fitness, components of fitness, selection coefficient, calculation of fitness based on survival and fertility	Chalk & Board	Solving problems on calculation of fitness based on survival and fertility
8	August 1 st week	III	Complete elimination of recessive genes	Allele frequency changes after one generation of selection against recessive deleterious and lethal alleles (q_1 & Δq)	Chalk & Board	Deriving equations to understand selection against deleterious recessive and lethal recessive alleles
9	August 2 nd week	III	Selection against dominants	Allele frequency changes after one generation of selection against dominants (p_1 & Δp)	<i>Chalk & Board</i>	Deriving equations to understand selection against dominants: Understanding how selection against dominants is more effective than selection

10	August 3 rd week	III	Selection in favor of and against heterozygotes	Stable polymorphism in case of Over dominance, Eg: Sickle cell heterozygotes and falciparum malaria, unstable polymorphism in case of Under dominance, Eg: translocation heterozygotes, Erythroblastosis fetalis	Chalk & Board	against recessives Deriving equations for allele frequency changes due to Over dominance and Under dominance; Understanding stable and unstable polymorphism in case of Over dominance and Under dominance respectively
11	August 4 th week	III	Joint effects of Mutation and Selection; Selection at the phenotypic level	Allele frequency at Mutation-Selection equilibrium for recessive deleterious and dominant deleterious alleles; Directional, Stabilizing and Disruptive selection	Chalk & Board	Deriving equations for Mutation-Selection equilibrium gene frequencies; Understanding different types of selection at the phenotypic level
12	August 5 th week	IV	Polymorphism; Migration and Drift: Polymorphism	Mechanisms for maintenance of polymorphism-heterozygote advantage, selection in a variable environment (cyclic selection), mutation-selection equilibrium	Chalk & Board	Understanding the various mechanisms for maintenance of polymorphism at loci
13	September 1 st week	IV	Polymorphism	Mechanisms for maintenance of polymorphism: mutation-drift equilibrium, neutral alleles, frequency dependent selection	Chalk & Board/ICT	Understanding the various mechanisms for maintenance of polymorphism at loci
14	September 2 nd week	IV	Migration	Effect of migration on gene frequencies	Chalk & Board	Deriving equations to study the effect of migration on gene frequencies
15	September 3 rd week	IV	Genetic Drift	Effective population size, relation between sample size and effect of drift, variance (standard deviation) in gene frequencies due to drift	Chalk & Board	Understanding the effect of sampling variations on allele frequencies in populations
16	September 4 th week	IV	Founder effect and Bottle neck effect	Occurrence of rare genetic disorders in small, genetically isolated populations, Eg:	Chalk & Board	Assignment on examples of Founder and Bottleneck effect in real world

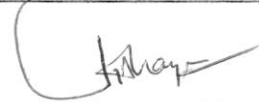
				Dunkers and Old Order Amish in Pennsylvania .US: Effect of drastic reduction in population size due to natural calamities or human destruction of habitat, Eg: African Cheetahs, Pinglelap Atoll population in Western Pacific ocean, Elephant Seals		populations
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Learning outcomes:

On completion of the course the students learn the role of micro-evolutionary forces in disturbing genetic equilibrium, thereby causing changes in genetic composition of populations, consequently leading to evolution; Application of Population Genetics to prevent genetic disorders in populations using disease incidence, carrier frequency etc in risk prediction as a part of genetic counseling.



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TEACHING PLAN: 2019-20

Program: BSc. (MbGC&BtGC)

Course Title: GT632: Inbreeding, Breeding techniques and Genome evolution

Name of the faculty: Dr B. Kalpana	Department: Genetics & Biotechnology	Year/Semester: III/VI	No. of classes per week: 3
<p>Learning objectives: To understand the effect of Inbreeding in a population, how inbreeding can increase the frequency of recessive genetic disorders, the application of Genetic principles in Plant and Animal breeding, the use of marker assisted selection (MAS) in plant breeding, importance of artificial selection in breeding programs, application of Molecular Phylogenetics, mechanisms driving genome evolution, concept of Molecular clock, UPGMA method for constructing phylogenetic trees from molecular data, Nei's standard genetic distance to assess evolutionary relationships between organisms.</p>			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 4 th week	I	Inbreeding and its effects: Types of Assortative mating	Positive and negative assortative mating, Inbreeding	Chalk & Board	Deriving the effect of inbreeding on gene and genotype frequencies mathematically in a tabular form.
2	December 1 st week	I	Inbreeding coefficient, genotype frequencies under inbreeding.	Path analysis, increase in homozygotes at the expense of heterozygotes	Chalk & Board	Drawing Arrow pedigrees to calculate inbreeding coefficient and deriving genotype frequencies under inbreeding.
3	December 2 nd week	I	Applications of inbreeding: Inbreeding depression	Increased frequency of recessive genetic disorders in a population; Manifestations and genetic basis of inbreeding depression	Chalk & Board	Solving problems related to inbreeding coefficient and genotype frequencies in case of first-cousin mating, uncle-niece mating etc.
4	December 3 rd week	I	Genetic load	Factors that contribute to genetic load	Chalk & Board	Understanding the types of genetic load and their implications in a population.
5	December 4 th week	II	Selection and breeding methods in Plants: selection methods in self-pollinated crops	Mass selection, Pureline selection, and Line breeding	Chalk & Board	Making flow charts for the different methods of selection in self-pollinated crops.
6	January 1 st week	II	Selection methods in cross-pollinated crops	Mass selection, Ear-to-row selection	Chalk & Board	Making flow charts for the different methods of selection in cross-pollinated crops.
7	January 2 nd week	II	Production of hybrids	Synthetic breeds, Composite breeds, Single cross hybrids, double-cross hybrids, Cytoplasmic Genetic	Chalk & Board	Understanding the steps in hybrid production and application of CGMS in hybrid production.

				Male Sterility (CGMS) systems in plants.		
8	January 3 rd week	II	Heterosis	Average heterosis, Heterobeltiosis, Economic heterosis, heterozygote advantage.	Chalk & Board	Understanding the genetic and physiological basis of heterosis.
9	January 4 th week	II	Marker Assisted Selection	Genetic markers, DNA markers- RFLPs, RAPDs, AFLPs, SSRs, and SNPs	Chalk & Board/ICT	Assignment on different types of DNA markers used in plant breeding.
10	January 5 th week	III	Selection and breeding methods in Animals: Inbreeding, Line breeding, Outcrossing and Cross breeding	Top-crossing, Grading – up, Two-breed, Three-breed, Criss-cross method of cross breeding, Synthetic breeds.	Chalk & Board	Drawing Raw pedigrees to understand Line breeding in animals.
11	February 1 st week	III	Artificial Selection- selection for a single quantitative trait.	Broad and narrow-sense heritability, Selection gain and Selection differential	Chalk & Board	Drawing and graphically understanding the response to selection in case of quantitative traits.
12	February 2 nd week	III	Genetic effects of selection, Correlated response to selection, Selection of individual animals	Positive or negative correlated response to selection, Probable breeding value (PBV).	Chalk & Board	Understanding the importance of PBV in selection of parents for breeding programs.
13	February 3 rd week	IV	Genome evolution and population variation: DNA and Protein sequence phylogenetics	Molecular clock, Unit Evolutionary Period (UEP)	Chalk & Board	Calculating UEP of Globin genes using the concept of Molecular clock and drawing an evolutionary tree of the Globin gene family.
14	February 4 th week	IV	Role of non-coding DNA and transposable elements in genome evolution, construction of evolutionary trees.	Unweighted Pair Group Method using Arithmetic Mean (UPGMA), Nei's standard genetic distance.	Chalk & Board	Constructing a rooted phylogenetic tree using the UPGMA method and deriving the Nei's standard genetic distance.
Learning outcomes: On completion of the course the students learn the applications of inbreeding coefficient, genetic basis of plant and animal breeding methods, and applications of Molecular Phylogenetics.						

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TEACHING PLAN: 2018-19 - 2019-'20

Program: BSc. (MbGC, BtGC&MBiC)

Course Title: SE332: Genetically Modified Crops

Name of the faculty: Dr B. Kalpana	Department: Genetics & Biotechnology	Year/Semester: II/III	No. of classes per week: 2
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Learning objectives: To understand and appreciate the basic steps in recombinant DNA technology, methods of gene transfer in plants, different strategies involved in the production of transgenic plants, importance of transgenic plants and ethical issues especially with reference to human health, effects on environment, impact on farmers and agricultural economy in countries like India where agriculture forms the backbone of the economy.

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 3 rd week	I	Basic concepts of genetic engineering	Restriction endonucleases, types of vectors, steps in gene cloning.	Chalk & Board	Understanding the methods and strategies used in recombinant DNA technology.
2	June 4 th week	I	Gene transfer methods- Agrobacterium mediated gene transfer	Ti plasmid based vectors- Co integrate vectors and Binary vectors	Powerpoint presentation	Appreciating the advantages of Agrobacterium as an efficient gene transfer vector.
3	July 1 st week	I	Vector less or direct DNA transfer	Physical gene transfer methods- Electroporation	Power point presentation	Understanding the different methods of direct DNA transfer
4	July 2 nd week	I	Physical gene transfer methods	Microprojectile or particle bombardment, Silicon carbide fibres, Macroinjection and Microinjection	Power point presentation	Understanding the different strategies used in physical gene transfer methods
5	July 3 rd week	I	Chemical gene transfer methods	PEG mediated gene transfer, Liposomes, Calcium phosphate coprecipitation method. DEAE Dextran method.	Power point presentation	Understanding the different strategies used in chemical gene transfer methods
6	July 4 th week	I	Transgenics in crop improvement- insect and virus resistance	Development of insect resistant transgenic plants using Bt toxin gene, virus resistant plants.	Power point presentation	Understanding the strategies involved in the development of insect and virus resistant plants.
7	August 1 st week	I	Resistance to abiotic stresses and Transgenics for quality	Resistance to abiotic stresses like oxidative stress and frost.	Chalk & Board	Understanding the strategies involved in development of

				Development of transgenic plants with improved quality like FlavrSavr tomatoes and Golden rice		transgenic plants resistant to abiotic stresses and transgenics with improved quality.
8	August 2 nd week	I	Ethics of transgenic plants	Socio economic implications of transgenic plants.	Chalk & Board	Understanding the pros and cons of transgenic crops
9	August 3 rd week	I	Transgenic crops in Indian agricultural scenario	Impact of transgenic plants on Indian agriculture and economy	Chalk & Board	Understanding the impact of transgenic crops on Indian agriculture and economy
10	August 4 th week	II	Project work assigned to students: 1.Cultivation, marketing and sales of genetically modified crops in India. 2. Awareness and problems of Indian farmers in the cultivation of GMO crops 3. The attitude and health concerns of consumers towards genetically modified foods. 4. List of genetically modified crops in the local area.			Compiling and analyzing information collected.
11	August 5 th week	II	Project work assigned to students: 1.Cultivation, marketing and sales of genetically modified crops in India. 2. Awareness and problems of Indian farmers in the cultivation of GMO crops 3. The attitude and health concerns of consumers towards genetically modified foods. 4. List of genetically modified crops in the local area.			Compiling and analyzing information collected.
12	September 1 st week	II	Project work assigned to students: 1.Cultivation, marketing and sales of genetically modified crops in India. 2. Awareness and problems of Indian farmers in the cultivation of GMO crops 3. The attitude and health concerns of consumers towards genetically modified foods. 4. List of genetically modified crops in the local area.			Compiling and analyzing information collected.
13	September 2 nd week	II	Project work assigned to students: 1.Cultivation, marketing and sales of genetically modified crops			Compiling and analyzing information collected.

