Effective from Session: 2024-25							
Course Code	B100101T/ BS103	**Title of the Course**	Introduction to Cell Biology and Genetics	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	**3**	**1**	**0**	**4**
Pre-Requisite	10+2 Biology	**Co-requisite**					
Course Objectives	The objective of this course is to develop an understanding of basics of cell, cell organelles structure and functions, and basics of Mendelian Genetics.						

Course Outcomes	
CO1	Develop an understanding of the discovery of Cell; Historical prospective, Structural and functional differences between Prokaryotic and Eukaryotic cells, difference between animal and plant cells.
CO2	Develop an understanding about structure and functions of different cell organelles, cytoskeleton and cell motility.
CO3	Develop an understanding of different types of cell divisions, cell membrane and transport across the cell membrane, cell-cell communication, signal transduction and cell death.
CO4	Develop an understanding about Chromosomes, there composition, structure and functions, Mendelian genetics, variations from mendelian genetics, Linkage and mechanism & importance of crossing over.
CO5	Develop an understanding of gene mutations in plant, animals and bacteria, its types and economic importance. Karyotyping, Chromosomal aberrations in human and associated diseases, various types of DNA damages and their repair mechanisms.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Cell as a Basic unit of Living Systems**	Discovery of cell, The Cell theory Ultrastructure of an eukaryotic cell – (both plant and animal cell).	**6**	CO.1
2	**Cell organelles and cytoskeleton**	Structure and functions of cell organelles, Cytoskeletal structures (Microtubules, Microfilaments); cell motility.	**6**	CO.2
3	**Cell Division and Membrane Transport**	Cell cycle, mitosis and meiosis, Membrane transport: active and passive transport.	**8**	CO.3
4	**Cell signaling & Cell Death**	Introduction to signal transduction and its molecular mechanism, cell senescence, Programmed Cell Death.	**8**	CO.3
5	**Chromosomes: Structural Organization**	Centromere, telomere, chromonema, euchromatin and heterochromatin, chemical composition and karyotype, nucleosome model, Special types of chromosomes: Salivary gland and Lampbrush chromosomes, Chromosomal Variations, Chromosome mapping, structural and numerical aberrations.	**8**	CO.4
6	**Mendelism**	Mendel's laws of heredity, Test cross, Incomplete dominance and simple problems, Interaction of Genes: Supplementary factors, Comb pattern in fowls, Complementary genes: Flower color in sweet peas, Multiple factors: Skin color in human beings, Epistasis: Plumage colour in poultry, Multiple allelism: Blood groups in human beings, Concepts of allosomes and autosomes, XX-XY, XX-XO, ZW-ZZ, ZO-ZZ type, Linkage and Crossing Over, Mechanism and importance.	**8**	CO.4
7	**Mutations**	Spontaneous and induced mutations, Physical and chemical mutagens, Mutation at the molecular level, Mutations in plants, animals, and microbes for economic benefit of man. Human Genetics: Karyotype in man, inherited disorders: Allosomal (Klinefelter syndrome and Turner's syndrome), Autosomal (Down syndrome and Cri-Du- Chat syndrome).	**8**	CO.5
8	**DNA Damage and Repair**	DNA Damage and Repair: Causes and Types of DNA damage, Major mechanisms of DNA repair: photoreactivation, nucleotide and base excision repairs, mismatch repair, SOS repair.	**8**	CO.5

Reference Books:

Molecular Biology of cell – Bruce Alberts et al, Garland publications

Animal Cytology & Evolution – MJD, White Cambridge University Publications

Molecular Cell Biology – Daniel , Scientific American Books.

Cell Biology & Molecular Biology – EDP Roberties & EMF Roberties, Sauder College.

