



(Bachelor of Sciences) (Botany)
(B.Sc.) (Botany-Major) Semester (I)

Course Code	US21MABOT01	Title of the Course	BIOMOLECULES AND CELLBIOLOGY
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	<ol style="list-style-type: none">1. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles2. Students will understand how these cellular components are used to generate and utilize energy in cells3. Students will understand the cellular components underlying cell division.
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Course Content		
Unit	Description	Weightage* (%)
1.	Unit 1: Biomolecules Types and significance of chemical bonds; Structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; Monosaccharides; Disaccharides; Oligosaccharides and polysaccharides. Biological functions of carbohydrates Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacyl glycerol structure, functions and properties; Phosphoglycerides. Proteins: Structure of amino acids; Levels of protein structure- primary, secondary, tertiary and quaternary; Protein denaturation and biological roles of proteins.	25
2.	Unit 2: Biomolecules Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA. Enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action(activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation, Enzyme inhibition and factors affecting enzyme activity.	25
3.	Unit3: The cell Cell as a unit of structure and function; Cell theory, Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory). Cell wall and plasma membrane	25





	Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis. Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Structure and types of chromosomes	
4.	Unit 4: Cell organelles Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes Cell division Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinase Cell death-Necrosis and Apoptosis.	25
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Teaching-Learning Methodology	Classroom interactions Multimedia presentation Chart/model presentation Live /preserved specimen observation Student seminar and unit test, quiz etc Question bank circulation Students assignments Student counselling for any problem of subject understanding Student-Teacher interaction on social media platform for any query (MS team, Google classroom, email, etc)
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%





3.	University Examination	70%
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Course Outcomes: Having completed this course, the learner will be able to

1.	Develop understanding on chemical bonding among molecules
2.	Identify the concept that explains chemical composition and structure of cell wall and membrane
3.	Classify the enzymes and explain mechanism of action and structure
4.	Compare the structure and function of cells & explain the development of cells
5.	Describe the relationship between the structure and function of bio molecules

Suggested References:

Sr. No.	References
1.	Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
2.	Biochemistry by U.Satyanarayana and U.Chakrapani,Elsevier 5 th Editon
3.	Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
4.	Cell Biology,Genetics,Molecular Biology,Evolution and Ecology by Verma P.S.
5.	Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6 th edition.

On-line resources to be used if available as refe

On-line Resources

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(Bachelor Of Sciences) (Botany)
(B.Sc.) (Botany-Major) Semester (I)

Course Code	US21MABOT02	Title of the Course	Practical
Total Credits of the Course	04	Hours per Week	08(PartA-4 and PartB-4)

Course Objectives:	1. To get hands on training to use various botany laboratory equipment. 2. To do experiment as per the given syllabus through fresh/preserved specimen/slides/models/charts etc
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Course Content		
PART-A	Description(Biomolecules)	Weightage* (%)
1.	Qualitative analysis of Monosaccharide	
2	Qualitative analysis of Disaccharides	
3.	Qualitative analysis of Polysaccharides	
4.	Qualitative tests for Protein (heat coagulation, Precipitation test, Colour reaction)	
5.	Qualitative tests for Lipids	
6.	Effect of temperature on enzyme catalyzed reaction.	
7.	Cytochemical staining of: DNA- Feulgen in the epidermal peel of onion.	
8.	To demonstrate enzyme activity(catalase/peroxidase/amylase)	
9.	Contribution of various scientists in discovering DNA and RNA	
10.	Contribution of various scientists in the field of enzymology.	





11	Field trip/project/submission	
PART-B	Cell Biology	
1	Study of Microscope (Pollen grain)	
2	To study the structure of plant cell through temporary mounts (with the help of epidermal peel mount of Onion)	
3	Study of cyanobacterial cell	
4	Study of Cell and its organelles with the help of Electron micrographs	
5	Structure of chromosome, its types. (photographs)	
6	Study of cell division Mitosis. (demo/permanent slides/chart)	
7	Study of cell division Meiosis. (demo/permanent slides/chart)	
8	To identify the different types cells present in the plant tissues.	
9	Study the phenomenon of plasmolysis.	
10	Study of mitochondria by Janus green.	
11	Study of stomatal cells.	
12	Study of non living cell inclusions.	
13	Lab visit/Fieldtrip/Submission	

Teaching-Learning Methodology	Observation of specimen Handling of specimen Using student's microscope Using certain required chemical for test
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	Dissection of specimen Preparing journal though drawing various figures with description Learn through charts/model Field visits for live experience. Preparing field visit note.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
3.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Get an insight of the functioning of the cell division and its significance.
2.	Identify various cell organelles through the structural organization.
3.	Know the functioning of various bio molecules through various confirmative tests.
4.	Learn detail structures of DNA and RNA through various models and charts.