			<p>in India.</p> <p>2. Awareness and problems of Indian farmers in the cultivation of GMO crops</p> <p>3. The attitude and health concerns of consumers towards genetically modified foods.</p> <p>4. List of genetically modified crops in the local area.</p>			
14	September 3 rd week		SEC internal exam	-----	-----	-----

Learning outcomes:

On completion of the course the students learn the different methods of gene transfer, strategies used in development of transgenic plants and the ethical issues concerned with transgenic crops.



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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-20
Program: BSc. (MbGC, BtGC, MBiC)
Course Title: SE632: Medicinal Plants

Name of the faculty: Dr B. Kalpana	Department: Genetics & Biotechnology	Year/Semester: III/VI	No. of classes per week: 2
Learning objectives: To understand the importance of plants in medicine, alternative systems of medicine such as Ayurveda and Siddha, to be aware of rhizome, bark, leaf, flower, fruit drugs. To learn medicinal properties of Cloves, Curcuma, Ginger, Senna and Cinnamon by powder & histochemical analysis, to enhance plant identification skills by Herbarium preparation.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 4th week	I	History and scope of Medicinal Botany with reference to Ayurveda and Siddha.	Basic concepts of Ayurveda and Siddha systems of medicine and advantages of alternative systems of medicine.	Chalk & Board	Understanding the basic principles of Ayurveda and Siddha systems of medicine.
2	December 1 st week	I	Sources, collection, contamination and preservation of drugs	Different sources of drugs such as sea, geographical source, cell & tissue culture as source, proper collection such as climatic factors, edaphic factors, cultivability, time and method of collection, contamination-unintentional and deliberate, different methods of preservation such as fumigation and cold storage.	Chalk & Board	Understanding the importance of different sources of drugs, proper methods of collection, preservation and reasons for adulteration of drugs.
3	December 2 nd week	I	Medicinal importance and identification of the following at the organoleptic level: Rhizome drugs: Ginger and Curcuma	Medicinal properties of rhizome drugs-Ginger and Curcuma. Histochemical and powder analysis of Ginger and Curcuma.	Laboratory work	Understanding the medicinal properties of Ginger and Curcuma by histochemical and powder analysis
4	December 3 rd week	I	Bark drugs: Cinchona and Cinnamon	Medicinal properties of bark drugs-Cinchona and Cinnamon. Histochemical and powder analysis of Cinnamon	Laboratory work	Understanding the medicinal properties of Cinchona & Cinnamon.

5	December 4 th week	I	Leaf drugs: Senna and Datura	Medicinal properties of leaf drugs like Senna and Datura. Histochemical and powder analysis of Senna.	Laboratory work	Understanding the medicinal properties of Senna and Datura.
6	January 1 st week	I	Flower drugs: Hibiscus Fruit drugs: Strychnos, Emblica	Medicinal properties of Hibiscus, Strychnos (Nux Vomica) and Emblica (Amla)	Chalk & Board	Understanding the medicinal importance of flower drugs like hibiscus and fruit drugs like Strychnos and Emblica
7	January 2 nd week	I	Medicinal principles and powder analysis of Cloves	Medicinal properties of Cloves. Histochemical and powder analysis of Cloves	Laboratory work	Understanding the medicinal properties of Cloves by histochemical and powder analysis
8	January 3 rd week	II	Herbarium preparation of medicinal plants	Herbarium preparation of commonly found medicinal plants in the neighbourhood: Hibiscus, Neem (Azadirachta), Tulsi (Oscimum), Vinca Rosea, Mint (Mentha)	Field work	Making herbarium of common medicinal plants found in the neighborhood
9	January 4 th week	II	Herbarium preparation of medicinal plants	Herbarium preparation of commonly found medicinal plants in the neighborhood: Hibiscus, Neem (Azadirachta), Tulsi (Oscimum), Vinca Rosea, Mint (Mentha)	Field work	Making herbarium of common medicinal plants found in the neighborhood
10	February 1 st week	III	Herbarium preparation of medicinal plants	Herbarium preparation of commonly found medicinal plants in the neighborhood: Hibiscus, Neem (Azadirachta), Tulsi (Oscimum), Vinca Rosea, Mint (Mentha)	Field work	Making herbarium of common medicinal plants found in the neighborhood
11	February 2 nd week	III	SEC internal examination	----	-----	-----
<p>Learning outcomes: On completion of the course the students learn the importance of medicinal plants and alternative systems of medicine. They are able to identify medicinally important plants by preparation of Herbarium. They learn the techniques involved in the histochemical and powder analysis of different crude drugs such as Cloves, Ginger, Turmeric, Cinnamon, & Senna.</p>						



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Bhavan's Vivekananda College
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2019-20

Program: MGC/BtGC: Gene Structure, Organization & Expression

Name of the faculty: Dr I Rachana Kumari	Department: Genetics & Biotechnology	Year/Semester:II/ III	No. of classes per week: 2
<p>Learning objectives: Appreciating the classical experiments like One gene- One enzyme hypothesis, deletion mapping etc. To give an insight into the protein synthesis mechanism in prokaryotes and eukaryotes. Learning the basic concepts in molecular biology helps the students to motivate towards research.</p>			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 2 nd week	III	Gene families, Histone genes		Chalk & Board	
2	3 rd week		Hemoglobin genes, Genome organisation	Mitochondrial & Chloroplast genomes	Chalk & Board	
3	4 th week		Compound eye locus	Lozenge&White eye locus	Chalk & Board	
4	July 1 st week		Cis-Trans test, Complementation	Significance of the test	Chalk & Board	
5	2 nd week		rII locus in T4 phages		Chalk & Board	Significance of plaque morphology
6	3 rd week		Deletion mapping, One gene one enzyme hypothesis	Tryptophan synthetase gene in neurospora	Chalk & Board	Exercises on deletion mapping
7	4 th week		Colinearity between gene & polypeptide	Intragenic / Intracodon mapping	Chalk & Board	
		IV	Gene Expression- Transcription in prokaryotes	Regulatory elements Steps involved	Chalk & Board	
8	August 2 nd week		Rho-dependent/ independent termination		Chalk & Board	
10	3 rd week		Transcription in eukaryotes		Youtube videos	
11	4 th week		RNA Processing	Methods of processing spliceosome	Chalk & Board	
12	5 th week		Reverse transcription		Chalk & Board	
13	September 1 st week		Translation	Steps involved in translations	Chalk & Board	

14	2 nd week		Steps in translation	Differences between eukaryote & prokaryotes	Youtube animation videos	
15	3 rd week		Genetic code	Properties of the code	Chalk & Board	
Learning outcomes: Students appreciate the discoveries related to the fine structure of the gene. They also learn the fundamental aspects of gene expression.						


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2019-20
Program: B Sc (BtGC/MbGC)
Course Title: Molecular Genetics

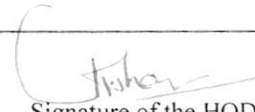
Name of the faculty: Dr I Rachana Kumari	Department: Genetics & Biotechnology	Year/Semester: II/ IV	No. of classes per week: 2
Learning objectives: To know the phenomenon of gene expression with reference to the regulation of genes in prokaryotes & eukaryotes. Introducing the students to the basics of Recombinant DNA technology.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 4th week	I	Basic concepts of Gene Regulation in prokaryotes	Inducible/ Repressible Negative//positive	Chalk & Board	Learning the concept of operons and types of regulation.
2	December 1 st week		Lactose & Tryptophan operon	Concept of operon	Chalk & Board	Lactose operon
3	2 nd week		Bacteriophage regulation, Lytic cycle & Lysogenic cycle	Concept of operon in phages	Chalk & Board	Insight into organization of phage genome
4	3 rd week		Gene Regulation in Eukaryotes	Regulatory elements of eukaryotes	Chalk & Board Powerpoint	Structure of DNA motifs and their role.
5	4 th week		-	-	-	-
6	January 1 st week		Gal locus regulation in yeast		Chalk & Board	
7	2 nd week		Mating type switch in yeast	Significance of enhancer	Chalk & Board	Life cycle of yeast.
8	3 rd week	II	Differential expression of hemoglobin, Development in Drosophila.	Study of genetic switch during embryogenesis.	Chalk & Board Powerpoint	The genes in a family switch on/off during the different stages of development.
9	4th week		-	-	-	
10	5 th week		Genetic Engineering	Basics of recombinant DNA	Chalk & Board	Exercises based on Restriction digestion
10	February 1 st week		Vectors	Introducing gene of interest	Chalk & Board	
11	2 nd week		Cloning strategies	Making rDNA molecules using different vectors.	Chalk & Board Powerpoint	Importance of transgenic plants & animals
12	3 rd week		Genomic & cDNA libraries	Uses of cloning	Chalk & Board Powerpoint	
13	4 th week		cDNA libraries		Chalk & Board	

Learning outcomes: At the end of the semester, students understand the response of genes to external stimuli. They also analyze the importance of rDNA technology and its applications in the development of transgenic animals & plants. An insight into the maintenance of genetic information in the form of libraries.



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2019-20

Program: B Sc -BtGC

Course Title: Advanced techniques in Genome analysis and Genetic Engineering

Name of the faculty: Dr I Rachana Kumari	Department: Genetics & Biotechnology	Year/Semester: III/ V	No. of classes per week: 3
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Learning objectives: To learn the various techniques involved in the genome analysis and Genetic engineering. This gives an overview on the theoretical aspects as well the practical perspective of the various techniques with the applications involved in the development of Transgenic plants and animals.