Principles of Genetics – E.J. Gardener, M.J. Simmons and D.P. Snustad, John Wiley & Sons Publications

e-Learning Source:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	1					1	2	2	1	
CO2	3	1					1	3	2	2	
CO3	3	1					1	3	2	3	
CO4	3	1					1	3	2	3	
CO5	3	1					1	3	2	3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Effective from Session: 2024-25							
Course Code	B100102T/BS104	**Title of the Course**	Biochemistry and Metabolism	**L**	**T**	**P**	**C**
Year	I year	**Semester**	I sem	**3**	**1**	**0**	**4**
Pre-Requisite	10+2	**Co-requisite**					
Course Objectives	**The objective of this course is to develop an understanding of basics of biomolecules, enzymes and their metabolism.**						

Course Outcomes	
CO1	To understand basic details of carbohydrate molecules and its classification
CO2	To understand basic details of amino acid & protein molecules and its classification
CO3	To understand basic details of lipid molecules and its classification
CO4	To understand basic details of Nucleic Acid molecules and its classification
CO5	To understand basic details of Enzyme and its classification

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Carbohydrates**	Structure, classification and properties of Monosaccharides, Disaccharides, and Polysaccharides (starch, glycogen, peptidoglycan, cellulose).	6	**CO1**
2	**Amino acids and Proteins**	Structure, classification and properties of amino acids, peptide bond, proteins: primary, secondary (α-Helix, beta-pleated sheet), tertiary and quaternary structures, Ramachandran plot, structure of hemoglobin and myoglobin.	6	**CO2**
3	**Lipids and its metabolism**	Structure, function, classification and properties of Fatty acids. degradation of fatty acids: oxidation; Ketone bodies, acidosis, ketosis, cholesterol synthesis	6	**CO3**
4	**Nucleic acids**	Purines and pyrimidines, nucleosides, nucleotides, polynucleotides, DNA types: A DNA, B DNA and Z DNA and their function, RNA types: mRNA, rRNA and tRNA and their function, Forces stabilizing nucleic acid structure.	6	**CO4**
5	**Enzymes**	Classification, properties and factors influencing enzyme activity, coenzymes, prosthetic group and co-factors, Lock & key hypothesis, induced fit hypothesis, Enzyme kinetics: Michaelis Menten equation, Lineweaver-Burk plot, Enzyme inhibition, Allosteric enzymes.	6	**CO5**
6	**Carbohydrate metabolism**	Glycolysis, TCA cycle, Electron Transport Chain and Oxidative phosphorylation, Gluconeogenesis and Glycogen metabolism.	6	**CO1**
7	**Protein metabolism**	Urea Cycle, transport of ammonia, deamination and transamination reactions. Inborn errors of protein metabolism.	6	**CO2**
8	**Nucleic acid metabolism**	Purine and Pyrimidine biosynthesis and degradation.	6	**CO4**

Reference Books:

Lehninger, AL “Principles of Biochemistry”

Lubert Stryer “Biochemistry”

Voet & Voet “Biochemistry”

Robert K., M Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, Appleton & Lange, Robert K. Murray “Harper’s Biochemistry”

e-Learning Source:

https://www.khanacademy.org/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	1					1	3		1	2
CO2	3	1					1	3		2	2
CO3	3	1					1	3		3	2
CO4	3	1					1	3		3	2
CO5	3	1					1	3		3	2

2- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Effective from Session: 2024-25							
Course Code	B100103P/BS105	**Title of the Course**	Introduction to Cell Biology & Genetics Lab	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**0**	**0**	**4**	**2**
Pre-Requisite	10+2	**Co-requisite**					
Course Objectives	The objective of this course is to develop the understanding of use of Micrometer and calibration, measurement of onion epidermal cells and yeast, Cell division processes: Mitotic and meiotic studies, Chromosomes: polytene chromosomes, Karyotype analysis – with the help of slides and how to make Blood smear – differential staining and Buccal smear – Barr bodies.						

Course Outcomes	
CO1	Comprehend the use of Micrometer and calibration, measurement of cells
CO2	Have knowledge and can evaluate Cell division: Mitosis and meiosis
CO3	Analyze Chromosomes.
CO4	Have knowledge of types of chromosomes as polytene chromosomes
CO5	Make and analyze Blood smear – differential staining, Buccal smear – Barr bodies

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Exp 1	Use of Micrometer and calibration, measurement of onion epidermal cells and yeast cells.	4	**CO1**
2	Exp 2	Cell division: Mitotic studies in onion root tips	4	**CO2**
3	Exp 3	Cell division: Meiotic studies in grasshopper testes or flower bud	4	**CO2**
4	Exp 4	Chromosomes: Mounting of polytene chromosomes	4	**CO3**
5	Exp 5	Buccal smear – Barr bodies	4	**CO5**
6	Exp 6	Karyotype analysis – with the help of slides	4	**CO4**
7	Exp 7	Study of polytene chromosomes by slides	2	**CO4**
8	Exp 8	Blood smear – differential staining	4	**CO5**