Suggested References:	
Sr. No.	References
1.	A text book of Practical Botany(vol I&II) by Bendre and Kumar
2.	Modern Practical Botany(vol I&II)byPandey B.P.

On-line resources to be used if available as reference material
On-line Resources
The virtual library of Botany
https://www.wiziq.com/tutorials/practical





(Bachelor Of Science) (Botany)
(B.Sc.) (Botany-Minor) Semester (I)

Course Code	US21MIBOT01	Title of the Course	Phycology and Mycology
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	1. Knowledge about structure, function, reproduction and economic importance algae, fungi, lichens and Mycorrhiza.
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Course Content		
Unit	Description	Weightage* (%)
1.	Blue Green Algae: General characters, classification of blue green algae Occurrence, Thallus structure and Reproduction of Gloeocapsa, Oscillatoria, Spirulina, Nostoc, Anabaena, Scytonema and Gloeotrichia. Economic importance of blue green algae Algae: General characteristics; Classification and Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar). Role of algae in the environment, agriculture, biotechnology and industry. Life cycles of Zygnema, Ectocarpus and Batrachospermum	50
2.	Introduction to true fungi: General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification. Life cycle with reference to Zygomycota-Rhizopus, Ascomycota-Aspergillus, Basidiomycota- Puccinia and Oomycota-Albugo Symbiotic associations: Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza and their significance.	50

Teaching-	Classroom interactions
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Learning Methodology	Multimedia presentation Chart/model presentation Live /preserved specimen observation Student seminar and unit test, quiz etc Question bank circulation Students assignments Student counselling for any problem of subject understanding Student-Teacher interaction on social media platform for any query (MS team, Google classroom, email, etc)
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	This course helps the students to gain knowledge theoretically and practically on microorganisms like algae, fungi ---their forms, structures, life cycles and their roles in maintaining biodiversity.

Suggested References:	
Sr. No.	References
1.	1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2.	Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers
3.	Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.





4.	Text book of Botany-Diversity of Microbes and Cryptogams-Singh,Pande and Jain
5.	Introductory Botany by Bendre and Pande

On-line resources to be used if available as reference material

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<https://onlinelibrary.wiley.com/doi/book/10.1002/9781444313383>





(Bachelor of Sciences) (Botany)
(B.Sc.) (Botany-Minor) Semester (I)

Course Code	US21MIBOT02	Title of the Course	Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	1. To get hands on training to use various biology laboratory equipment. 2. To do experiment as per the given syllabus through fresh/preserved specimen/slides/models/charts etc
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No	Practical
1.	Study of vegetative and reproductive structures of Nostoc ,Anabaena ,Scytonema and Gloeotrichia (electron micrographs) through temporary preparations and permanent slides
2.	Study of vegetative and reproductive structures of Gloeocapsa ,Oscillatoria, Spirulina, (electron micrographs) through temporary preparations and permanent slides
3.	Study of vegetative and reproductive structures of Zygnema (electron micrographs) through temporary preparations and permanent slides
4.	Study of vegetative and reproductive structures of Ectocarpus (electron micrographs) through temporary preparations and permanent slides
5.	Study of vegetative and reproductive structures of Batrachospermum (electron micrographs) through temporary preparations and permanent slides
6.	Rhizopus: study of asexual stage from temporary mounts and sexual structures through permanent slides.
7.	Aspergillus: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.
8.	Albugo: Study of symptoms of plants infected with Albugo; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.
9.	Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.
10.	Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on





	different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides.
11.	Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)
12.	Submission/project/Fieldtrip

Teaching-Learning Methodology	Observation of specimen Handling of specimen Using student's microscope Using certain required chemical for test Dissection of specimen Preparing journal though drawing various figures with description Learn through charts/model Field visits for live experience. Preparing field visit note.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Gain hands-on experience of using various optical instruments and making temporary mountings.
2.	Identifying various plant and animal specimen through mountings of fresh specimens/charts/models.
3.	Understand characteristics of biological specimens.
4.	Carried out field visits to explore ecological understanding and learn range of biodiversity.