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 2 nd week	I	Biophysical techniques Chromatography	Overview on different techniques	Chalk and board	Paper chromatography of amino acids - experiment
2	3 rd week		Electrophoresis. PCR	Types of Electrophoresis	chalk and board	SDS-PAGE and AGE were conducted
3	4 th week		Types of PCR. Site-directed mutagenesis	Use in the study of point mutations	chalk and board	Induction of mutations
4	July 1 st week	II	Autoradiography Hybridisation techniques	Types of Hybridisation	Chalk and board	
5	2 nd week		FISH, DNA microarray, Sequencing	Types of sequencing	Chalk and board, Google classroom	Microarray used in disease detection through DNA chips
6	3 rd week		Monoclonal antibodies. Banding techniques	Hybridoma technology.	chalk and board, Powerpoint	Production of vaccines, Preparation of Karyotypes
7	4 th week		Flow Cytometry, DNA fingerprinting	Application in Forensic Science	Powerpoint, Google classroom	Medico-legal cases solving
		III	Physical methods of gene transfer	Cost effective methods	Chalk & board	
8	August 1 st week		Chemical methods, Vectors	Differentiating between plant and animal vectors	Chalk & board	Applications
9	2 nd week		Plant vectors - examples	Engineering vectors	Chalk & board	In vivo methods of gene transfer
10	3 rd week		Animal vectors		Chalk & board	
11	4 th week		Stem cells	Importance of stem cells in transgenics	Chalk & board, powerpoint	Ethical issues in using stem cells
12	5 th week		Engineering stem cells	Selection methods	Chalk & board	Strategy involved and its uses
		IV	Transgenic plants	Uses of transgenic plants – Insect resistant plants	Chalk & board, Google classroom	Engineering the genes
13	September 1 st week		Examples – Drought & Salt stress resistant plants	Methodology involved in the development	Chalk & board, powerpoint	
14	2 nd week		Nuclear cloning.	Creation of dolly	Chalk &	Discussion on Issues

			Transgenic cattle		Board Powerpoint	related to cloning
15	3 rd week		Transgenic Fish & Birds	Need to develop Transgenic fish & Birds	Chalk & Board, powerpoint	Uses of these animals for mankind
16	4 th week		Transgenic mice	Animal models	Chalk & Board	For the treatment of human diseases
Learning outcomes: The students learn various advanced techniques of genome analysis, strategies of gene transfer and development of transgenic organisms.						



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Bhavan's Vivekananda College
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2019-20

Program: B Sc (BtGC)

Course Title: Human Genetics & Biostatistics

Name of the faculty: Dr I Rachana Kumari	Department: Genetics & Biotechnology	Year/Semester: III/ VI	No. of classes per week: 3
Learning objectives: To understand core concepts of Human Genetics like risk prediction, genetic counseling, prenatal diagnosis, treatment of genetics diseases, gene therapy and genome projects, to apply principles of Biostatistics like probability, correlation & Regression for data Analysis.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 3 rd week	I	Single gene disorders	Examples of genetic diseases	Chalk & Board	Exercises on pedigree analysis-pattern of inheritance
2	4th week		Carrier detection	Methods involved	Chalk & Board	Exercises on pedigree analysis-Biochemical markers
3	December 1 st week		Risk calculation Empiric risk	Application of Probability	Chalk & Board Powerpoint	Exercises on pedigree analysis-risk assessment
4	2 nd week		Genetic counselling Prenatal diagnosis	Role of genetic counsellors in genetic clinics. Invasive & non invasive methods	Chalk & Board Powerpoint	Discussion on the need for genetic counsellors/prenatal diagnostic methods.
5	3 rd week		Treatment of genetic disorders	Strategies of treatment	Chalk & Board	
6	4th week		-	-	-	
7	January 1 st week	II	Strategies of gene therapy. vectors used in Gene Therapy	Examples of gene therapy trials	Powerpoint Chalk & Board	
8	2 nd week		Ethical issues of Gene Therapy	Necessity of societal implications on genetic alterations	Chalk & Board	Discussion on case studies
9	3 rd week		Human genome project Bioinformatics	Programs & tools in bioinformatics	Chalk & Board	
10	4th week	III	Humulin	Use of microorganisms in large scale production.	Powerpoint	Fermentation tanks-importance
11	5 th week		Phytase, and Subtilisin and Vaccines	Production of Commercial products - Microorganisms	Chalk & Board	
12	February 1 st week		Biofertilisers, Biopesticides, bioreactors & Xenobiotics	Uses of these in agriculture	Chalk & Board	
13	2 nd week	IV	Probability distributions, Random variable, Probability distributions	Applications of biostatistics in genetic studies.	Chalk & Board	
14	3 rd week		Test of hypothesis	Chi square test, independence test, t test	Chalk & Board	Problems on Chi square, t-test,
15	4 th week		- Normal deviate test,	z test , Curves	Chalk & Board	Exercises on Z test.
16	5 th week		Correlation & regression	Uses in Data analysis of genetic studies.	Chalk & Board	Problems on correlation & Regression

Learning outcomes: On completion of the course the students learn the applications of prenatal diagnosis, genetic counseling and statistical analysis in genetics



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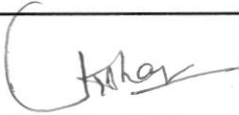
Program: B.Sc Course - BtGC/MbGC/MBiC
Course Title : SEC - Genetic Counseling
Academic Year - 2019-20

Name of the faculty: Dr I Rachana Kumari	Department: Genetics	Year/Semester: II/IV	No. of classes per week: 2
Learning objectives: Overview on genetic disorders and discuss the importance of Genetic counseling in our life. Knowledge of Prenatal diagnostic techniques and the role of molecular techniques in detection. Methods available in the treatment of genetic diseases.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November, 4 th Week	I	Basic Concepts of Genetic Counseling	Genetic disorders- types	Chalk & board	Identification of genetic disorders
2	December, 2 nd & 3 rd week		Steps in Genetic Counseling	Importance of Counselor	Chalk & Board	Examples of cases- Discussion
3	January, 1 st week		Carrier detection and risk prediction	Methods of Carrier detection	Chalk & Board	
4	January 2 nd week		Prenatal diagnosis	Types of techniques and the principle involved	Powerpoint, Chalk & Board	Relevance of techniques in our life.
5	January 3 rd week		Applications of Molecular Genetic techniques	Basic techniques of molecular biology	Chalk & Board	
6	February 1 st & 2 nd week		Treatment of Genetic disorders	Options available in treating genetic disorders	Chalk & Board	Discussion on treatment facilities in Hyderabad

Learning outcomes: Students learn the basics of human genetic disorders, the steps involved in genetic counselling prenatal diagnostic techniques and the treatment methods. Hands on training program is at the Institute of Genetics & Hospital for Genetic diseases, Osmania University, Begumpet, Hyderabad.


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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-20
Program: BSc. (Mb/Bt/G/C)
Course Title: GT132: Transmission Genetics

Name of the faculty: Dr Sushma Patkar	Department: Genetics & Biotechnology	Year/Semester: I/I	No. of classes per week: 2
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Learning objectives: To learn the basic concepts of Classical Genetics and cell division. To understand extensions to Mendelian Genetics, like codominance, incomplete dominance, epistasis etc. To develop an understanding of fundamentals of recombination and gene mapping. To help students to have a comprehensive understanding of Genetics so that they can appreciate the recent developments and trends in biological sciences.

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 4 th week	I	Mendelian Inheritance Mendel's experiments	Reason of success and comparison with predecessors	Chalk & Board	Understanding the importance of Mendel's experiment
2	July 1 st week	I	Monohybrid cross- Law of Segregation	Biological basis of Law and test cross ratio	Chalk & Board	Solve problem based on Law of segregation
3	July 2 nd week	I	Dihybrid cross- Law of Independent assortment	Biological basis of Law of independent assortment and test cross ratio	Chalk & Board	Solve problem based on Law of Independent Assortment
4	July 3 rd week	I	Trihybrid cross	Fork line method	Chalk & Board	Solve numerical problems on trihybrid cross.
5	July 4 th week	I	Mendelian Inheritance in Man	Pedigree and their significance	Chalk & Board	Solve numerical problems on pedigrees
6	July 5 th week	I	Autosomal recessive Inheritance	Human Autosomal recessive disorders	Chalk & Board	Understand molecular concepts of AR disorders
7	August 1 st week	I	Autosomal dominant Inheritance	Human Autosomal Dominant disorders	Chalk & Board	Understand molecular concepts of AD disorders
8	August 2 nd week	I	X linked Dominant and recessive inheritance	Human Sex linked disorders	Chalk & Board	Understand the molecular basis of x linked disorders
9	August 3 rd week	III	Extension to Mendelian Segregation pattern: Variation to dominance	Co dominance and Incomplete Dominance	Chalk & Board/ICT	Solve numerical problems on codominance and incomplete dominance
10	August 4 th week	III	Lethal genes and epistasis	Types of lethal genes	Chalk & Board /ICT	Solve numerical problems on lethal gene and epistasis
11	August	III	Lethal genes and epistasis	Types of lethal	Chalk & Board /	Solve numerical

	5 th week			genes	ICT	problems on lethal gene and epistasis
12	September 1 st week	III	Paramutation and segregation Distortion	Understand the genetic basis of paramutation	Chalk & Board/	Understand the basis of segregation distortion
13	September 2 nd week	III	Multiple Alleles	Multiple alleles in man, Drosophila,	Chalk & Board / ICT	Solve numerical problems on multiple alleles
14	September 3 rd week	III	ABO Blood groups	Genetic and biochemical basis of blood grouping intolerance	Chalk & Board/	Blood typing
15	September 4 th week	III	ABO Blood groups	Genetic and biochemical basis of blood grouping intolerance	Chalk & Board/	Blood typing

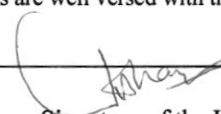
Learning outcomes:

Students learn the two basic laws of Genetics and their application to human pedigrees.. They understand the molecular mechanisms involved in cell cycle. They learn the extensions of Mendel's laws like epistasis and multiple alleles with examples. Students learn the basics of gene mapping and recombination.. The students are well versed with the fundamentals of Genetics.

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Bhavan's Vivekananda College
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TEACHING PLAN: 2019-20
Program: BSc. (Mb/Bt/G/C)
Course Title: GT232: Genetic Analysis

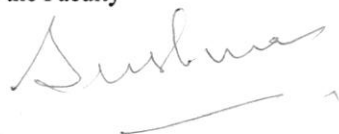
Name of the faculty: Dr Sushma Patkar	Department: Genetics & Biotechnology	Year/Semester: I/II	No. of classes per week: 2
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Learning objectives: To understand the significance of Cytogenetics in detecting chromosomal anomalies. Recombination and Gene mapping Procedures in Bacteria and Viruses.

