

**Vithalbhai Patel & Rajratna P. T. Patel Science College  
(Autonomous)**

(Reaccredited with 'A' Grade by NAAC (CGPA 3.13))

Affiliated to SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar, Gujarat

Syllabus effective from the Academic Year 2026-2027



(Bachelor of Science) (Undergraduate)

B. Sc. (UG) Semester-II

|                             |                    |                     |                                                        |
|-----------------------------|--------------------|---------------------|--------------------------------------------------------|
| Course Code                 | <b>UAS2MABOT01</b> | Title of the Course | Biodiversity (Microbes, Algae, Fungi and Archegoniate) |
| 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"> <li>1. This course aims at making a familiarity with special groups of Bacteria, Viruses, Algae, Fungi and Archegoniate (Bryophytes, Pteridophytes and Gymnosperms).</li> <li>2. To acquaint the students with external and internal basic structure and cellular composition of the Bacteria, Viruses, Fungi, Bryophytes and Pteridophytes and Gymnosperms</li> <li>3. To gain knowledge of diversity, life forms, life cycles, morphology and importance of microorganisms, algae, fungi and archegoniate</li> </ol> |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Unit           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Weightage* (%) |
| 1.             | <p><b>Microbes :</b></p> <p>Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.</p>                                                                                                                      | 25%            |
| 2.             | <p><b>Algae</b></p> <p>Cyanobacteria: History, Characteristics, Types, Classification, Structure, Specialized structure, Reproduction, Economic importance and harmful effects of Cyanobacteria.</p> <p>Role of Cyanobacteria as a Food Supplements, Reduction of Methane Emissions, as Source of Bio-energy, as Plant Growth Promoters, in Bioremediation and as Bio-fertilizers.</p> <p>Occurrence, thallus structure and reproduction of Gloeocapsa, Oscillatoria, Spirulina, Nostoc and Gloeotrichia.</p> | 25%            |

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|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|    | <p>Culturing Of algae.<br/>General characteristics; Classification, Range of thallus organization and reproduction and Classification and Economic importance of algae.<br/>Life-cycle of the Spirogyra, Ectocarpus and Batrachospermum<br/>Contribution of Professor M O P Iyengar.</p>                                                                                                                                                                                                                                                                                    |     |
| 3. | <p><b>Fungi –</b><br/>Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition , nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of Rhizopus (Zygomycota) Penicillium, Alternaria (Ascomycota), Puccinia, Agaricus (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance<br/>Contribution of Prof. Karam chand Mehta</p> | 25% |
| 4. | <p><b>Introduction to Archegoniate :</b> General characters, Economic importance, Classification , alternation of generation and outline lifecycles of following -<br/>A. Bryophyta – <i>Riccia</i>, <i>Anthoceros</i><br/>B. Pteridophyta – <i>Nephrolepis</i>, <i>Funaria</i><br/>C. Gymnosperms – <i>Cycas</i><br/><br/>Contribution of Prof. Shiv Ram Kashyap and Prof. Birbal Sahni.</p>                                                                                                                                                                               | 25% |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Teaching-Learning Methodology | <p>Classroom interactions, Chalk and talk<br/>Multimedia presentation<br/>Chart/model presentation<br/>Live /preserved specimen observation<br/>Student seminar and unit test, quiz etc<br/>Question bank circulation<br/>Students assignments<br/>Student counselling for any problem of subject understanding<br/>Student-Teacher interaction on social media platform for any query (MS team, Google classroom, email, etc)</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 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%)Which makes total 50 Marks. | 50           |
| 2.      | External Examination(50 Marks)                                                                                                                                                                                              | 50           |

**Course Outcomes: Upon completion of this course, the students will be able to:**

|    |                                                                                                                                                                                                                                                         |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | aware of the various groups of organisms like bacteria, viruses, algae bryophytes, pteridophytes and gymnosperms that have given rise to land habit ..                                                                                                  |
| 2. | the classification, characteristics features, cell structure and growth and reproduction in viruses, bacteria, and various groups of marine and fresh water algae and their ecological and economic importance.                                         |
| 3. | gain knowledge theoretically and practically on microorganisms like viruses, bacteria, algae, fungi and archegoniates like bryophytes, Pteridophytes and gymnosperms---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. 2nd edition                            |
| 3       | Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition. |
| 4       | Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot,Allahabad.                          |

