

Sant Gadge Baba Amravati University, Amravati

Faculty: Science and Technology
Programme: B. Sc. (Biotechnology)

POs:

At the time of graduation, Students will be able to

PO1. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives. PO2. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

PSOs:

Upon completion of the programme successfully, students would be able to

1. understand the structures and purposes of prokaryotic and eukaryotic cells.
2. understand the structures and purposes of basic components of cell.
3. understand the cellular components underlying mitotic cell division.
4. apply their knowledge of cell biology in cell function.

Employability Potential of the Programme:

The Biotechnology sector in India is extremely innovative and on the rise. Next few years are bound to see exponential growth in this sector. India is among the top 12 Biotechnology destinations in the world and ranks third in the Asia-Pacific region. The industry comprises around 5000 biotech companies, with 4,240 being start-ups and 760 being core biotech companies, with the number of startups expected to touch 10,000 by 2024.

India has 665 FDA-approved plants; 44% of the global abbreviated new drug applications (ANDA) and more than 1400 manufacturing plants, which are compliant with WHO's requirements. It is regarded as one of the most significant sectors in enhancing India's global economic profile. India has been blessed with a highly talented pool of students in biotechnology.

The National Biotechnology Development Strategy (2015 – 2020) and National Education Policy (2016) envision a quality education system to produce graduates equipped with the knowledge, skills, attitude, and values that are required to lead a productive life and participate in the country's development process. Improving employability in this sector is heavily dependent on the overall curriculum of the educational programs. Since the last curriculum revision exercise was undertaken long ago, it is necessary to update the current curriculum.

The curriculum updating exercise not only brings the course curricula at par with the current development in Biotechnology sector but also seeks to create manpower and human resource capable of high order thinking and skills.

The programme has been aligned with the National Biotechnology Development Strategy (2015-2020) put forth by Department of Biotechnology, Ministry of Science and Technology, Government of India, which provides a strategic roadmap for India's emergence as a global Biotechnology innovation and manufacturing hub, which also highlight importance of human resource development and need for nurturing tailor-made human capital for advanced strategic research and entrepreneurship.

Syllabus Prescribed for B. Sc. I Sem I Year UG Programme

Programme:

Semester 1

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
IBTC-DSC-3	Cell Biology	90 hrs

COs

Upon completion of this course successfully, students would be able to

1. understand the Cell as a basic structural and functional unit of life
2. differentiate prokaryotic and eukaryotic Cell.
3. understand the structure and function of various cell organelles
4. understand the basics of Cell organization, Cell communication and Cell transport.
5. understand the cellular components underlying cell division and cell cycle.

Unit	Content
Unit I	<p>Introduction to cell</p> <p>A. Origin of life: Miller experiment B. Discovery of cell and Cell theory. Exceptions to the cell theory C. Cell as a basic unit of living system D. Prokaryotic and eukaryotic cell: Similarities and differences E. Structure of prokaryotic (bacterial) cell F. Structure of eukaryotic (plant and animal) cell G. Similarities and differences between plant and animal cell</p> <p>(15 periods)</p>
Unit II	<p>Cell organelles: Structure and Function</p> <p>A. Nucleus B. Cell wall C. Plasma membrane D. Mitochondria E. Golgi complex F. Endoplasmic reticulum, G. Lysosomes and Vacuoles H. Chloroplast I. Ribosomes J. Peroxisomes</p> <p>(15 periods)</p>
Unit III	<p>Cytoskeleton and cell locomotion</p> <p>A. Structure and function of microtubules B. Structure and function of actin filament C. Structure and function of intermediate filaments D. Cell locomotion : Flagellar, ciliary and amoeboid locomotion E. Stem cells: Properties and applications</p> <p>(15 periods)</p>
Unit IV	<p>Cell division and cell transport</p> <p>A. Cell division, Mitosis and meiosis B. Overview and phases of cell cycle C. Cancer D. Programmed cell death E. Cell transport across membrane: Active, Passive, Diffusion, Osmosis, Transporters, Ion channels</p> <p>(15 periods)</p>

