ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

ACADEMIC YEAR 2024-25

DEPARTMENT: BIOTECHNOLOGY **CLASS: I** SEM **(SEP)**

SUBJECT: BIOTECHNOLOGY

PAPER: CELL BIOLOGY & GENETICS

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
August 2024	3	1	Introduction to biotechnology: Definition and objectives.	GK
		2	Bridging the gap: Connecting PUC biology to degree biotechnology.	GK
		3	Bridging the gap: Connecting PUC biology to degree biotechnology.	GK
	4	1	Bridging the gap: Connecting PUC biology to degree biotechnology.	GK
		2	Introduction of the syllabus.	BMA
		3	Unit 1: Biotechnology scope and importance	BMA
		4	Unit 3: Genetics: Introduction, Mendel and his works.	GK
	5	1	Unit 3: Genetics: Principle of Dominance.	GK
		2	Unit 1: Biotechnology scope and importance.	BMA
		3	Unit 1: Cell biology: historical perspective. Discovery of cell	BMA
		4	Unit 3: Genetics: Laws of inheritance- Law of Segregation, Incomplete dominance and co-dominance.	GK
September 2024	1	1	Unit 3: Law of independent assortment. Back cross & Test cross with examples.	GK
		2	Back cross with examples	GK
	2	1	Unit 3 : Maternal inheritance: plastid inheritance in mirabilis, Kappa particles in paramecium	GK
		2	Petite characters in yeast , sex linked inheritance	GK
		3	Unit 1: Cell biology: cell theory , ultra structure of eukaryotic cell	BMA
		4		

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
September 2024		1	Unit 1: Cell biology: Ultrastructure of eukaryotic cell- Plant & Animal cell	
		2	Unit 3: Gene interaction: Supplementary factors - comb pattern in fowls.	
		3	Unit 3: Gene interaction: Complementary genes-sweet peas, multiple factors-skin colour in man.	
		4	Unit 3: Gene interaction: Epistasis- plumage colour in poultry. Solving problems.	
			Unit 1: Cell biology: Structural organization of plasma membrane.	
		4	Unit 1: Cell biology: Structural organization of plasma membrane-complete**.** Functions of plasma membrane	BMA
	2	1	Unit 3: Maternal inheritance: Kappa particle in *Paramoecium*	GK
		2	Unit 3: Maternal inheritance: Plastid inheritance in *Mirabilis* & Petite characters in yeast.	GK
		3	Unit 1: Cell biology: Structural organization of plasma membrane-complete. Functions of plasma membrane	BMA
		4	Unit 1: Structure and functions of endoplasmic reticulum.	BMA
	3	1	Unit 3: Sex-linked inheritance.	GK
		2	Unit 3: Chromosomal theory of inheritance	GK
		3	Unit 1: Structure & functions of Golgi complex, peroxisomes & vacuole.	BMA
		4	Unit 1: Structure & functions of Chloroplast.	BMA
	4	1	Unit 4: Linkage: general introduction. Coupling & repulsion hypothesis.	GK
		2	Unit 4: Linkage in Maize.	GK
		3	Unit 1: Structure & functions of Cytosol, ribosomes and lysosome.	BMA
		4	Unit 1: Structure & functions of Nucleus, nucleolus and cytoskeleton structures.	BMA
	5	1	Unit 4: Linkage in Drosophila.	GK