Reference Books:

RF. (2012) Biochemistry laboratory: modern theory and techniques (2nd Edition). Pearson Education, Inc

e-Learning Source:

https://vlab.amrita.edu/index.php?brch=188&cnt=1&sim=1102&sub=3

https://vlab.amrita.edu/?sub=3&brch=188&sim=1102&cnt=2106

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	1		3		3	1	3	2	3	
CO2	3	1		3		3	1	1		3	
CO3	3	1		3		3	1				3
CO4	3	1		3	3	3	1				3
CO5	3	1									

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Effective from Session: 2024-25							
Course Code	B100104P/BS106	**Title of the Course**	Basic Biochemistry Lab	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**0**	**0**	**4**	**2**
Pre-Requisite	10+2	**Co-requisite**					
Course Objectives	The objective of this course is to familiarize the students with basic instruments used in Biochemistry and practical learning of biomolecules.						

Course Outcomes	
CO1	Qualitative test for carbohydrates (Molisch test, Benedict test, Fehling test, Bradford and Iodine tests)
CO2	Estimation of vitamin C and Determination of pKa of glycine
CO3	Perform spot test for amino acids in a given sample
CO4	Estimate cholesterol in a given sample
CO5	Perform DNA and RNA estimation in a given sample

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Exp 1	Qualitative test for carbohydrates (Molisch test, Benedict test, Fehling test, Barfoed and Iodine tests)	6	**CO1**
2	Exp 2	Estimation of vitamin C and Determination of pKa of glycine	6	**CO2**
3	Exp 3	Perform spot test for amino acids in a given sample	6	**CO3**
4	Exp 4	Estimate cholesterol in a given sample	6	**CO4**
5	Exp 5	Perform DNA and RNA estimation in a given sample	6	**CO5**

Reference Books:

RF. (2012) Biochemistry laboratory: modern theory and techniques (2nd Edition). Pearson Education, Inc

e-Learning Source:

https://vlab.amrita.edu/index.php?brch=188&cnt=1&sim=1102&sub=3

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	1						3		3	
CO2	3	1		3		3	1	3	2	3	
CO3	3	1		3		3	1	1		3	
CO4	3	1		3		3	1				3
CO5	3	1		3	3	3	1				3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Effective from Session: 2023-24							
Course Code	Z010101T/ BE105	**Title of the Course**	Food, Nutrition, and Hygiene	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**2**	**0**	**0**	**2**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	**To learn the basic concept of food, nutrition, hygiene, and common diseases prevalent in society along with 1000 days nutrition concept**						

Course Outcomes	
CO1	To learn the basic concept of the Food and Nutrition, and meal planning
CO2	To learn about macro and micronutrientsand theirs RDA, sources, functions, deficiency, and excess.
CO3	To learn 1000 days Nutrition Concept and study the nutritive requirement during special conditions like pregnancy and lactation.
CO4	To study common health issues in the society and to learn the special requirement of food during common illness.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Concept of Food and Nutrition	(a) Definition of Food, Nutrients, Nutrition, Health, balanced Diet (b) Types of Nutrition- Optimum Nutrition, under Nutrition, Over Nutrition (c) Meal planning- Concept and factors affecting Meal Planning (d) Food groups and functions of food	8	CO1
2	Nutrients: Macro andMicro RDA, Sources, Functions, Deficiency and excess of	(a) Carbohydrate (b) Fats (c) Protein (d) Minerals Major: Calcium, Phosphorus, Sodium, Potassium Trace: Iron, Iodine, Fluorine, Zinc (e) Vitamins Water soluble vitamins: Vitamin B, C Fat soluble vitamins: Vitamin A, D, E, K (f) Water (g) Dietary Fibre	7	CO2
3	1000 days Nutrition	(a) Concept, Requirement, Factors affecting growth of child (b) Prenatal Nutrition (0 - 280 days): Additional Nutrients' Requirement and risk factors during pregnancy (c) Breast / Formula Feeding (Birth – 6 months of age) Complementary and Early Diet (6 months – 2 years of age)	8	CO3
4	Community Health Concept	(a) Causes of common diseases prevalent in the society and Nutrition requirement in the following: Diabetes Hypertension (High Blood Pressure) Obesity Constipation Diarrhea Typhoid	7	CO4
5	Community Health Concept	(b) National and International Program and Policies for improving Dietary Nutrition (c) Immunity Boosting Food	4	CO5

Reference Books:

Singh, Anita, "Food and Nutrition", Star Publication, Agra, India, 2018.