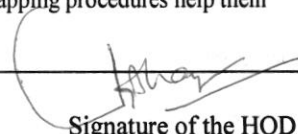
S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 4th week	I	Polygene and Multifactorial Inheritance Complex Loci Rh blood group system	Maternal fetal incompatibility and erythroblastosis fetalis	Chalk & Board	Understanding the complexity of Rh blood group system
2	November 5 th week	I	Histocompatibility loci.	MHC antigens Type I, II and III	Chalk & Board	Understanding the role of MHC in graft rejection
3	December 1 st week	I	Effect of temperature on gene expression; Phenocopies and twin studies	Infra and ultra bar eye in drosophila, Microcephaly, phocomelia, cleft lip and palate	Chalk & Board	Understanding the role of teratogens
4	December 2 nd week	I	Quantitative traits	Additive effect, kernel color, skin color, height and IQ in man	Chalk & Board	Solve numerical problems on mean, median mode, variance and standard deviation.
5	December 3 rd week	I	Quantitative traits	Additive effect, kernel color, skin color, height and IQ in man	Chalk & Board	Solve numerical problems on mean, median mode, variance and standard deviation
6	December 4 th week	I	Multifactorial Inheritance: Hypertension, diabetes mellitus	Diabetes mellitus type I and II	Chalk & Board	Understand multifactorial inheritance in hypertension and diabetes
7	January 1 st week	I	Multifactorial Inheritance: Hypertension, diabetes mellitus	Diabetes mellitus type I and II	Chalk & Board	Understand multifactorial inheritance in hypertension and diabetes
8	January 2 nd week	III	Genetics of sex determination and sex linked inheritance: primary and secondary determination	Chromosomal Sex determination	Chalk & Board	Understand the basic mechanism of sex determination
9	January 3 rd week	III	Mechanism of sex determination	Melandrium, man, Drosophila, Bonellia	Chalk & Board/ICT	Understand the various mechanisms of

						determination including environmental sex determination
10	January 4 th week	III	Mechanism of sex determination	Melandrium, man, Drosophila, Bonellia	Chalk & Board /ICT	Understand the various mechanisms of determination including environmental sex determination
11	January 5 th week	III	Mechanism of sex determination	Melandrium, man, Drosophila, Bonellia	Chalk & Board /ICT	Understand the various mechanisms of determination including environmental sex determination
12	February 1 st week	III	Sex linked inheritance	Color blindness, Hemophilia, DMD, Vitamin D resistant rickets	Chalk & Board	Understanding the inheritance of X linked diseases
13	February 2 nd week	III	Sex chromatin and X inactivation	Inactivation center, dosage compensation	Chalk & Board/	Understanding the molecular mechanism of X inactivation and screening for Barr bodies
14	February 3 rd week	III	Gynandromorphs, Y linked inheritance	Holandric genes, SRY gene	Chalk & Board	Understanding the Y linked inheritance and role of SRY region
15	February 4 th week	III	Partial sex linkage and sex limited and sex influenced traits	Bobbed bristles, PAR region in man	Chalk & Board	Understanding partial sex linkage and sex limited and sex influenced traits
Learning outcomes: On completion of the course the students will get an in-depth view of the structure of the chromosome and chromosomal aberrations leading to various disorders. Recombination and gene mapping procedures help them understand the underlying principles of Genetic Analysis.						

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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-20
Program: BSc. (MbGC)

Course Title: GT532A: Advanced Techniques in Genome analysis and Genetic Engineering

Name of the faculty: Dr Sushma Patkar	Department: Genetics & Biotechnology	Year/Semester: III/ V	No. of classes per week: 3
Learning objectives: Cob1: To examine biophysical techniques such as electrophoresis, hybridization, PCR etc. Cob2: To discuss advanced genome analysis techniques like NGS and DNA Microarray. Cob3: To describe gene transfer strategies for the development of Genetically Modified Organisms. Cob4: To report the uses of transgenic plants and animals.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 2 nd week	I	Biophysical techniques: Chromatography	Types of chromatography, affinity etc	Chalk & Board/	Identification of unknown amino acid using paper chromatography
2	June 3 rd week	I	Chromatography	Types of chromatography, affinity etc	Chalk & Board/	Identification of unknown amino acid using paper chromatography
3	June 4 th week	I	Separation of amino acids and nucleic acids	AGE & PAGE	Chalk & Board/	Separation of Proteins and DNA using AGE and PAGE
4	July 1 st week	I	PCR and its applications	Types of PCR, RT PCR anchored etc	Chalk & Board/ICT	Assignment
5	July 2 nd week	I & II	Autoradiography Advanced Techniques in Genome Analysis: Hybridization techniques	Southern, Northern & Western Blotting	Chalk & Board/ICT	Assignment
6	July 3 rd week	II	DNA microarray, FISH, DNA sequencing	NGS	Chalk & Board /ICT	Understand the different sequencing methods
7	July 4 th week	II	Monoclonal Antibodies, chromosome banding	Types of banding	Chalk & Board	G Banding Karyotyping
8	August 1 st week	III	Strategies of Gene transfer: Physical and chemical methods of gene transfer, plant vectors, Ti plasmid	Gene Gun, Liposome method, significance of Agrobacterium	Chalk & Board	Assignment
9	August 2 nd week	III	Plant and animal vectors	CaMV, Gemini BPV and SV40	Chalk & Board	Understand the modifications of genomic DNA to create vector
10	August 3 rd week	III	Engineered embryonic stem cell method	Positive negative selection and PCR method	Chalk & Board	Understand selection methods in Engineered embryonic stem cell

11	August 4th week	IV	Genetic Engineering of plants and animals: Transgenic plants	Need for developing Transgenic plant	Chalk & Board	Understand the molecular mechanism for development of transgenic plants
12	September 1st week	IV	Insect and Herbicide resistant plants, stress tolerant plants	Role of transgenic plants	Chalk & Board	Understand the molecular mechanism for development of transgenic plants
13	September 2nd week	IV	Transgenic animals and Nuclear cloning	Need for developing transgenic animals	Chalk & Board	Understand the significance of nuclear cloning
14	September 3rd week	IV	Transgenic cattle, fish and mice	Methods used for creation of transgenic animals	Chalk & Board	Understand the molecular mechanism for development of transgenic animals
15	September 4th week	IV	Transgenic mice models	Mice models for various human diseases	Chalk & Board	Understand the need for developing mice models

Learning outcomes:

CO1: To value biophysical techniques such as electrophoresis, Hybridization techniques, PCR etc.

CO2: To appreciate advanced genome analysis techniques like NGS and DNA Microarray.

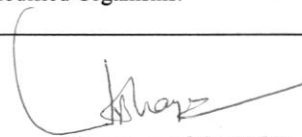
CO3: To differentiate gene transfer strategies for the development of Genetically Modified Organisms.

CO4: To appraise the uses of transgenic plants and animals.

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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-20
Program: BSc. (MbGC)
Course Title: GT632A: Human Genetics & Biostatistics

Name of the faculty: Dr Sushma Patkar	Department: Genetics & Biotechnology	Year/Semester: III/ VI	No. of classes per week: 3
Learning objectives: To understand core concepts of Human Genetics like risk prediction, genetic counseling, prenatal diagnosis, treatment of genetics diseases, gene therapy and genome projects, to apply principles of Biostatistics like probability, correlation & Regression for data Analysis.			

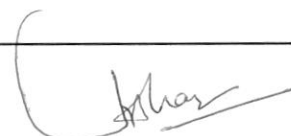
S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 3 rd week	I	Management of Inherited Human Diseases: Types of Genetic disorders	Single gene, Chromosomal and multi factorial disorders	Chalk & Board/	Understanding the different types of genetic disorders
2	November 4 th week	I	Identification of Carriers	Biochemical and DNA Marker analysis	Chalk & Board/	
3	December 1 st week	I	Risk Estimation and Genetic Counselling	Bayesian Analysis	Chalk & Board/	Solving problems on Genetic Counseling
4	December 2 nd week	I	Prenatal Diagnosis and treatment of genetic Disorders	Invasive and non Invasive Techniques	Chalk & Board/ICT	Assignment
5	December 3 rd week	II	Gene therapy, Genome projects and Bioinformatics: Gene therapy	Somatic and Germline gene therapy	Chalk & Board/ICT	Student seminar
6	December 4 th week	II	Gene therapy	Ex vivo/In vivo gene therapy	Chalk & Board /ICT	Student seminar
7	January 1 st week	II	Vectors in gene therapy	Adeno viruses and Retro viruses	Chalk & Board	Student seminar
8	January 2 nd week	II	Gene therapy trials and ethical issues	ADA, Cystic Fibrosis, Hypercholesterolemia and cancer	Chalk & Board	Student seminar
9	January 3 rd week	II	Human Genome project and Bioinformatics	Achievements and ethical issues of HGP; applications of Bioinformatics	Chalk & Board	Student seminar
10	January 4 th week	III	Genetic Engineering and Industrial Products: Humulin and Vaccines	Types of DNA Vaccines	Chalk & Board	Student seminar
11	January 5 th week	III	Vaccines		Chalk & Board	Student seminar

12	February 1 st week	III	Commercial Enzymes and Bioreactors	Subtilisin and Phytase, Types of bioreactors	Chalk & Board	Student seminar
13	February 2 nd week	III	Biopesticides and biofertilizers	Role of Biopesticides and comparison with chemical pesticides	Chalk & Board	Student seminar
14	February 3 rd week	III & IV	Bio remediation, theory of probability	Gene manipulation in bioremediation; probability laws and distributions	Chalk & Board	understand bioremediation using microorganisms
15	February 4 th week	IV	Sampling, Test of hypothesis, chi-square, correlation and regression.	Test of significance, t test, Z test	Chalk & Board	Solving Problems on Chi square test, t test, z test, correlation and regression
16	March 1 st Week	IV	Correlation and Regression.	types of correlation	Chalk & Board	Solving problems on correlation and regression
Learning outcomes: On completion of the course the students learn the applications of prenatal diagnosis, genetic counseling and statistical analysis in genetics.						

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 Bhavan's Vivekananda College
 of Science, Humanities and Commerce
 Autonomous – Affiliated to Osmania University
 TEACHING PLAN: 2019-20
 Program: GE offered to BCom and BBA
 Course Title: GE632: Wine Making

Name of the faculty: Dr Sushma Patkar	Department: Genetics & Biotechnology	Year/Semester: III/ VI	No. of classes per week: 2
Learning objectives: The students get to know the basics of wine education; they learn that wine production can be done from any edible plant substrate not just grapes. The students get an insight into the process of wine making and benefits of moderate wine consumption on health			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
2	November 4 th week	I	History of wine making	Historical perspective	Chalk & Board/	Assignment
3	December 1 st week	I	Wine- making: definition, Principle and terminologies.	Amphora, Principle of wine making	Chalk & Board/	Assignment
4	December 2 nd week	I	Wine- making: definition, Principle and terminologies.	Amphora, Principle of wine making	Chalk & Board/ICT	Assignment
5	December 3 rd week	I	Flow chart on wine production.	Different stages of wine preparation	Chalk & Board/ICT	Wine making practical
6	December 4 th week	II	Preparation of wine from grapes	Preparation of red wine	Chalk & Board /ICT	Wine making practical
7	January 1 st week	II	Preparation of wine from rice		Chalk & Board	Wine making practical
8	January 2 nd week	II	Preparation of wine from Oranges		Chalk & Board	Wine making practical
9	January 3 rd week	II	Wine as an alcoholic Drink	Justify the role of wine in various cuisines and benefits	Chalk & Board	Assignment
10	January 4 th week	I	Sensory evaluation of wine	Parameters for wine tasting	Chalk & Board	Wine tasting
11	January 5 th week	I	Comparison of wine with other beverages	Compare with drinks like vodka, whisky etc.	Chalk & Board	Student seminar
12	February 1 st week	I	Comparison of wine with other beverages	Compare with drinks like vodka, whisky etc.	Chalk & Board	Student seminar
13	February 2 nd week	I	Wine and health.	Benefits on moderate consumption	Chalk & Board	Understand the need of moderate consumption of wine
14	February 3 rd week	I	Wine and health.	Benefits on moderate consumption	Chalk & Board	Understand the need of moderate consumption of wine
15	February 4 th week	I	Internal Assessment	Internal Assessment	Chalk & Board	