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
October 2024	1			
		1	Unit 4: Mechanism of crossing over & its importance.	GK
		2	Unit 2: Chromosomes: General introduction, discovery & morphology	BMA
		3	Unit 2: Structural organization of metaphase chromosome.	BMA
	2		**IA TEST**	
	3	1	Unit 4: Chromosome mapping.	GK
		2	Unit 4: Structural and numerical chromosomal aberrations.	GK
		3	Unit 2: chromosome: chemical composition & karyotype.	BMA
		4	Unit 2: Ultrastructure of chromosome-hypothesis.	BMA
	4	1	Unit4: Sex determination in plants and animals- XX-XY, XX-XO, ZW-ZZ, ZO-ZZ types.	GK
		2	Unit4: Mutations: Introduction. Types of mutations- spontaneous mutation.	GK
		3	Unit 2: Ultrastructure of chromosome-folded-fibre model.	BMA
		4	Unit 2: Ultrastructure of chromosome-nucleosome model.	BMA
	5	1	Unit 4: Mutations: Induced mutation. Physical & chemical mutagens.	GK
		2	Unit4: Mutations in plants, animals & microbes and their merits & demerits.	GK
		3	Unit 2: Salivary gland chromosome & Lampbrush chromosomes.	BMA
		4	Unit2: Cell cycle: phases of cell cycle & checkpoints of cell cycle.	BMA
November		1	Revision and clearing doubts.	GK
		2	Unit 2: Cell cycle- enzymes involved, achromatic apparatus & significance.	BMA

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
2024	1	3	Unit2: Senescence & programmed cell death.	BMA
		4	Discussion of Question bank.	GK

ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

ACADEMIC YEAR 2023-24

DEPARTMENT: BIOTECHNOLOGY **CLASS: III** SEM **(NEP)**

SUBJECT: BIOTECHNOLOGY

PAPER: Biomolecules (NEP Core)

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
August 2024	3	1	Syllabus: Introduction. Definition and introduction of biochemistry	GK
		2	Unit 1 a) Carbohydrates: Introduction and Definition.	BMA
		3	Unit 1b) Aminoacids and proteins: Introduction and definition of amino acids.	GK
		4	Aminoacids: General formula and features.	GK
	4	1	Classification of carbohydrates	BMA
		2	Properties of carbohydrates.	BMA
		3	Amino acids: Names, three letter and single letter symbols.	GK
		4	Classification of Amino acids.	GK
September 2024	1	1	Structure of carbohydrates.	BMA
		2	Structure of carbohydrates- completed.	BMA
		3	Structure of Amino acids.	GK
		4	Properties of Amino acids.	GK
	2	1	Monosaccharides – Isomerism and ring structure. Fructose.	BMA
		2	Oligosaccharides: Sucrose.	BMA
		3	Amino acids: Isoelectric point and pK values.	GK
		4	Proteins: Properties and Classification.	GK
	3	1	IA Test	
		2		
		3		

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
October 2024	4	1	Polysaccharides: Classification, Starch and glycogen.	BMA
		2	Polysaccharides: Cellulose and chitin.	BMA
		3	Structural organization of proteins – primary structure.	GK
		4	Structural organization of proteins- secondary structure; alpha & beta sheet.	GK
	1	1	Polysaccharides: glycoproteins and peptidoglycans.	BMA
		2	Unit 2 b) Enzymes: Introduction, definition and nomenclature.	BMA
		3	Structural organization of proteins- secondary structure- complete.	GK
		4	Structural organization of proteins: tertiary and quaternary structure.	GK
	2	1	Unit 2 b) Enzymes: Enzyme kinetics.	BMA
		2	Factors influencing enzyme activity.	BMA
		3	Denaturation and renaturation of proteins.	GK
		4	Unit 3 a): Lipids: Introduction and classification.	GK
	3	1	Coenzymes and their functions. Metalloenzymes.	BMA
		2	Enzyme inhibition- types with example.	BMA
		3	Lipids: Properties- Saponification, iodine number and rancidity.	GK
		4	Lipids: Hydrogenation of fatty acids and oils.	GK
	4	1	Zymogens and Isozymes.	BMA
		2	Unit 4 a): Electrophoresis: Introduction. Principle, procedure and applications of Agarose gel electrophoresis.	BMA
		3	Saturated and unsaturated fatty acids.	GK
		4	General structure & Biological functions of phospho, sphingo and glycol lipids.	GK