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|   |                                                                                                                 |
|---|-----------------------------------------------------------------------------------------------------------------|
| 5 | Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.                          |
| 6 | Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India. |

On-line resources : Shodhganga

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(Bachelor of Science) (Undergraduate)

B. Sc. (UG) Semester-II

|                             |                                                                                                                                                                                                                        |                     |                         |  |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------|--|
| Course Code                 | <b>UAS2MABOT02</b>                                                                                                                                                                                                     | 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:<br>1. To get hands on training to use various biology laboratory equipment.<br>2. To do experiment as per the given syllabus through fresh/preserved specimen/slides/models/charts etc |                     |                         |  |

| No | Practical (Part-A)                                                                                                                                           |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Electron Micrographs/Models of viruses –Bacteriophage, TMV/ Lytic and Lysogenic Cycle                                                                        |
| 2. | Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.                          |
| 3. | Gram staining/Permanent slides                                                                                                                               |
| 4. | Study of vegetative/ reproductive structure of <i>blue green algae</i> through temporary preparation / permanent slides(Gloeocapsa, Oscillatoria, Spirulina) |
| 5. | Study of vegetative/ reproductive structure of <i>blue green algae</i> through temporary preparation / permanent slides(Nostoc and Gloeotrichia)             |
| 6. | Study of vegetative/ reproductive structure of <i>Spirogyra</i> through temporary preparation / permanent slides                                             |
| 7. | Study of vegetative/ reproductive structure of <i>Ectocarpus</i> through temporary preparation / permanent slides                                            |
| 8. | Study of vegetative/ reproductive structure of <i>Batrachospermum</i> through temporary preparation / permanent slides                                       |
| 9. | Contribution of various Phycologists                                                                                                                         |

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|     |                                                                                                                                                                                                                          |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10. | Culturing of algae(Protocol)                                                                                                                                                                                             |
| 11. | Fieldtrip/project/submission                                                                                                                                                                                             |
|     | Practical (Part-B)                                                                                                                                                                                                       |
| 1   | Asexual stage from temporary mounts and sexual structures through permanent slides.(Rhizopus)                                                                                                                            |
| 2   | Asexual stage from temporary mounts and sexual structures through permanent slides.(Penicillium)                                                                                                                         |
| 3   | Alternaria: Specimens/photographs and tease mounts                                                                                                                                                                       |
| 4   | Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts                                                   |
| 5   | Agaricus: Specimens of button stage and full grown mushroom; Sectioning of gills of Agaricus.                                                                                                                            |
| 6   | Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)                                                                                                                                              |
| 7   | Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)                                                                                                                                                            |
| 8   | Study of <i>Riccia</i> – Morphology of thallus, capsule/ sporophyte /Permanent Slides)                                                                                                                                   |
| 9   | Study of <i>Anthoceros</i> – Morphology of thallus, capsule/ sporophyte /Permanent Slides)                                                                                                                               |
| 10  | Study of <i>Nephrolepis</i> – plant morphology, mounting of sporangia                                                                                                                                                    |
| 11  | Funaria- Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema. |
| 13  | Cycas- morphology, t.s. coralloid root, t.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides)                                                                                                               |

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|           |                               |
|-----------|-------------------------------|
| <b>14</b> | Field trip/project/submission |
|-----------|-------------------------------|

|                               |                                                                                                                                                                                                                                                                                                                            |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Teaching-Learning Methodology | Observation of specimen<br>Handling of specimen<br>Using student's microscope<br>Using certain required chemical for test<br>Dissection of specimen<br>Preparing journal though drawing various figures with description<br>Learn through charts/model<br>Field visits for live experience.<br>Preparing field visit note. |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| 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.                 | External Examination Evaluation includes Lab Work Assignment-20(40%),Viva voice/Lab Quiz-20(40%),Attendance-10(20%)Which makes total 50 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>