SheelSharma,Nutrition and Diet Therapy,Peepee Publishers Delhi,2014,First Edition.

1000Days-Nutrition_Brief_Brain-Think_Babies_FINAL.pdf

https://pediatrics.aappublications.org/content/141/2/e20173716

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5750909/

e-Learning Source:

https://www.udemy.com/course/internationally-accredited-diploma-certificate-in-nutritionDiploma in Human Nutrition-Revised Offered by Alison

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)												
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	-	-	2	2	3	2	3	3	2	2		
CO2	-	-	-	3	2	3	2	3	3	2	2		
CO3	-	-	-	3	3	2	3	3	-	-	2		
CO4	-	-	3	3	3	3	3	3	3	2	3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Effective from Session: 2024-25							
Course Code	B100206V/BS108	**Title of the Course**	Animal and Plant Biotechnology	**L**	**T**	**P**	**C**
Year	**1**	**Semester**	I	**2**	**0**	**2**	**3**
Pre-Requisite	10+2 with Biology	**Co-requisite**					
Course Objectives	The course has been designed to make students aware of basic plant biotechnology techniques and their applications in plant growth and development, and large scale production of natural products from plant source. The course also imparts information on characteristics of primary & secondary cell culture, hybridoma technology & application of animal biotechnology.						

Course Outcomes	
CO1	Get proper knowledge about media preparation for In-vitro propagation of plants and aseptic techniques used.
CO2	The students will learn the role of techniques for haploid plant production and its significance.
CO3	Have basic knowledge of several technique of transformation: Agrobacterium-mediated and physical methods (Microprojectile bombardment and electroporation) and the biology growth promoting bacteria.
CO4	Understand the characteristics of Primary & Secondary cell cultures. Principle & application of Hybridoma technology
CO5	Have an understanding of various methods of gene delivery methods of Animals and the application of Animal biotechnology

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Aseptic Techniques**	Aseptic Techniques, Nutrient media, and use of growth regulators (Auxins, Cytokininis and Gibberellins). Callus and suspension culture	8	CO-1
2	**Haploid Plant Production**	Microspore and ovule culture, Organ Culture and their applications, Somatic Embryogenesis: Techniques and applications. Protoplast Culture, somatic hybridization, methods of protoplast fusion: chemical and electro fusion, practical application of somatic hybridization	8	CO-2
3	**Transgenic Plants & Transformation Techniques**	Transgenic Plants & Technique of transformation: Agrobacterium-mediated and physical methods (Microprojectile bombardment and electroporation).	8	CO-3
4	**Animal Tissue culture**	Nutrient requirements of mammalian cells, Media for culturing cells, Growth supplements. Primary cultures & Secondary cultures	8	CO-4
5	**Plant Growth Promoting Bacteria**	Nitrogen fixation, Nitrogenase, Hydrogenase, Nodulation, Biocontrol of Pathogens and growth promotion by free- living bacteria.	8	CO-3
6	**Hybridoma Technology**	Principles and methods of hybridoma technology. Production and characterization of monoclonal antibodies and their application in animal health and production.	8	CO-4
7	**Gene delivery methods for Animals**	Viral vectors, Direct DNA transfer, Particle bombardment, Electroporation, Microinjection & Chemical methods.	8	CO-5
8	**Application of Animal Biotechnology**	Application of Animal biotechnology: Gene Therapy, Milk Production, Meat Production and Aquaculture Production.	8	CO-5

Reference Books:

e-Learning Source:

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**1**			**2**		**3**		**3**		
CO2	**3**	**1**			**2**		**3**		**3**		
CO3	**3**	**1**			**2**	**2**	**3**		**3**		
CO4	**3**	**1**					**3**	**2**	**3**		**1**
CO5	**3**	**1**		**2**	**2**		**3**				**3**

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**