Unit V	<p style="text-align: center;">Extracellular Matrix, Membrane function, Cell lysis</p> <p>A. Extracellular Matrix: Composition, molecules that mediate cell adhesion. B. Cell junctions. C. Signal transduction (Basic steps) D. Types of receptors: Cell surface receptors and nuclear receptors. E. Cell lysis methods, Density gradient and Differential centrifugation</p> <p style="text-align: right;">(15 periods)</p>
Unit VI	<p style="text-align: center;">Skill Enhancement Module: Basic Microscopic techniques</p> <p>A. Light microscopy B. Dark field microscopy C. Phase contrast microscopy D. Immuno fluorescence microscopy E. Electron microscopy</p> <p style="text-align: right;">(15 periods)</p>

Course Material/Learning Resources

Text books:

Reference Books:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

Syllabus Prescribed for 2022 Year

UG

Programme: B. Sc. Biotechnology

Semester I Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical/practicum/hands-on/Activity)	(No. of Periods/Week)
- Practical – I	Practical based on DSC I	06

CO:

Upon completion of this course successfully, students would be able to

1. Adapt basic knowledge on various techniques and areas of cell biology.

Practical-I :

1. Compound microscope
2. Study the effect of temperature and organic solvents on semi permeable membrane.
3. Demonstration of dialysis.
4. Study of plasmolysis and de-plasmolysis.
5. Demonstrate Cell fractionation and identification of cell fraction
6. Study of structure of any Prokaryotic and Eukaryotic cell.
7. Cell division in onion root tip.

Learning Outcome:

Student would be able to design and execute experimental procedures in cell biology.

Syllabus Prescribed for B. Sc. I Sem II Year UG Programme

Programme: B. Sc. Bio Technology

Semester II

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
DSC-3	Biomolecules	90 hrs

COs

Upon completion of this course successfully, students would be able to

1. describe the properties of some important biomolecules.
2. explain important functions of biomolecules in living systems.
3. perform tests to detect the presence of carbohydrates and proteins.
4. explain classification of carbohydrates, proteins, lipids, nucleic acids etc.

Unit	Content
Unit I	<p>Carbohydrates –</p> <p>A. Importance, classification, physical and chemical properties of carbohydrates</p> <p>B. Structure, configuration and biochemical importance of monosaccharides (Glucose and Fructose) Oxidation, Reduction; Vitamins- classification, sources, functions and applications</p> <p>C. Reducing and non-reducing sugars- structure, configuration and biochemical importance of disaccharides and glycosidic bond (Sucrose, Lactose, Maltose, Isomaltose)</p> <p>D. Structure and functions of polysaccharides (Starch, glycogen, chitin)</p> <p>(15 periods)</p>
Unit II	<p>Lipids –</p> <p>A. Importance and properties.</p> <p>B. Classification-- simple lipids, complex lipids, derived lipids, sterols,</p> <p>C. Fatty acids: saturated and unsaturated fatty acids with examples</p> <p>D. Triacylglycerols: Structure & properties</p> <p>E. Biological significance of fats,</p> <p>F. Structure & functions of Phospholipids and glycolipids: lecithins, cephalins, phosphoinositides & spingomyelins, glycolipids-cerebrosides, gangliosides</p> <p>G. Steroids: properties & functions of ergosterol, cholesterol, bile acids</p> <p>(15 periods)</p>
Unit III	<p>Proteins –</p> <p>F. Classification, structure, physical and chemical properties of amino acids</p> <p>G. Classification of proteins.</p> <p>H. Peptide bond and peptides: Characteristic properties and formation</p> <p>I. Peptide-hormones</p> <p>J. Structure of proteins: primary, secondary, tertiary and quaternary.</p> <p>K. Biological importance of proteins.</p> <p>(15 periods)</p>
Unit IV	<p>Nucleic acids –</p> <p>A. Structure and functions: Physical & chemical properties of Nucleic acids</p> <p>B. Purine & pyrimidine bases,</p> <p>C. Nucleosides & nucleotides,</p> <p>D. Biologically important nucleotides</p> <p>E. Structure and functions of DNA</p> <p>F. structure and forces responsible for A, B & Z – DNA</p> <p>G. denaturation and renaturation of DNA</p> <p>H. Structure and functions of RNA (mRNA , tRNA, rRNA)</p> <p>(15 periods)</p>