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(Bachelor of Science)(Undergraduate)  
B. Sc. (UG) Semester-II

|                             |                    |                     |                              |
|-----------------------------|--------------------|---------------------|------------------------------|
| Course Code                 | <b>UAS2MIBOT01</b> | Title of the Course | Introduction to Archegoniate |
| Total Credits of the Course | 02                 | Hours per Week      | 02                           |

|                    |                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Objectives: | To make students familiar with:<br>Taxonomy, Morphology, Anatomy and Evolutionary significance of Non-flowering plants which spread over three major groups such as Bryophytes, Pteridophytes and Gymnosperms. |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Unit           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Weightage* (%) |
| 1.             | <b>Introduction to Archegoniate:</b> Unifying features of archegoniates, Transition to land habit, Alternation of generations. <b>Bryophytes:</b> General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of Riccia, Anthoceros, Sphagnum and Funaria (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum. Contribution of Prof. Shiv Ram Kashyap                                                 | 50%            |
| 2.             | <b>Pteridophytes :</b> General characteristics, Classification (up to family), morphology, anatomy and reproduction of Lycopodium, Selaginella and Equisetum (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and conomical importance of Pteridophytes. Contribution of Prof. Birbal Sahni.<br><b>Gymnosperms:</b> General characteristics, Distribution, Classification (up to family), morphology, anatomy and reproduction of Cycas and Gnetum (Developmental details not to be included). Ecological and economical importance | 50%            |

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|                               |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Teaching-Learning Methodology | Classroom interactions, Chalk and talk<br>Multimedia presentation<br>Chart/model presentation<br>Live /preserved specimen observation<br>Student seminar and unit test, quiz etc<br>Question bank circulation<br>Students assignments<br>Student counselling for any problem of subject understanding<br>Student-Teacher interaction on social media platform for any query (MS team, Google classroom, email, etc) |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| 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.                 | External Examination(25 Marks)                                                                                                                                             | 50           |

| Course Outcomes: Upon completion of this course, the students will be able to: |                                                                                                                                                                                               |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                                                                             | gain knowledge theoretically and practically archegoniates like bryophytes, Pteridophytes and gymnosperms---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.                         | Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot,Allahabad. |
| 3                          | Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.                 |



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Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.

On-line resources : Shodhganga

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(Bachelor of Science)(Undergraduate)

**B. Sc. (UG) Semester-II**

|                             |                                                                                                                                                                                                                        |                     |           |  |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|--|
| Course Code                 | <b>UAS2MIBOT02</b>                                                                                                                                                                                                     | Title of the Course | Practical |  |
| Total Credits of the Course | 02                                                                                                                                                                                                                     | Hours per Week      | 04        |  |
| Course Objectives:          | To make students familiar with:<br>1. To get hands on training to use various biology laboratory equipment.<br>2. To do experiment as per the given syllabus through fresh/preserved specimen/slides/models/charts etc |                     |           |  |

| No | Practical                                                                                                                                                                                                                                                                                                                                       |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Riccia – Morphology of thallus, Sex organs and sporophyte                                                                                                                                                                                                                                                                                       |
| 2. | Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).                                                                                                                                                               |
| 3. | Sphagnum- Morphology of plant, whole mount of leaf (permanent slide only).                                                                                                                                                                                                                                                                      |
| 4. | Funaria- Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.                                                                                                                        |
| 5. | Study of Lycopodium                                                                                                                                                                                                                                                                                                                             |
| 6. | Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).                                                                                                      |
| 7. | Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide)                                                                               |
| 8. | Cycas- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide). |

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|            |                                                                 |
|------------|-----------------------------------------------------------------|
| <b>9.</b>  | Contribution of various scientists in the field of archegoniate |
| <b>10.</b> | Submission/project/Fieldtrip                                    |

|                               |                                                                                                                                                                                                                                                                                                                            |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Teaching-Learning Methodology | Observation of specimen<br>Handling of specimen<br>Using student's microscope<br>Using certain required chemical for test<br>Dissection of specimen<br>Preparing journal though drawing various figures with description<br>Learn through charts/model<br>Field visits for live experience.<br>Preparing field visit note. |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**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 25 Marks. | 50         |
| 2.      | External Examination Evaluation includes Lab Work Assignment-10(40%),Viva voice/Lab Quiz-10(40%),Attendance-05(20%)Which makes total 25Marks.  | 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>