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
November 2024	1	1	Principle, procedure and applications of SDS-PAGE.	BMA
		2	Unit 4 b) UV Spectrometry	BMA
		3	General structure & Biological functions of lipoproteins, prostaglandins & cholesterol.	GK
		4	Unit 3 a) Vitamins: water soluble vitamins.	GK
	2	1	Visible spectrometry	BMA
		2	Mass spectroscopy	BMA
		3	Fat soluble vitamins.	GK
		4	Unit 3 b) Nucelic acids: structure of purines and pyrimidines. Nucleosides & nucleotides in DNA.	GK
	3	1	Atomic Spectroscopy	BMA
		2	Absorption spectroscopy	BMA
		3	Unit 3 c) Hormones: Introduction and classification based on chemical nature.	GK
		4	Structure & functions of Glucagon, Cortisone & Epinephrine.	GK
	4	1	Discussion of Question bank.	BMA
		2	Structure & functions of Testosterone & Estradiol.	GK
		3	Discussion of Question bank	GK
		4	Revision.	GK

DEPARTMENT: BIOTECHNOLOGY **CLASS: V** SEM

SUBJECT: BIOTECHNOLOGY

PAPER 5: GENETIC ENGINEERING (NEP Core)

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
August 2024	3	1	Genetic Engineering (GE) Syllabus and Introduction.	GK
		2	**Unit 1:** Genetic Engineering: Historical development and scope.	GK
		3	Genetic Engineering: Concepts and Basic principles.	GK
		4	Genetic Engineering: Applications of Genetic engineering in various fields.	GK
	4	1	DNA structure and manipulation – Techniques for DNA isolation, purification, quantification & characterization.	GK
		2	Recombinant DNA technology – Introduction to molecular cloning.	GK
		3	Vectors: Over view of cloning vectors	GK
		4	Vectors: BAC & YAC	GK
September 2024	1	1	Enzymes used in rDNA technology.	GK
		2	**Unit 2**: Gene manipulation techniques. In-vitro construction of rDNA molecule.	GK
		3	Preparation of desired DNA: cDNA method and Chemical synthesis method.	GK
		4	Isolation of Vector DNA. Restriction and Digestion and Ligation of desired DNA with vector DNA.	GK
	2	1	Methods of gene delivery: physical & chemical techniques.	GK
		2	Methods of gene delivery: biological techniques.	GK
		3	Screening of transformed cells/organisms: Colony hybridization.	GK
		4	Screening of transformed cells/organisms: Insertional inactivation method.	GK
	3		**IA Test**	

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
	4	1	Techniques used in GE: Principle, procedure and applications of PCR	GK
		2	Techniques used in GE: Principle, procedure and applications of Blotting techniques.	GK
		3	Techniques used in GE: Principle, procedure and applications of Blotting techniques.	GK
		4	Techniques used in GE: Principle, procedure and applications of DNA sequencing – Sanger's method.	GK
October 2024	1	1	Techniques used in GE: Next generation sequencing.	GK
		2	Techniques for expressing recombinant DNA in bacterial expression systems.	GK
		3	Techniques for expressing recombinant DNA in animal & plant expression systems.	GK
		4	**Unit 3:** Applications of GE in Human health care - Production of human insulin.	GK
	2	1	Applications of GE in Human health care - Production of human growth hormone.	GK
		2	Applications of GE in Human health care: Production of recombinant vaccine (hepatitis).	GK
		3	Applications of GE: Gene therapy & its potential in treating genetic disorders.	GK
		4	Applications of GE: Diagnostic applications – DNA fingerprinting & applications	GK
	3	1	Applications of GE: Molecular diagnostic kits & their role - WIDAL, RPR	GK
		2	Applications of GE: Molecular diagnostic kits & their role- Monoclonal Abs & PET Scan.	GK
		3	Applications of GE: production of biopharmaceuticals.	GK
		4	Gene Libraries: genomic DNA library, cDNA library and their applications.	GK
		1	**Unit 4:** Advances in GE: Industrial applications of GE – Enzyme production.	GK
		2	Advances in GE: Industrial applications of GE – Biofuel production.	GK

