



(Bachelor of Science)(Undergraduate)

B. Sc. (UG) Semester-I

Course Code	US01MABOT01	Title of the Course	BIOMOLECULES AND CELLBIOLOGY
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	<p>To make students familiar with:</p> <ol style="list-style-type: none"> 1. This course will provide a detailed discussion on a wide range of topics in Cell biology & Bio-molecules emphasizing experimental approaches and key experiments that have provided important insights. 2. The course is aimed at conveying an understanding of how cellular structure and function arise as a result of the properties of cellular macromolecules. 3. Emphasis will be on the dynamic nature of cellular organization, structure and function.
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Course Content		
Unit	Description	Weightage* (%)
1.	<p>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.</p>	25%
2.	<p>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</p>	25%



	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.	
3.	<p>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).</p> <p>Cell wall and plasma membrane 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.</p> <p>Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Structure and types of chromosomes.</p>	25%
4.	<p>Unit 4: Cell organelles Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament.</p> <p>Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast.</p> <p>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</p> <p>Cell division Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinase Cell death-Necrosis and Apoptosis.</p>	25%

Teaching-Learning Methodology	<p>Classroom interactions, Chalk and talk</p> <p>Multimedia presentation</p> <p>Chart/model presentation</p> <p>Live /preserved specimen observation</p> <p>Student seminar and unit test, quiz etc</p> <p>Question bank circulation</p> <p>Students assignments</p> <p>Student counselling for any problem of subject understanding</p>
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	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 –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation.	Weightage(%)
1.	Internal Examination Evaluation includes Class Test (At least one)-15(30%), Quiz (At least one)-15(30%), Active learning-05(10%), Home Assignment-05(10%), Class Assignment-05(10%), Attendance-05(10%) This makes total 50 Marks.	50
2.	Semester End Examination(50 Marks)	50

Course Outcomes:	
1.	Predict and interpret the importance of cell, its types and origin
2.	Define, describe, classify and explain cytoskeleton, cell organelle
3.	Define, describe, classify and explain about chemical nature and importance of biomolecules.
4.	Describe the relationship between the structure and function of bio molecules

Suggested Reference Books:	
Sr. No.	Reference Books
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

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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. 6th edition.

On-line Resources :GOOGLE BOOKS,INFLIBNET,GOOGLE WEB,SHODHGANGA



(Bachelor of Science)(Undergraduate)

B. Sc. (UG) Semester-I

Course Code	US01MABOT02	Title of the Course	Practical
Total Credits of the Course	04	Hours per Week	08(PartA-4 and PartB-4)

Course Objectives:	To make students familiar with: Different test to know nature of biomolecules and to study various types of cells and its organelles and different tests for biomolecules.
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PART-A	Biomolecules
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

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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

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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 –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation.	Weightage%
1.	Internal Examination Evaluation includes Lab Work Assignment-20(40%), Viva voice/Lab Quiz-20(40%), Attendance-10(20%) Which makes total 50 Marks.	50
2.	Semester End Examination Evaluation includes Lab Work Assignment-40(80%), Viva voice/Lab Quiz-10(20%) This makes total 50 Marks.	50

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.
5.	Understand how to demonstrate factors affecting enzyme activity.

Suggested Reference Books:	
Sr. No.	Reference Books

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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 : <https://www.wiziq.com/tutorials/practical>

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(Bachelor of Science)(Undergraduate)

B. Sc. (UG) Semester-I

Course Code	US01MIBOT01	Title of the Course	Phycology and Mycology
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	To make students familiar with: In this course students get an elaborate idea of different groups of algae and fungi in detail in terms of their general characteristics, ecology, significant contribution and role in the environment, agriculture and biotech industries.
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Course Content		
Unit	Description	Weightage* (%)
1.	<p>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</p> <p>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</p>	50%
2.	<p>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</p> <p>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.</p>	50%

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Teaching-Learning Methodology	Classroom interactions, Chalk and talk 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 –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation.	Weightage(%)
1.	Internal Examination Evaluation includes Class Test (At least one)-10(40%), Quiz (At least one)-05(20%), Home Assignment-05(20%), Attendance-05(10%) This makes total 25 Marks.	50
2.	Semester End Examination(25 Marks)	50

Course Outcomes: Upon completion of this course, the students 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 Reference Books:	
Sr. No.	Reference Books
1.	Text book of Botany-Diversity of Microbes and Cryptogams-Singh,Pande and Jain
2.	Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2ndedition

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Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.

On-line resources : Shodhganga, Inflibnet



(Bachelor of Science)(Undergraduate)

B. Sc. (UG) Semester-I

Course Code	US01MIBOT02	Title of the Course	Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	To make students familiar with: 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	<p>Observation of specimen</p> <p>Handling of specimen</p> <p>Using student's microscope</p> <p>Using certain required chemical for test</p> <p>Dissection of specimen</p> <p>Preparing journal though drawing various figures with description</p> <p>Learn through charts/model</p> <p>Field visits for live experience.</p> <p>Preparing field visit note.</p>
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Evaluation Pattern		
Sr. No.	Details of the Evaluation –NEP 2020,KCG and CCE(Continuous and Comprehensive Evaluation.	Weightage%
1.	Internal Examination Evaluation includes Lab Work Assignment-10(40%), Viva voice/Lab Quiz-10(40%), Attendance-05(20%) Which makes total 50 Marks.	50
2.	Semester End Examination Evaluation includes Lab Work Assignment-20(80%), Viva voice/Lab Quiz-05(20%), Which makes total 25 Marks.	50

Course Outcomes: Having completed this course, the learner will be able to

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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.	Carry out field visits to explore ecological understanding and learn range of biodiversity.

Suggested Reference Books:

Sr. No.	Reference Books
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 : <https://www.wiziq.com/tutorials/practical>

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Course Code	US01IDBOT01	Title of the Course	Plants and Human welfare -I
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	To make students familiar with: Common name, Botanical name, family, Variety, geographical distribution, important constituents and plants used as cereals, millets and vegetables.
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Course Content		
Unit	Description	Weight age* (%)
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, Chalk and talk Multimedia presentation Chart/model presentation Live /preserved specimen observation Student seminar and unit test, quiz etc Question bank circulation Students assignments
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	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 –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation.	Weightage (%)
1.	Internal Examination Evaluation includes Class Test (At least one)-10(40%), Quiz (At least one)-05(20%), Home Assignment-05(20%), Attendance-05(10%) Which makes total 25 Marks.	50
2.	Semester End Examination(25 Marks)	50

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

Suggested Reference Books:	
Sr. No.	Reference Books
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 : Shodhganga, INFLIBNET

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

Course Objectives:	To make students familiar with: 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.	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.

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8.	Study of water imbibing capacity of starchy, oily and proteinaceous seeds.
9.	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		
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2.	Semester End Examination Evaluation includes Lab Work Assignment-20(80%), Viva voice/Lab Quiz-05(20%), Which makes total 25 Marks.	50

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.

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Suggested Reference Books:

Sr. No.	Reference Books
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 : <https://www.wiziq.com/tutorials/practical>