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(Bachelor of Science)(Undergraduate)  
B. Sc. (UG) Semester-II

|                             |                    |                     |                              |
|-----------------------------|--------------------|---------------------|------------------------------|
| Course Code                 | <b>UAS2IDBOT01</b> | Title of the Course | Plants and Human welfare -II |
| Total Credits of the Course | 02                 | Hours per Week      | 02                           |

|                    |                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Objectives: | To make students familiar with:<br>Common name, Botanical name ,family ,Variety, geographical distribution, important constituents and plants used as fruits, sugar, oil crops and spices. |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Course Content |                                                                                                                                                                                                                                                                                                                                                    |                 |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Unit           | Description                                                                                                                                                                                                                                                                                                                                        | Weight age* (%) |
| 1.             | Fruits and Sugar Producing Plants:<br>Common name, Botanical name ,family ,Variety, geographical distribution, important constituents and uses of :Mango,Date<br>Palm,Banana,Apple,Grapes,Guava,Pomegranate,Papaya,Peach,Cherry,Jujube, Mulberry,Jamun,Watermelon,Muskmelon.<br>Sugar Producing Plants: Sugarcane, Sugar Beet.                     | 50%             |
| 2.             | Oil Crops:<br>Common name, Botanical name ,family ,Variety, geographical distribution, important constituents and uses of :<br>Groundnut,Castor,Linseed,Sesame,Mustard,Palm,Coconut,Khas.<br>Spices and Condiments:Ginger,Turmeric,Cinnamon,Cloves,Saffron,Black Pepper,Cardamom,Red Pepper,Fennel,Corinder,Carway,Cumin,Celery,Indian Dill,Anise. | 50%             |

|                               |                                                                                                                                       |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Teaching-Learning Methodology | Classroom interactions, Chalk and talk<br>Multimedia presentation<br>Chart/model presentation<br>Live /preserved specimen observation |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|

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|  |                                                                                                                                                                                                                                                                            |
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|  | Student seminar and unit test, quiz etc<br>Question bank circulation<br>Students assignments<br>Student counselling for any problem of subject understanding<br>Student-Teacher interaction on social media platform for any query (MS team, Google classroom, email, etc) |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**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.      | External 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 fruits, sugars, oil crops and spices. |
| 2, | Understand about basic food ingredients and their uses.                                            |

**Suggested Reference Books:**

| Sr. No. | Reference Books                                                                                                 |
|---------|-----------------------------------------------------------------------------------------------------------------|
| 1.      | Text book of Botany-Diversity of Microbes and Cryptogams-Singh,Pande and Jain                                   |
| 2.      | Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot,Allahabad.          |
| 3.      | Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.                          |
| 4       | Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India. |

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**Vallabh Vidyanagar, Gujarat**

**Syllabus effective from the Academic Year 2026-2027**



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| On-line resources : Shodhganga |
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 Vallabh Vidyanagar, Gujarat  
 Syllabus effective from the Academic Year 2026-2027



(Bachelor of Science)(Undergraduate)  
 B. Sc. (UG) Semester-II

|                             |                                                                                                                                                                                                                        |                     |           |  |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|--|
| Course Code                 | <b>UAS2IDBOT02</b>                                                                                                                                                                                                     | Title of the Course | Practical |  |
| Total Credits of the Course | 02                                                                                                                                                                                                                     | Hours per Week      | 04        |  |
| Course Objectives:          | To make students familiar with:<br>1. To get hands on training to use various biology laboratory equipment.<br>2. To do experiment as per the given syllabus through fresh/preserved specimen/slides/models/charts etc |                     |           |  |

| No | Practical                                                                            |
|----|--------------------------------------------------------------------------------------|
| 1. | Botanical name,Family,Morphology of :<br>Mango, Date Palm,Banana,Apple,Grapes,Guava, |
| 2  | Botanical name,Family,Morphology of Pomegranate,Papaya,Peach,Cherry,Jujube           |
| 3. | Botanical name,Family,Morphology of Mulberry,Jamun,Watermelon,Muskmelon              |
| 4. | Botanical name,Family,Morphology of Groundnut,Castor,Linseed,Sesame                  |
| 5. | Botanical name,Family,Morphology of Mustard,Palm,Coconut,Khas                        |
| 6. | Botanical name,Family,Morphology of, Ginger,Turmeric,Cinnamon,Cloves,Saffron         |
| 7. | Botanical name,Family,Morphology of Black Pepper,Cardamom,Red Pepper, Fennel         |
| 8  | Botanical name,Family,Morphology of Corinder,Carway,Cumin,Celery,Indian Dill,Anise   |
| 9  | Field trip/Submission/ Project report                                                |