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
	4	3	Genome editing: Introduction to genome editing.	GK
		4	Genome editing: Techniques – Gene knockout technique.	GK
November 2024	1	1	Genome editing: Techniques – Principle and applications of CRISPR-Cas9	GK
		2	Genome editing: Techniques – Principle and applications of site directed mutagenesis.	GK
		3	Introduction to synthetic biology.	GK
		4	Synthetic biology and its integration with genetic engineering.	GK
	2	1	Revision.	GK
		2	Revision.	GK
		3	Revision.	GK
		4	Discussion of question bank and model questions.	GK

DEPARTMENT: BIOTECHNOLOGY **CLASS: V** SEM

SUBJECT: BIOTECHNOLOGY

PAPER 6: PLANT & ANIMAL BIOTECHNOLOGY (NEP Core)

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
August 2024	3	1	Syllabus and Introduction.	BMA
		2	**Unit 1: Plant Tissue culture**: Historical definition and hypothesis.	BMA
		3	Principles of plant tissue culture.	BMA
		4	Tissue culture Laboratory organization	BMA
	4	1	Plant tissue culture media.	BMA
		2	Plant tissue culture media – growth regulators.	BMA
		3	Callus: Morphogenesis and differentiation.	BMA
		4	Direct and indirect organogenesis.	BMA
September 2023	1	1	Somatic embryogenesis.	BMA
		2	Synthetic seeds.	BMA
		3	Invitro propagation.	BMA
		4	Types of culture- Seed culture, embryo culture- limitations & applications.	BMA
	2	1	Meristem culture & bud culture - limitations & applications.	BMA
		2	Micropropagation.	BMA
		3	Secondary metabolites: invitro production, suspension culture.	BMA
		4	Bioreactors & scaling up of secondary metabolite production. Limitations & applications.	BMA
	3		**IA Test**	
		1	**Unit 2: Transgenic plants & biosafety**: Overview.	BMA

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
	4	2	Transgenic plants and their significance in agriculture.	BMA
		3	Techniques of transgenesis: Agrobacterium mediated transformation.	BMA
		4	Biolostics and other methods of gene transfer.	BMA
October 2024	1	1	Selection and screening of transformed plants.	BMA
		2	Applications of transgenic plants.	BMA
		3	Biosafety assessment of transgenic plants: potential risks and benefits.	BMA
		4	International regulatory frameworks for releasing and commercialisation of genetically modified organisms.	BMA
	2	1	Ethical & socio-economic impacts of transgenic crops. IPR & access to transgenic technologies.	BMA
		2	**Unit 3: Animal cell culture methods:** Introduction & history. Laboratory organization.	BMA
		3	Animal cell culture media. Cel types and culture characters.	BMA
		4	Differentiation, transdifferentiation and reprogramming.	BMA
	3	1	Biology & characterization of cultured cells: cell adhesion, proliferation.	BMA
		2	Morphology of cells and identification.	BMA
		3	The basic techniques of mammalian cell culture invitro, measuring parameters of growth in cultured cells.	BMA
		4	Large scale culture of cell lines – monolayer, suspension & immobilized cultures.	BMA
		1	Organ & histotypic culture. Stem cells –types and uses.	BMA
		2	Stem cell engineering & ethical issues.	BMA

MONTH/YEAR	WEEK	CLASS	PORTIONS	FACULTY
	4	3	**Unit 4; Gene transfer in animals & Applications:** Gene constructs for animals.	BMA
		4	Transfection of animal cells: calcium phosphate coprecipitation, Electroporation, Lipofection.	BMA
November 2024	1	1	Direct gene transfer & microinjection methods.	BMA
		2	Transgene identification methods.	BMA
		3	Transgene & genome edited animals. Recent advances and applications in the field. Ethical issues.	BMA
		4	Manipulation of animal reproduction and characterisation of animal genes.	BMA
	2	1	Embryo transfer in cattle & applications.	BMA
		2	Somatic cell cloning: Dolly. Production of vaacines.	BMA
		3	Revision.	BMA
		4	Discussion of question bank and model questions.	BMA