Suggested References:





SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus with effect from the Academic Year 2023-2024

Sr. No.	References
1.	A text book of Practical Botany(vol I&II) by Bendre and Kumar
2.	Modern Practical Botany(vol I&II)byPandey B.P.
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On-line resources to be used if available as reference material

On-line Resources

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(Bachelor Of Science) (Botany)
(B.Sc.) (Botany-IDP) Semester (I)

Course Code	US21IDBOT01	Title of the Course	Plants and Human welfare -I
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	To know very basics of plants used as cereals, millets and vegetables.
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Course Content		
Unit	Description	Weightage* (%)
1.	Plants and Food: Cereals and Millets: Common name, Botanical name ,family ,Variety, geographical distribution, important constituents and uses of : Cereals : Wheat ,Rice,Maize,Barley,Oat,Jowar,Bajra,Ragi,Bread millet. Legumes: Pigeon pea, Gram, Pea, Green gram, Black gram, Lentil, Aconite Bean (Math).	50
2.	Vegetables: Common name, Botanical name ,family ,Variety, geographical distribution, important constituents and uses of :Sweet potato,Carrot,Radish,Turnip.Potato,Onion,Garlic,Lettuce,Spinach,Fenugreek,Cabbage,Cauliflower,Tomato,Brinjal,Okra,Bottle guard.	50

Teaching-Learning Methodology	Classroom interactions Multimedia presentation Chart/model presentation Live /preserved specimen observation Student seminar and unit test, quiz etc Question bank circulation Students assignments Student counselling for any problem of subject understanding Student-Teacher interaction on social media platform for any query (MS team, Google classroom, email, etc)
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand outlines of plants used for human welfare such as cereals, millets and vegetables.
2.	Understand about basic food ingredients and their uses.

Suggested References:	
Sr. No.	References
1.	A text book of angiosperms by Singh, Pande and Jain.
2.	Economic botany by Dr.B.P.Pandey
3.	Economic botany by S.L.Kocher

On-line resources to be used if available as reference material
Shodhganga
https://onlinelibrary.wiley.com/doi/book/10.1002/9781444313383





(Bachelor Of Sciences) (BOTANY)
(B.Sc.) (BOTANY-IDP) Semester (I)

Course Code	US01IDBOT02	Title of the Course	Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	1. To get hands on training to use various plants. 2. To do experiment as per the given syllabus through fresh/preserved specimen/slides/models/charts etc
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Unit	Description
1.	Botanical name, Family, Morphology of Wheat, Rice Maize, Barley and Oat. Micro chemical test for the presence of Starch and Starch Grains
2	Study of Millets- Jowar, Bajra, Ragi, Bread millet. Study of seed germination
3.	Botanical name,Family,Morphology of Pigeon pea, Gram, Pea, Green gram Micro chemical test for the presence of Protein
4.	Botanical name, Family, Morphology of Black gram, Lentil, Aconite Bean (Math).
5.	Botanical name,Family,Morphology of Sweet potato, Carrot,Radish,Turnip.Potato,Onion,Garlic
6.	Botanical name,Family,Morphology of Lettuce, Spinach,Fenugreek,Cabbage,Cauliflower
7.	Botanical name, Family, Morphology of Tomato, Brinjal, Okra, Bottle guard.
8.	Study of water imbibing capacity of starchy, oily and proteinaceous seeds.
8.	Field trip/Submission/ Project report





Teaching-Learning Methodology	Observation of specimen Handling of specimen Using student's microscope Using certain required chemical for test Dissection of specimen Preparing journal though drawing various figures with description Learn through charts/model Field visits for live experience. Preparing field visit note.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand botanical name ,family,important morphological characters and uses of cereals,millet,legumes and vegetables.
Suggested References:	
Sr. No.	References
1.	A text book of Practical Botany(vol I&II) by Bendre and Kumar
2.	Modern Practical Botany(vol I&II)byPandey B.P.

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