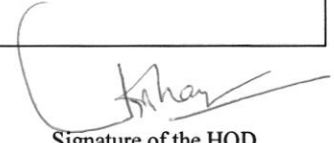
Learning outcomes:

Students learn the basic method of wine preparation.. They learn the difference between wine and other alcoholic beverages
They learn to identify and taste the different kinds of wine. The present Generic elective encourages them to be entrepreneurs

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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-20
Program: BSc. (BtGC)
Course Title: BT133: Cell Biology and Genetics

Name of the faculty: Dr S. Nagamanju	Department: Genetics & Biotechnology	Year/Semester: I/I	No. of classes per week: 4
Learning objectives: To make students aware of the various cell culturing methods both animal cells and plant cells. Introduce them to various types of media formulations and role of hormones. Teach about applications of animal biotechnology in IVF, gene therapy. Students are exposed to plant tissue culture methods			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 4 th week	I	Structure, function of cells, Viral, Bacterial cell	Identification of different types of cells	Chalk & Board, Chart	Students made relevant charts to understand the prokaryotic cell
2	July 1 st week	I	Eukaryotic cell Plant and Animal cell in detail	Microscopic observation of various eukaryotic cells	Chalk & Board ICT	Students observed cells of different types of prokaryotic and eukaryotic cells under microscope.
3	July 2 nd week	I	Mitochondria and chloroplast	Energy transducing organelles of the cell were understood by students.	Chalk & Board.	They wrote an assignment the ultra structure of both Eukaryotic and Prokaryotic cell highlighting on the differences between both Plant and Animal cell.
4	July 3 rd week	II	Genome compaction Prokaryotic and Eukaryotic Heterochromatin and Euchromatin and Heterochromatin Mitosis cell division		Chalk & Board	Students understood the role of histone and histone like proteins in the compaction of genome. They understood the importance of mitosis.
5	July 4 th week	II	Meiosis Synaptonemal complex and Kinetochore Cell cycle, regulation, role of cyclins and CDK's in cell cycle regulation	Highlighted on the role of the kinetochore and synaptonemal complex in cell division.	Chalk & Board	Students carried out mitosis experiments in garlic root tips to observedifferent phases of mitosis under microscope
6	July 5 th week	II	Cell death Necrosis, Apoptosis and Senescence	Emphasized on the differences between Necrosis and Apoptosis	Chalk & Board	Students understood the different pathways leading to cell death.
7	August 1 st week	III	Mendelian genetics Mono, di and trihybrid crosses and ratios	Solved problems on mono and dihybrid crosses	Chalk & Board	students were made to appreciate Importance genes and their alleles in inheritance.

8	August 2 nd week	III	Incomplete dominance and co-dominance including Pleiotropism, Penetrance and expressivity.	Students solved problems on test cross and backcross	Chalk & Board	Understood the difference between different types of gene and allele interactions..
9	August 3 rd week	III	Epistasis Dominant, Recessive, duplicate dominant and duplicate recessive	Students solved problems on different types of epistatic gene interactions	Chalk & Board	Students could differentiate between different types of epistatic gene interactions
10	August 4 th week	III	Genes and environment PKU, Microcephaly, and Pattern baldness		Chalk & Board	Acquired a sound knowledge on the role of environment on the expression of genes resulting in different phenotypes.
11	September 1 st week	IV	Linkage discovery.	Types of linkage cis and trans linkage were highlighted	Chalk & Board	Students understood the cytological proof for crossingover.
12	September 2 nd week	IV	Recombination frequency and map-distance		Chalk & Board	Students were made aware of the importance of recombination frequency.
13	September 3 rd week	IV	Two point and three point test cross, Interference and coincidence	Students learnt to solve problems on linkage including two point and three point test cross.	Chalk & Board	students appreciated the importance of linkage.
14	September 4 th week	IV	Sex determination Bonelia, Humans, Birds and drosophila	Importance of chromosomal theory of sex determination	Chalk & Board	Students appreciated the role of sex chromosomes in the determination of sex in humans and birds.
15	October 1 st week	IV	X-linked inheritance Hemophilia and color blindness		Chalk & Board	Students understood the pedigree in the transfer of x linked disorders across the generations.
<p>Learning outcomes: On completion of the course the students will get an in-depth knowledge on different types of cells, their structure and function including the role of different cell organelles in making the cell the structural and functional unit of life. They also appreciate mechanism involving the compaction of cell genome and cell division. Students will also excel in understanding the basic concepts of genetics and also gain knowledge on the role of linkage in recombination frequency. They even appreciate the role of autosomes and sex chromosomes in the determination of sex of organisms. They also understood the role of x-linked disorders in the inheritance of hemophilia and colorblindness.</p>						

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TEACHING PLAN: 2019-20

Program: BSc. (BtGC)

Course Title: BT233: Nucleic acids, Cell culture and Bioinformatics

Name of the faculty: Dr S. Nagamanju	Department: Genetics & Biotechnology	Year/Semester: I/II	No. of classes per week: 4
Learning objectives: To understand the significance of Genetic material, its structure and duplication of DNA through replication in prokaryotes and eukaryotes. Understand the importance of Animal cell culturing and bioinformatics in biotechnology.			


S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 3 rd week	I	Structure, function of nucleic acids Griffith's experiment	Time line in recognition of genetic material	Chalk & Board	Understanding the importance of genetic material in transformation of organisms.
2	November 4 th week	I	DNA as genetic material DNA structure, Chargaff's rules		Chalk & Board	Understanding DNA as genetic material, and its chemical composition.
3	December 1 st week	I	X-ray diffraction of Rosalind, Watson and Crick model of DNA Different forms of DNA, A, B & Z forms Super Coiled DNA	Chart paper model of Watson and Crick model of DNA. Assignment on different forms of DNA	Chalk & Board	Understanding the significance of Rosalind X-ray diffraction and structure of DNA by Watson and Crick.
4	December 2 nd week	I	Structures of hnRNA, rRNA, tRNA, mRNA and rRNA Functions of different types of RNA	Highlighted on the arrangement of arms of tRNA in recognition of ribosome, amino acid and codon on mRNA	Chalk & Board	Appreciating the structure of different RNA's
5	December 3 rd week	II	Prokaryotic replication Initiation, elongation and termination. Enzymes involved. Eukaryotic replication	Highlighted on the importance of different steps involved in the process of replication.	Chalk & Board	Understand the process of prokaryotic replication and the role of enzymes in the process.
6	December 4 th week	II	Eukaryotic replication initiation and elongation	Importance of enzymes involved	Chalk & Board	Understand the whole process of eukaryotic replication process.
7	January 1 st week	II	Termination of Eukaryotic replication process. Theta and rolling circle mode of replication.	Mechanism of replication in circular DNA	Chalk & Board	Understand the mechanism of replication in circular DNA
8	January 2 nd week	II/III	Different replication enzymes like Polymerases, Helicases,	Understanding the role of	Chalk & Board PPT	Appreciate the role of different

			Topoisomerases, Ligases and SSBS. Principles of animal cell culture including monolayer cell cultures.	different enzymes. Understand the basic requirements for cell culture process.		enzymes in the process of replication.
9	January 3 rd week	III	Animal Cell culture vessels, Monolayer and suspension cell culture vessels.	Highlight on the requirement of different types of culture vessels	Chalk & Board/PPT	Understand the significance of culture vessels.
10	January 4 th week	III	Animal cell culture medium	Importance of medium for cell to establish invitro	Chalk & Board	Understand the role of serum
11	January 5 th week	III	Natural and Artificial animal cell culture medium Disaggregation of tissue by mechanical method and enzymatic method	Role of enzymes like collagenase and trypsin in tissue disaggregation.	Chalk & Board PPT on Departmental system .	Understanding the role of different enzymes to disassociate cells from tissue.
12	February 1 st week	III	Establishment of cell cultures, cell lines and their cryopreservation.	Highlight on the requirement for cryopreservation of cell culture	Chalk & Board	Understand different types of cell lines and their cryopreservation.
13	February 2 nd week	IV	Bioinformatics, types of biological databases.	Nucleotide databases like GenBank, EMBL and DDBJ.	Chalk & Board	Understanding different types of nucleotide databases.
14	February 3 rd week	IV	Protein data bases like PDB, SwissProt, UniProt. Data Submission and Retrieval like entrez and BLAST.	Highlight on the role of data retrieval tools.	Chalk & Board ICT	Understanding the presence of different protein databases and data retrieval tools.
15	February 4 th week	IV	Local and Global alignment of sequences, Pairwise sequence alignment	Understand the Alignment of different types of sequences.	Chalk & Board ICT	Understanding the alignment of a pair of protein and nucleotide sequences
16	March 1 st week	IV	Multiple sequence alignment	Alignment of sequences.	Chalk & Board ICT	Understanding the alignment of more than two sequences of protein and nucleotide.

Learning outcomes:

On completion of the course the students will get an in-depth knowledge on Genetic material its structure and replication including the role of different enzymes in its structural stability, and duplication by replication. Understanding of Animal cell cultures and bioinformatics makes the students appreciate the role of these subjects in present day research.


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Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-20
Program: BSc. (BtGC)
Course Title: BT533A: Animal and Plant Biotechnology

Name of the faculty: Dr S. Nagamanju	Department: Genetics & Biotechnology	Year/Semester: III/V	No. of classes per week: 3
<p>Learning objectives: To understand the significance of Cell culturing along with various vessels and media used for culturing both animal and plants cells along with their significance in basic and applied research. Understand the importance of stem cells IVF and Gene therapy. Students learnt about plant tissue culture and do callus and shoot induction in the laboratory. They get exposed to the use of plant hormones in callus and shoot induction.</p>			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1.	June 2 nd week	I	Principles of Animal cell culturing		Chalk & Board, Chart	Students understood he kinetics and cell surface markers in the culturing of cells.
2.	June 3 rd week	I	Animal cell culture vessels.	Laboratory setup essential for the culturing of cells under highly sophisticated atmosphere.	Chalk & Board, ICT	Students understood about different types of vessels for culturing different types of cells.
1	June 4 th week	I	Animal cell culture media and explant dis aggregation.	Identification of different types of cell culture media	Chalk & Board, Chart	Students understand the importance of cell culture.
2	July 1 st week	I/ II	Culture establishment, cell lines Stem cells and their applications	Students appreciated the various applications of stem cells.	Chalk & Board ICT	Students wrote an assignment on establishment and types of cell lines
3	July 2 nd week	II	IVF and Embryo transfer technology	Importance of Invitro fertilization in treatment of couples facing fertility issues	Chalk & Board.	Students understood the importance of embryo transfer technology in obtaining a high yielding variety of cattle
4	July 3 rd week	II	Method of Gene transfer and transgenic animals	Various trans genic animals raised and their applications	Chalk & Board ICT	Students understood the role of various gene transfer techniques employed to get trans genic animals.
5	July 4 th week	II	Molecular pharming In-vivo and Ex-vivo Gene therapy	Highlighted on the role of the gene therapy in solving medical alignments	Chalk & Board	Students understood the role of gene therapy and the importance of transgenic animal in molecular pharming
6	July 5 th week	III	Principles of plant cell culture Plant cell culture media	Emphasized on the importance of plant cell culturing.	Chalk & Board ICT	Students appreciated significance of sterilization in invitro culturing of cells

