Effective from Session: 2023-24							
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.	**8**	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.	**6**	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: 2022-23						
Course Code	B110101T / BS142	**Title of the Course**	Fundamentals of Biochemistry	**L**	**T**	**P**
Year	I	**Semester**	I	**3**	**1**	**0**
Pre-Requisite	10+2	**Co-requisite**				
Course Objectives	**The objective of this course is to develop an understanding of basics of biomolecules.**					

Course Outcomes	
CO1	To understand basic details of Normality, Molarity, Molality, per cent solutions, mole fractions, w/v and v/v solutions.Concept of pH, water as well as 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 vitamin, Plant and animal hormones and their classification.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Basics of Biochemistry**	General idea about Normality, Molarity, Molality, per cent solutions, mole fractions, w/v and v/v solutions. Concept of pH, water : a universal solvent.	6	**CO1**
2	**Carbohydrates**	Carbohydrates: structure, classification and properties of Monosaccharides, Disaccharides, and Polysaccharides (starch, glycogen, peptidoglycan, cellulose).	8	**CO1**
3	**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.	8	**CO2**
4	**Lipids and fats**	Lipids: Structure, function, classification and properties of Fatty acids, Glycerolipid, Cholesterol, Sphingolipid, Phospholipids, Lipoproteins.	8	**CO3**
5	**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 acidstructure.	8	**CO4**
6	**Vitamins**	Structure, sources, dietary requirements, function and deficiency disorders of water (B, C) and fat soluble vitamins (A, D, E and K).	8	**CO5**
7	**Plant hormones**	Plant hormones classification and function. Auxin, gibberellins, cytokinins, ethylene and abscisic acid.	6	**CO5**
8	**Animal hormones**	Animal hormones secreted by endocrine glands Hypothalamus, pituitary, thyroid gland, adrenal gland, pancrease and gonads. Their classification and function	8	**CO5**

Reference Books:

Principles of Biochemistry- AlbertL. Lehninger CBS Publishers & Distributors

Biochemistry – Lubertstryer Freeman International Edition.

Biochemistry – Keshav Trehan Wiley Eastern Publications

Fundamentals of Bochemistry-J.L.JainS.Chand and Company

The Biochemistry of Nucleic acid – Tenth Edition-Roger L.P.Adams, John T. Knowler and David P.Leader, Chapman and Hall Publications

Textbook of Organic Chemistry (A Modern Approach)

e-Learning Source:

https://www.khanacademy.org/

www.coursera.com

	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			

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

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

Effective from Session: 2022-23							
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: 2022-23							
Course Code	B110102P /BS143	**Title of the Course**	Analytical 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 pK A 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,Bradford and Iodine tests).	6	**CO1**
2	Exp 2	Estimation of vitamin C and Determination of pK A 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:

Books recommended: Boyer RF. (2012) Biochemistry laboratory: modern theory and techniques (2nd Edition). PearsonEducation, Inc.

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						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				
CO5	3	1		3	3	3	1				

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

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

Effective from Session:							
Course Code	B110205V /BS146	**Title of the Course**	Basic Microbiology and Bio safety Measures	**L**	**T**	**P**	**C**
Year	1	**Semester**	I	**2**	**0**	**1**	**3**
Pre-Requisite	10+2	**Co-requisite**					
Course Objectives	On completion of this course, students will be able to develop an understanding of basics of microbiology,general classification of microbes, control of microorganisms, basics of recombination in prokaryotes, microbial interaction with environment.						

Course Outcomes	
CO1	Know the basics of microbiology, bacteriophage, stains and staining techniques, general classification of microbes.
CO2	Understand basics of structure of bacterial cell.
CO3	Study control measures for microorganisms.
CO4	Know the economic and pathogenic importance of microorganisms.
CO5	Discuss bio-safety measures.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**History and classification of Microbiology, Traditional Indian Knowledge**	Criteria for classification of microorganisms, various types of microorganisms (bacteria, fungi, viruses,protozoa). Experimental analysis: Staining of bacteria & fungi, microscopic analysis. Pasteur's experiments. Fermentation in Ayurvedic medicine.	6	**CO1**
2	**Structure of bacterial cell**	Culturing of bacteria: growth media, media preparation, sterilization techniques. Isolation, preservation, & maintenance of cultures. Bacterial cell structure, gram positive and gram-negative bacteria, growth curve.	6	**CO2**
3	**Control of microorganisms**	Physical agents (autoclave, hot airoven, laminar air flow and membrane filter), chemical agents (Alcohol, Halogens and Gaseous agents, antibiotics), radiation methods (UV rays).	6	**CO3**
4	**Economic & pathogenic importance of microorganisms**	Common pathogenic microorganisms, bacterial gall, viral: TMV, fungal: red rot of sugar cane, multidrug resistance, *Mtb*. Fermentation: ethanol & antibiotics produciton. Demonstration of bioreactor working.	6	**CO4**
5	**Bio-safety measures**	Historical background; introduction to biological safety cabinets; primary containment for biohazards; biosafety levels; biosafety guidelines -Government of India; definition of GMOs; roles of Institutional Biosafety Committee, RCGM, GEAC etc.	6	**CO5**

Reference Books:

Srilakshmi B (2018): Food Science, 7th Colour Ed. New Age International (P) Ltd.

Mann J and TruswellS (2017) : Essentials of Human Nutrition, 5th Ed. Oxford University Press.

SrilakshmiB (2017): Nutrition Science,6th Multicolour Ed. New Age International (P) Ltd.

e-Learning Source:

https://www.khanacademy.org/

www.coursera.com

	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	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:							
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**