Unit V	Enzymes- A. Terminology: Enzyme, substrate, prosthetic group, coenzyme, cofactor, active site, inductive enzymes, allosteric enzymes, Isozymes, metalloenzymes, ribozymes, abzymes B. Classification and nomenclature C. Effect of temperature, pH, substrate concentration and enzyme concentration on enzyme catalyzed reactions. D. Mechanism of enzyme action E. Michaelis Menton equation F. Enzyme inhibition (competitive and non-competitive), G. Role of co-enzymes.
Unit VI	Skill Enhancement Module: Qualitative analysis of biomolecules a. Benedicts test for monosaccharides b. Qualitative analysis of amino acids c. Qualitative analysis of proteins d. Test for nitrogen, sulphur, halogens and phosphorus <p style="text-align: right;">(15 periods)</p>

Course Material/Learning Resources

Text books:

1. Lehninger Principles of Biochemistry By: David L. Nelson and Cox
2. Biochemistry By: Rex Montgomery
3. Harper's Biochemistry By: Robert K. Myrray
4. Enzymes By: Trevor Palmer
5. Enzyme structure and mechanism By: AlanFersht
6. Principles of Biochemistry By: Donald J. Voet, Judith G. Voet, Charlotte W. Pratt
7. Analytical Biochemistry By Cooper

Reference Books:

Weblink to Equivalent MOOC on SWAYAM if relevant:

Weblink to Equivalent Virtual Lab if relevant:

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

Syllabus Prescribed for UG Programme: B. Sc. Biotechnology

Semester II Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical/practicum/hands-on/Activity)	(No. of Periods/Week)
- Practical – II	Practical based on DSC II	06

CO:

Upon successful completion of this course, students would be able to

1. Adapt basic knowledge on various techniques and areas of biological chemistry.

Practical-II :

1. Demonstrate Qualitative tests of sugars, amino acids and lipids
2. Estimation of total sugars by Anthron method
3. Reducing sugars by DNS method
4. Estimation of proteins by Biuret method
5. Enzyme assay- catalase or invertase
6. Determination of acid value of fats
7. Amylase activity assay

Learning Outcome:

Student would be able to design and execute experimental procedures in biochemistry.

Sant Gadge Baba Amravati University Amravati

Scheme of teaching, learning & Examination leading to the Degree Bachelor of Science (Three Years ... Six Semesters Degree Course- C.B.C.S)**(B. Sc Part-I) (Semester- I) BIOTECHNOLOGY**

Sr. No	Subjects	Subject Code	Teaching & Learning Scheme							Duration of Exams Hrs.	Examination & Evaluation Scheme							
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing		
			L	T	P	Total	Theory	Practical	Total		Theory + M.C.Q External	Skill Enhancement Module		Practical		Total Marks	Marks	Grade
												Internal	External	Internal	External			
1	BTC 1(Theory)		6	-	-	6	4.5	-	4.5	3hrs.		80	20	-	-			
2	BTC lab 1 (Practical)		-	-	6	6	-	2.25	2.25	3 hrs.	-	-	-	50	50	25	p	
3																		
4																		
5	AEC (Theory)																	
6	AEC (Practical)																	
7	GOEC – 1										College Level Evaluation							
8	Induction Programme		30 Hrs. (One Week) at the beginning of semester – 1 only								Non exam credit, evaluation at college level							
	Total																	

L: Lecture, T: Tutorial, P: Practical

Sant Gadge Baba Amravati University Amravati

Scheme of teaching, learning & Examination leading to the Degree Bachelor of Science (Three Years ... Six Semesters Degree Course- C.B.C.S)(B.Sc Part-I) (Semester- II) **BIOTECHNOLOGY**

Sr. No	Subjects	Subject Code	Teaching & Learning Scheme							Duration of Exams Hrs.	Examination & Evaluation Scheme							
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing		
			L	T	P	Total	Theory/ Tutorial	Practical	Total		Theory + M.C.Q External	Skill Enhancement Module		Practical		Total Marks	Marks	Grade
												Internal	External	Internal	External			
1	BTC 2(Theory)		6	-	-	6	4.5	-	4.5	3hrs.	80	20	-	-	100	40	p	
2	BTC lab 2 (Practical)		-	-	6	6	-	2.25	2.25	3 hrs.	-	-	-	50	50	25	p	
3																		
4	DSC-(Practical) if applicable																	
5	AEC (Theory)																	
6	AEC (Practical)																	
7	GOEC – II									College Level Evaluation								
	Total																	

L: Lecture, T: Tutorial, P: Practical

Note : Internship /Field Work / Work Experience will be conducted after IInd semester till Vth semester in vacations for 15/30 days (60 hrs.)