7	August 1 st week	III	Plant cell culture media Plant growth regulators sterilization	Emphasized on methods of sterilization including autoclaving, and fumigation of laboratory	Chalk & Board ICT	Students understood role of plant growth regulators in plant tissue culturing and prepared plant tissue culture media MS media..
8	August 2 nd week	III	Callus induction and Organogenesis	Students understood the importance of NAA, BAP, IAA, 2-4D, kinetin and Zeatin hormones	Chalk & Board ICT	Students conducted callus induction and shoot induction in the laboratory.
9	August 3 rd week	III	Embryogenesis	Students appreciated the induction of embryogenesis in somatic tissues.	Chalk & Board	Students encapsulated seed embryos to understand the preparation of synthetic seeds.
10	August 4 th week	III	Meristem culture	Applications of meristem culture	Chalk & Board ICT	Acquired a sound knowledge on the importance of meristem culture.
11	September 1 st week	Iii	Virus free plants Mass cultivation of plant cells.	Various virus free plants obtained through meristem culture	Chalk & Board	Students understood the various bioreactors employed for the mass cultivation of plant cells.
12	September 2 nd week	IV	Commercial production of Shikonin, Capsaicin and Saffron		Chalk & Board	Students were made aware of the various cell products in cell cultures.
13	September 3 rd week	IV	Ti plasmid and gene gun rDNA technique	Students learnt to about the various applications of rDNA technology.	Chalk & Board	students appreciated the importance of gene gun and Ti plasmid in the transfer of transgene in the production o
14	September 4 th week	IV	Transgenic plants		Chalk & Board	Students appreciated the importance of transgenic plants
15	October 1 st week	IV	Production of therapeutic proteins		Chalk & Board	Students were made aware of the various therapeutic proteins from transgenic plants.

Learning outcomes:

On completion of the course the students will get an in-depth knowledge on different types of cell culturing methods including the various media formulated to culture animal and plant cells. They will gain knowledge in obtaining cells from tissues for culturing analyzing them for viability and using them for various basic and applied research. Students will also excel in plant tissue culture like callus induction and shoot induction. They even appreciate the role of different gene trans methods employed to raise transgenic animals and plants.



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TEACHING PLAN: 2019-20

Program: BSc. (BtGC)

Course Title: **BT 633A: Industrial and Environmental biotechnology**

Name of the faculty: Dr S Nagamanju	Department: Genetics & Biotechnology	Year/Semester: III/VI	No. of classes per week: 3
Learning objectives: To understand core concepts fermentation technology and the various products of fermentation. Introduce to students to the importance of nanotechnology in present day science and medicine. Bring awareness among students on environment, energy recourses and bioremediation along with phyto-remediation			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November 4 th week	I	Bioreactors and fermentation technology: Design of the fermentor		Chalk & Board/	Knowledge on the basic design of a fermentator
2	December 1 st week	I	Types of fermentors CSTR, Airlift and packed bed bioreactors. Surface and submerged fermentation.		Chalk & Board/	Concepts on fermentation along with the types of fermentors and types of fermentation processes.
3	December 2 nd week	I	Industrially important organisms Strain improvement	Student involvement the preparation of wine from fresh fruits like grapes and tomatoes	Chalk & Board/	Significance of improving the industrially important microbe fermentator compatible
4	December 3 rd week	I & II	Mutant Selection Primary and secondary metabolites Fermentation technology fermentation technology	biotechnology	Chalk & Board	Highlighted to students the different products obtained from microbes
5	December 4 th week	II	Microbial enzymes and antibiotic production	Isolation of microbes from industrial effluents	Chalk & Board	Significance of the importance of microbial enzymes and antibiotics.
6	January 1 st week	II	Fermented foods,		Chalk & Board	A very clear understanding on the role of microbes in fermentation of food
7	January 2 nd week	II	Fermented foods like bread and Cheese Animal cells as bioreactors for production of hGH and interferons		Chalk & Board	Role of Animal cells for the production of eukaryotic proteins
8	January 4 th week	II	GMP, Bio-safety, Bioethics IPR and Patenting	Assignment on biotechnology products patented by India	Chalk & Board	Significance on Intellectual property rights and GMPs for patenting

						Bio-safety measures for safe lab practice.
9	January 5 th week	III	Energy resources and Nanotechnology Renewable and non-renewable energy resources Conventional and non-conventional fuels		Chalk & Board	Understood the importance of conserving the non-renewable energy resources. Importance of ethanol as a substitute for fossil fuels
10	February 1 st week	III	Bio-ethanol and biogas production Nanotechnology and Nanotechnology applications in medicine		Chalk & Board	Students were made to understand and appreciate the significance of nano sized particles nanotechnology.
11	February 2 nd week	IV	Microbial analysis and bioremediation microbiology of milk, food and water	Use of various types of waste biomass for bio-fuels production using microbes	Chalk & Board	Role of microbes in Spoilage of food.
12	February 3 rd week	IV	Microbial Ore leaching Microbial degradation of pesticides and Xenobiotics	Laboratory production of biogas	Chalk & Board	Significance of microbes in low grade ore recovery was introduced to students
13	February 4 th week	III	Bio-fertilizers. Extraction of copper and Pesticide degradation	Information on various nano products available in market in use.	Chalk & Board	Importance of Bio-pesticides and Bio-fertilizers was made clear for students to appreciate the use of them in future
14	March 1 st Week	IV	Phyto-remediation	History of phyto-remediation	Chalk & Board	Role of plants in bringing bioremediation was appreciated by students
<p>Learning outcomes: On completion of the course the students learned to appreciate the importance of microbes in industry for the production of various metabolites. Students even understand the significance of nanotechnology in medicine. Importance of bioremediation and use of Bio-fuels and Bio-pesticides and Bio-fertilizers.</p>						

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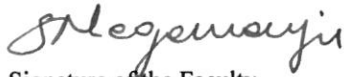
Bhavan's Vivekananda College
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TEACHING PLAN: 2019-20
Program: BSc. BtGC/ MGC/ MBiC
Course Title: SE333: Integrated Pest Management

Name of the faculty: Dr S. Nagamanju	Department: Genetics & Biotechnology	Year/Semester: II/III	No. of classes per week: 2
Learning objectives: To make students aware of the various types of pest present which belong to various taxa, emphasizing on the reasons for pest outbreak and measures to control by adopting environmental friendly IPM Strategies.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 3rd week	I	Basic concept of Pest	Students got an idea of the concept of pest	Chalk & Board, Chart	Students were made aware of various types of pest
2.	June 4 th week	I	Insect Pests	Students observed various insects present in the college campus		Students were sent on a short survey in the college campus to take the pictures of insects
3	July 1 st week	I	IPM Concepts		Chalk & Board ICT	Students made a scrap books of the various insects they came across in their daily lives.
4	July 4 th week	I	How IPM works	Emphasized on functioning of IPM	Chalk & Board	Understood the different methods adopted by IPM
5	August 2nd week	I	IPM Principles	Emphasis was made on the eco-friendly strategies of IPM		
6	August 4 th week	I	Principles of IPM	Students were shown videos scouting	Chalk & Board ICT	Students carried out a survey of the college campus for insects
7	September 1 st week	I/II	Components of IPM	Made aware of the various components that make IPM	Chalk & Board	Students wrote an assignment on success stories of IPM
8	September 2 nd week	II	Field Scouting		Chalk & Board	Students were asked to go through the campus to look for insects

Learning outcomes:

On completion of the course the students will get an in-depth knowledge on different types of pests that cause damage to the agricultural yield and also to the mankind by spoiling various important items of highest significance in day to day life. They will understand the functioning of IPM in controlling the pest by not causing any damage to the surrounding environment as it adopts various methods to control the pest and not just rely on the use of harmful chemical pesticides



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Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-20
Program: BSc. BtGC/ MGC/ MBiC
Course Title: SE433: Bioinformatics


Name of the faculty: Dr S Nagamanju	Department: Genetics & Biotechnology	Year/Semester: II/IV	No. of classes per week: 2
Learning objectives: To understand core concepts use of the information technology in understanding the interpretation of results in biological research and make the data available universally to every research scholar on the same platform of information technology.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	December 2 nd week	I	Bioinformatics introduction	Student learnt the role of computers to analyze biological research	Chalk & Board/	Significance of information technology in biological research was highly acknowledged by students.
2	December 3 rd week	I	Role of internet in Bioinformatics	Computational biology	Chalk & Board	Highlighted to students the different programs that make computers accessible to analyze biological data
3	January 1 st week	I	Abbreviations and definitions		Chalk & Board	A preliminary understanding Bioinformatics
4	January 2 nd week	I	Applications of Bioinformatics and various biological databases.	Understanding of the concept of storage of large amount to f biological data	Chalk & Board ICT	Role of computers in organizing the biological data
5	January 3 rd week	I	Types of Biological databases	Various nucleotide and protein databases	Chalk & Board	Significance on Intellectual property rights and GMPs for patenting Biosafety measures for safe lab practice.
6	January 5 th week	I	GenBank, EMBL and DDBJ	Analyzed the Nucleotide databases	Chalk & Board	Understood the functioning of the three very important nucleotide databases.
7	February 1 st week	I/II	PIR,PDB, Swiss-Prot, Uni-Prot	Understood the Protein databases	Chalk & Board	Student were made to use the databases in the computer lab sessions
8	February 2 nd week	I/II	ENTREZ,BLAST Program	Use of data retrieval tools to analyze the data	Chalk & Board	Role of Blast and Entrez Students were given accession no o retrieve data and analyze the data using various programs of blast.

Learning outcomes:

On completion of the course the students learned to analyze the research data generated and use various tools to retrieve data from the various databases available online and do homology research. They will try doing small data retrieval project using the accessions numbers give to them as a part od an assignment.


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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
TEACHING PLAN: 2019-20
Program: BSc. (Bt/G/C) MGC
Course Title: SE533 : Plant Tissue Culture

Name of the faculty: Dr S. Nagamanju	Department: Genetics & Biotechnology	Year/Semester: III/ V	No. of classes per week: 2
Learning objectives: To understand the significance of Micro propagation to achieve more number of plants in a very short period of time by employing the technique of tissue culture which otherwise is not possible by following simple plant breeding techniques.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 4 th week	I	Plant Tissue culture Introduction		Chalk & Board, ICT	Students were introduced to the concepts of Plant tissue culture
2	July 1 st week	I	Cell tissue culture techniques	Students understood how cells tissues are cultured in lab	Chalk & Board ICT	Students appreciated the concept
3	July 4 th week	I	Plant Tissue culture medium, MS medium and Gamborg's medium	Introduced to various tissue culture mediums present.	Chalk & Board. ICT	Students were taught how to make stock solutions to made the MS medium for plant tissue culture.
4	Aug 3 rd week	I	Direct and Indirect Organogenesis	Importance of Callus and generation of tissue cultured plants in laboratory.	Chalk & Board ICT	Students learnt how to induce organogenesis and callus in cultured tissues in the laboratory
5	August 5 th week	I	Organogenesis	Emphasized on laboratory procedure for plant tissue culture.	Chalk & Board ICT	Students hand hands on training on the process of raising callus from the plant tissues in laboratory.
6	Sep 2 nd week	I/II	Experimental exposure to raise the tissue cultured organogenesis.	Students understood the importance of NAA, BAP, IAA, 2-4D, kinetin and Zeatin hormones Emphasized on conversion of somatic embryos to synthetic seeds	Chalk & Board	Students were made to encapsulate normal seed embryos in sodium alginate and prepare synthetic seeds
7	Sep 3 rd week	I/II	Meristem culture		Chalk & Board ICT	Students understood the importance of meristem for raising virus free plants.

8	Sep 4 th	I/II	Synthetic seed Preparation	Understood the concept of artificial seed.	Chalk & Board ICT	Students encapsulated normal seed embryos in sodium alginate.
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Learning outcomes:

On completion of the course the students will get an in-depth knowledge on different types of cell culturing methods including the various media formulated to culture plant cells. Students will get hands on training in plant tissue culture like callus induction and shoot induction. They even appreciate the role of different gene trans methods employed to raise transgenic animals and plants.


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Bhavan's Vivekananda College
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Teaching Plan 2019-2020
Program: B.Sc (BtGC)
Course Title (paper title): Biochemistry

Name of the faculty: D. Metilda Rosalin	Department: Genetics and Biotechnology	Year/Semester: II / III	No. of classes per week: 4
Learning objectives: To understand the concepts of biochemistry which includes the structures and importance of Biomolecules and their metabolic pathways, Importance of vitamins and minerals in balanced diet.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 3 rd week	I	Carbohydrates and Proteins: Carbohydrates, Monosaccharides	Importance, classification and properties	Chalk & board	Qualitative analysis of different monosaccharide samples
2	June 4 th week	I	Disaccharides and Polysaccharides	Biochemical importance and structures	Chalk & board	Qualitative analysis of different Disaccharide and polysaccharide samples
3	July 1 st week	I	Proteins	Classification, Structure and properties of amino acids	Chalk & board,	Qualitative analysis of different amino acid samples
4	July 2 nd week	I	Peptide bond synthesis and Structure of Proteins	Primary, secondary, tertiary and quaternary Structures.	Chalk & board	Quantitative analysis of proteins by Biuret method.
5	July 3 rd week	II	Lipids, Enzymes, Vitamins and minerals Lipids- Fatty acids, Triacyl glycerols and Sterols	Saturated and unsaturated fatty acids and their structures	Chalk & board	Qualitative analysis of lipid Samples
6	July 4 th week	II	Phospholipids. Enzymes	Classification and Nomenclature, kinetics of enzyme catalysed reaction	Chalk & board	Equations
7	August 1 st week	II	Factors influencing enzymatic reaction. Enzyme Inhibition.	pH, temperature, Substrate and Enzyme Concentration. Competitive and non - competitive inhibition	Chalk & board	Graphical representation
8	August 2 nd week	II	Vitamins and Minerals	Classification of Vitamins. Sources and functions of Minerals	Chalk & board	Understanding Importance of a balanced diet
9	August 3 rd week	III	Intermediary Metabolism of Carbohydrates and lipids.	Significance and the site of occurrence	Chalk & board, Chart	Importance of every reaction and the enzymes involved thereby forming the

						end product.
10	August 4 th week	III	Glycolysis	Importance and site of occurrence	Chalk & board, Chart	To understand that it is a process of breaking down sugar resulting in pyruvate and ATP with the involvement of 10 enzymes. It takes place in the cytoplasm.
11	August 5 th week	III	Gluconeogenesis and Citric acid cycle	Importance and site of occurrence	Chalk & board, Chart	To understand that it is a metabolic process by which organism produce sugars for catabolic reactions from non-carbohydrate precursors.
12	September 1 st week	III	Mitochondrial electron transport .	Structure of Mitochondrion, Components and reactions of electron transport chain	Chalk & board, Chart	To understand that it is a series of complexes that transfers electrons from electron donors to electron acceptors via redox reactions and couples this electron transfer with the transfer of protons across a membrane.
13	September 2 nd week	III	Chemiosmotic theory of ATP Synthesis, Alcoholic fermentation	Oxidative Phosphorylation and Structure of Mitochondrial ATP Synthase Complex	Chalk & board, Chart	To understand that it is a biological process which converts sugars into cellular energy producing ethanol and carbon dioxide .
14	September 3 rd week	IV	Beta oxidation of fatty acids. Intermediary Metabolism of Proteins and Photosynthesis Catabolism of Phenylalanine and Tyrosine	Oxidation, hydration, Cleavage Phenylketonuria and Albinism	Chalk & board, Chart	To understand it is a catabolic process where fatty acids are broke down to generate acetyl-CoA. Assignment
15	September 4 th week	IV	Reaction of Amino acids Photosynthesis	Transamination, Deamination, Decarboxylation, Photophosphorylation	Chalk and board, Chart	Student Seminar

16	October 1 st week		Carbon assimilation	Significance and site of occurrence	Chalk and board, Chart	Student Seminar
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Learning outcomes:

On completion of the course, Students will learn the structure and importance of Biomolecules, Metabolic pathways, Nutritional significance of vitamins and minerals.
Practical approach helped them to acquire knowledge on biophysical techniques to carry out research in Biochemistry



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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
Teaching plan 2019-2020
Program: B.Sc (BtGC)

Course Title (paper title): Microbiology and Biophysical Techniques

Name of the faculty: D. Metilda Rosalin	Department: Genetics and Biotechnology	Year/Semester: II / IV	No. of classes per week: 4
Learning objectives: To understand the concepts and methods in Microbiology to enhance pathogen free atmosphere and to learn and understand the principles and application of Biophysical techniques.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November	I	Classification of Micro organisms	General classification of microorganisms.	Chalk and board	Isolation of common pathogenic bacteria from soil and air
2	December 1 st week	I	Structure and general characters of micro algae	Chrococcus and Chlorella	Chalk and board	Preparation of routine microbiological media
3	December 2 nd week	I	Identification of Fungi and algae Isolation and Identification of bacteria	Colony Morphology, hyphae spores and reproductive bodies	PPT, chalk and board	Preparation of routine microbiological media
4	January 1 st week	I	Preservation of bacteria and sterilization methods	Refrigerator cold storage, mineral oil, -40 C in glycerol, lyophilisation and liquid nitrogen method	Chalk and board	Staining and identification of bacteria- E.coli, Pseudomonas, Bacillus and staphylococcus.
5	January 2 nd week	I II	Pure cultures methods. Bacterial reproduction Growth kinetics	Common method, special methods & cultural characteristics Binary fission, Conjugation, transformation, transduction. Growth curve	Chalk and board	Staining and identification of bacteria- E.coli, Pseudomonas, Bacillus and staphylococcus.
6	January 3 rd week	II	Production of SCP	Bacterial	Chalk and board	To understand the growth pattern, packaging and application
7	January 4 th week	II	Production of SCP – algae Disease causing pathogens	Algal Typhoid	Chalk and board	To understand the cause of typhoid, its mode of entry, and prevention
8	January 5 th week	III	Structure of HIV, Colorimetry	Aids disease and symptoms. Beer and lamberts law	Charts, chalk and board	Enzyme assay

9	February 1 st week	III	UV – Vis spectrophotometry. Infrared . X ray diffraction NMR	Principles and applications	PPT,Chalk and Board	To understand the basic principles and applications.
10	February 2 nd week	III	Microscopy	Light,Inverted,Fluorescent, Electron,phase contrast microscopy	Seminars, chalk and board . Assignments	Techniques of micrometry,Scrap books
11	February 3 rd week	IV	Chromatography	Paper,thin layer,ion exchange,gel filtration and HPLC	Charts,chalk and board	Separation of amino acid samples by paper chromatography
12	February 4 th week	IV	Electrophoresis Centrifugation, Filtration Dialysis Lyophilisation	Native gels & SDS PAGE Basic principles	PPT,Chalk and Board	Electrophoretic separation of proteins-SDS-PAGE
13	March 1 st week	IV	Radiography and autoradiography	Basic principles	Chalk and board	To understand the basic principles and applications.

Learning outcomes:

The students will be able Understand the different microorganisms and their general characteristics,microbial pathogenesis. Learning Biophysical techniques will help students to study about instrumentation, and their working procedure to carry out advanced research . Practically they will explore microbial growth techniques and expertise in electrophoresis and analysis of proteins by Chromatography.



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Bhavan's Vivekananda College
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Teaching Plan 2019-2020
Program: B.Sc (BtGC)
Course Title (paper title): Molecular Biology

Name of the faculty: D.Metilda Rosalin	Department: Genetics and Biotechnology	Year/Semester: III / V	No. of classes per week: 3
Learning objectives: To introduce students to concepts of Molecular biology like Genome Organization, Gene kinetics, Mutations, Prokaryotic and Eukaryotic gene expression and regulation.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 3 rd week	I	Genes–Kinetic Classes Organization of Nuclear Genome	Genes and gene numbers	Chalk & Board, ICT	Isolation of DNA from plant and animal sources.
2	June 4 th week	I	Essential and Non-essential genes	Cistron, Muton, Cryptic genes, Constitutive & Non – Constitutive genes, Pseudogenes, Transposable genes.	Chalk & board, ICT	To understand the different types of genes and their functions.
3	July 1 st week	I	Denaturation and Renaturation of DNA, Renaturation Kinetics	Tm values and Cot curves	Chalk & Board, ICT	Graphical representation
4	July 2 nd week	I	Kinetic classes of DNA	Single copy sequences and repeated sequences	Chalk & Board	Separation of DNA through Agarose gel electrophoresis based on their molecular weight.
5	July 3 rd week	II	Satellite DNA. Genome Organization	Human Mitochondrial genome, Chloroplast genome in Plants	Chalk and Board, ICT	To understand the structure and functions of mitochondrial and chloroplast genome.
6	July 4 th week	II	Eukaryotic genes, Gene families and clusters	Exons, Introns, promoters and terminators Globin gene, histones, ribosomal genes.	Chalk & board	To understand its structure, role, occurrence and functions
7	August 1 st week	II	Mutations Mutations at molecular level.	Types of Mutations, Mutagens Transitions, Transversions, Deletions and additions	Chalk & Board,	To understand what are causes of Mutation and its significance at Molecular level. As an example, Effect of UV on bacterial growth.
8	August 2 nd week	II	DNA Repair Mechanism	Photo-reactivation, excision repair, SOS repair, recombinational repair and error prone	Chalk & Board,	Student Seminar

				repair		
9	August 3 rd week	III	Gene expression Prokaryotic transcription	Initiation, elongation and termination	Chalk & Board, ICT	Preparation of Competent cells of bacteria exhibits how gene expression can be interrupted by Transformation.
10	August 5 th week	III	Eukaryotic transcription	Initiation, elongation and termination	Chalk & Board, ICT	To understand the formation of mRNA through transcription in Eukaryotes
11	September 1 st week	III	Post – transcriptional modification, Genetic Code and it's features, Wobble hypothesis	Capping, Polyadenylation, Splicing, alternate splicing	Chalk & board	To understand the importance of codons, amino acids and tRNA
12	September 2 nd week	III	Prokaryotic translation Eukaryotic translation	Initiation, elongation and termination.	Chalk & board,ICT	To understand the elements involved in the process of translation in prokaryotes and eukaryotes
13	September 3 rd week	IV	Gene Regulation Regulation of gene expression in prokaryotes Operon concept in bacteria	Lac Operon concept	Chalk & Board	If a gene is not regulated properly what can be it's effects in a living system example, micronucleus test
14	September 4 th week	IV	Regulation of gene expression in Eukaryotes. Mating types switching in yeast.	Transcriptional regulation elements- Enhancers and Motifs.	Chalk& Board	To understand Structure of DNA enhancers , motifs and their functions and how it facilitates transcription. To understand DNA recombination events where haploid yeast cells of one mating type to produce haploid cells of other type to mate and become diploid.
15	October 1 st week	IV	Gal locus regulation in yeast.	Regulation Process	Chalk and board	To understand the expression of the yeast Gal genes in response to galactose

Learning outcomes:

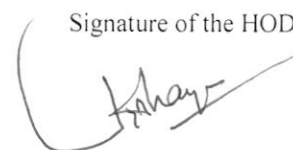
On completion of the syllabus, the students will able to understand Kinetic classes of DNA, Genes and Genome organization, Concepts of Gene expression and regulation in prokaryotes and eukaryotes. Mutations and DNA repair mechanism.

Practically they were able to learn DNA isolation techniques, understand the concept of cells and analyze it by electrophoresis and transformation.

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Bhavan's Vivekananda College
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Teaching plan 2019-2020
Program: B.Sc (BtGC)
Course Title (paper title): Genetic Engineering and Immunology

Name of the faculty: D. Metilda Rosalin	Department: Genetics and Biotechnology	Year/Semester: III / VI	No. of classes per week: 3
Learning objectives: To understand rDNA technology through cloning strategies, enzymes involved and vector designing. To understand the basics of Immunology involving cells and organs of the immune system and immune response. to learn the importance of Antigen and antibody interaction and autoimmune disease and its mechanisms.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	November	I	Restriction endonucleases	Structure ,types , function and application.	Chalk and board	Restriction digestion of DNA
2	December 1 st week	I	Ligases, Phosphatases Methylases Kinases Terminal transferases Reverse transcriptase Klenow polymerase	Structure, function and application.	Chalk and board	Bacterial transformation
3	December 2 nd week	I	Vectors plasmids, Cosmids phage vectors .M13 shuttle vectors Expression vectors	Structure ,function and application.	Chalk and board	Selection of transformants under pressure(antibiotic)
4	January 1 st week	II	Construction of genomic DNA ,cDNA libraries	Its source,function and application	Chalk and board	To understand its source,function and application
5	January 2 nd week	II	Identification of cloned genes	Procedures and applications	Chalk and board	To understand its Procedures and applications
6	January 4 th week	II	Principles involved in blotting Blotting principles,Principles of DNA finger printing	Principles,methods and applications	PPT,Chalk and board.	To understand Principles,methods and applications
7	January 5 th week	II	Principles of PCR and applications	Principles,methods and applications	PPT,Chalk and board	To understand Principles,methods and applications
8	February 1 st week	III	Immunology,organs of immune system	Bone marrow ,thymus,	Chalk and board	To understand the structure and function
9	February 2 nd week	III	Organs of Immune system, Cells of immune system Antigens and haptens Structure of immunoglobulins	spleen, B&T Lymphocytes,NK, granulocytes, macrophages dendritic cells. Physico chemical characteristics	Chalk and board.	Assignments ELISA Test
10	February 3 rd week	III IV	Primary and secondary antibody response.antigen antibody reactions,MHC	Methods and structure. Structure of MHC	PPT,Chalk and Board	Micro agglutination using microtiter plates eg ABO and Rh blood grouping.

				molecules and types		
11	February 4 th week	IV	Role of MHC in organ transplantation, Generation of antibody diversity Hypersensitivity coombs classification autoimmune diseases	Allergy ,cell mediated, immune complex, delayed hypersensitivity.	Chalk and board	Coombs test
12	March 1 st week	IV	Autoimmune diseases	Graves ,Rheumatoid Arthritis,Diabetes Mellitus	Chalk and board	To understand the cause and pathway of the disease

Learning outcomes:

Basic exposure to the concepts in rDNA Technology will encourage them to carry out research in Molecular Biology and seek job opportunities in national laboratories.

Immunology helps students to understand different techniques and diagnosis of different pathogens and immunology related disorders



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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
Program: B.Sc (BtGC)
Teaching Plan 2019-2020
Skill Enhancement Course
Course Title: Vermicomposting

Name of the faculty: D. Metilda Rosalin	Department: Genetics and Biotechnology	Year/Semester: III / V	No. of classes per week: 2
<p>Learning objectives: To understand vermicomposting has extraordinary potentials for reducing organic waste accumulation and providing income-earning potentials through sale of compost. To rely on earthworms and microorganisms to help stabilize active organic materials and convert them to a valuable soil .</p>			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	June 4 th week	1	Introduction to Vermiculture	Definition, meaning, history, economic importance	Chalk & board	To understand the roles of earthworms in composting
2	July 1 st week	1	Maintenance of soil structure and its role in Four r s. Soil profile and Humus cycle.	Different layers of soil. Recycling - reduce, reuse, recycle, restore	Chalk & board,	Went around the campus and observed the different layers of soil
3	July 3 rd week	1	Choosing the right worm.	Useful species. Keys to identify the species of earthworms.	Chalk & board. PPT	Field trip - Collection of native earthworms and their identification
4	July 4 th week	1	Conventional Commercial composting	Earthworm composting larger scale	Chalk & board	Preparation of vermibeds, maintenance of vermicompost and climatic conditions
5	August 3 rd week	1	Small scale earthworm farming for home gardens	Earthworm compost for home gardens	Chalk & board, Video	To understand the organic waste from our homes also can be used for maintaining Home gardens.
6	August 5 th week	1	Earthworm farming (Vermiculture)	Extraction (Harvest), vermicomposting harvest and processing	Chalk & board	Harvesting and packaging of the vermicompost that was prepared by students
7	September 1 st week	1	Nutritional composition	Vermicompost nutrition for plants and comparison with other fertilizers	Chalk & board, PPT	To understand the nutritional value of vermicompost
8	September 2 nd week	1	Enemies of earthworms, sickness and worms enemies.	Frequent problems and how to prevent it	Chalk & board	To understand that earthworms also have sickness and enemies and if so, how to treat them

9	September 3 rd week	1	Harvesting and packaging	Process	Chalk and board , demonstration	The harvested vermicompost was used for the plants in our campus
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Learning outcomes:

The interested students will get the knowledge of composting, Students will get the employment, They can generate employments, Will help to maintain the environment pollution free and Will get the knowledge of biodiversity of local earthworms.



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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
Teaching Plan 2019-2020
Program: B.Sc (BtGC)
General Elective
Course Title: Food Preservation and Adulteration

Name of the faculty: D. Metilda Rosalin	Department: Genetics and Biotechnology	Year/Semester: III / V	No. of classes per week: 2
Learning objectives: To help students to learn and understand the basics of food preservation, spoilage and the different types of food adulterants added to foods consumed daily including health hazards.			

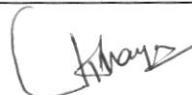
<i>S.No.</i>	<i>Month & Week</i>	<i>Units</i>	<i>Syllabus</i>	<i>Additional Input/ value addition</i>	<i>Teaching method</i>	<i>Student/learning activity</i>
1	July 1 st week	I	History of Food preservation	Evolution of cooking	Chalk & board,	To understand the importance of cooking
2	July 3 rd week	I	Food Fermentation process and preservation process	A brief introduction to fermentation	Chalk & board	Microbial analysis of Food
3	July 4 th week	I	Food additives	Preservation ,antioxidants,supplements, emulsifiers and thickening agent	Chalk & board	To understand the role of food additives in Food industry
4	August 3 rd week	I	Food additives	Taste and flavour enhancers (sweetners ,bleaching and matring agents,colorig and flavoring agents	Chalk & board,	To understand the importance of food additives in food industry
5	August 5 th week	III	Food adulteration MBRT test	Types of adulteration Intentional adulteration	Chalk & board,	MBRT test
6	September 1 st week	III	Food adulterants	Types of adulterants Incidental adulteration	Chalk & board,	Report writing on Food adulterants in coffee,turmeric,edible oil,ghee,honey and milk
7	September 2 nd week	III	Health hazards and risks	Adulterants used and its risk factors	Chalk & board, Chart	Assignments
8	September 3 rd week	I	Preparation of mayyonaise	Ingredients and procedure demonstration	Chalk & board,	Performed preparation of mayonnaise in the lab group wise

Learning outcomes:

Students get to know the basics of Food preservation and microbial degradation of food.
To evaluate Milk by MBRT test and to acquire basic knowledge on food adulterants, its risk factors in terms of health.



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Bhavan's Vivekananda College
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Autonomous – Affiliated to Osmania University
Teaching Plan 2019-2020
Program: B.Sc (BtGC)
Skill Enhancement Course
Course Title: Fermentation Technology

Name of the faculty: D. Metilda Rosalin	Department: Genetics and Biotechnology	Year/Semester: III / VI	No. of classes per week: 2
Learning objectives: To help students understand that fermentation technology enables mass production of microorganism using fermentors for the production of therapeutics, food and beverages.			

S.No.	Month & Week	Units	Syllabus	Additional Input/ value addition	Teaching method	Student/learning activity
1	December 1 st week	I	Fermentation	Definition, meaning, history and economic importance	Chalk and board	To understand the fundamentals of fermentation
2	December 2 nd week	I	Fermentation Technology	Upstream and downstream processing	PPT, chalk and board	To understand the processing mechanisms
3	December 4 th week	I	Principles of Fermentation	Solid and submerged	Chalk and board	To understand the mechanisms
4	January 1 st week	I	Types and design of Fermentor	Continuous stirred tank and airlift Fermentor	Chalk and board	To understand the structure and working mechanisms
5	January 3 rd week	I	Characteristics of an ideal fermentation medium. Screening of microorganisms	Basic composition of the fermentation medium and its support to the growing microorganisms in the medium. Different types of identification	Chalk and board	To understand what are the basic requirements from the media by microorganisms and their growth pattern.
6	January 5 th week	I	Yeasts and its uses	Role of yeast in fermentation	Charts, chalk and board	Isolation and culturing of yeast. Grams staining of yeasts
7	February 1 st week		Production of beverages by Fermentation (Wine)	Principles and methods involved	Chalk and Board	Production of wine from different plant sources and ethanol estimation

Learning outcomes:

Students will be able to acquire knowledge on the design and construction of fermentor and parameters to be monitored and controlled in fermentation process and study the principle of sterilization necessary for fermentation. They will also be able to study the cell growth and product formation.



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