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|                               |                                                                                                                                                                                                                                                                                                                            |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Teaching-Learning Methodology | Observation of specimen<br>Handling of specimen<br>Using student's microscope<br>Using certain required chemical for test<br>Dissection of specimen<br>Preparing journal though drawing various figures with description<br>Learn through charts/model<br>Field visits for live experience.<br>Preparing field visit note. |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| 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.                 | External Examination Evaluation includes Lab Work Assignment-10(40%),Viva voice/Lab Quiz-10(40%),Attendance-05(20%)Which makes total 50 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.     |

| 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-I1

|                             |                    |                     |                                              |
|-----------------------------|--------------------|---------------------|----------------------------------------------|
| Course Code                 | <b>UAS2VABSC01</b> | Title of the Course | <b>Introduction to Environmental Science</b> |
| Total Credits of the Course | 02                 | Hours per Week      | 02                                           |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Objectives: | <ul style="list-style-type: none"> <li>- To introduce students to the core concepts of environmental sustainability.</li> <li>- To analyze current environmental challenges and their impact.</li> <li>- To explore mitigation strategies and government initiatives for environmental protection.</li> <li>- To inspire students through case studies of young environmental entrepreneurs.</li> </ul> <p>To develop critical thinking and practical skills for addressing environmental issues.</p> |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Unit           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Weightage* (%) |
| 1.             | <p><b>Introduction to Environmental Science:</b> Core concepts, interdisciplinary nature.</p> <p><b>Principles of Sustainability:</b> Ecological, economic, and social dimensions.</p> <p><b>Ecosystems and Biodiversity:</b> Importance, threats, and conservation.</p> <p><b>Climate Change Basics:</b> Causes, impacts, and global responses.</p> <ul style="list-style-type: none"> <li>- <b>Class Activity:</b> Group discussions on local environmental issues and their connection to global sustainability.</li> </ul> <p><b>Pollution:</b> Air, water, soil; sources, impacts, and mitigation.</p> <p><b>Waste Management:</b> Types, impacts, and sustainable solutions (circular economy).</p> <p><b>Resource Depletion:</b> Water, energy, minerals; impacts and conservation.</p> <p><b>Deforestation and Habitat Loss:</b> Causes, impacts, and restoration</p> | 50%            |

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|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|    | <p>efforts.</p> <p><b>Renewable Energy:</b> Types, benefits, and implementation.</p> <p><b>Class Activity:</b> Case study analysis of a specific environmental challenge and brainstorming mitigation strategies.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |
| 2. | <p><b>Environmental Laws and Regulations:</b> National and international frameworks.</p> <p><b>Government Policies and Programs:</b> Related to pollution control, waste management, and renewable energy.</p> <p><b>Sustainable Development Goals (SDGs):</b> Relevance and implementation.</p> <p><b>Corporate Social Responsibility (CSR) and Environmental Governance.</b></p> <p><b>Class Activity:</b> Mock policy debate on a proposed environmental regulation.</p> <ul style="list-style-type: none"> <li>- <b>Case Studies of Young Environmental Entrepreneurs:</b> Success stories and innovations.</li> </ul> <p><b>Green Startups and Sustainable Businesses:</b> Opportunities and challenges.</p> <p><b>Career Opportunities in the Environmental Sector:</b> Research, policy, consulting and entrepreneurship.</p> <p><b>Sustainable Agriculture and Eco-tourism.</b></p> <p><b>Class Activity:</b> Guest lecture by a young environmental entrepreneur or a field visit to a sustainable business.</p> | 50% |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Teaching-Learning Methodology | <p>Classroom interactions, Chalk and talk</p> <p>Multimedia presentation</p> <p>Chart/model presentation</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> <p>Student-Teacher interaction on social media platform for any query (MS team, Google classroom, email, etc)</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 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:

- Students will be able to understand and explain the principles of environmental sustainability.
- Students will be able to analyze and discuss current environmental challenges and their impact.
- Students will be able to evaluate and propose mitigation strategies for environmental issues.
- Students will be able to understand and discuss government policies and initiatives related to environmental protection.
- Students will be inspired and informed about career opportunities in the environmental field through case studies

**Suggested Reference Books:**

| Sr. No. | Reference Books                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | <ol style="list-style-type: none"><li>1. "Environmental Studies" by ErachBharucha</li><li>2. "Textbook of Environmental Studies for Undergraduate Courses" by C.P. Kaushik and AnubhaKaushik</li><li>3. "Environmental Science: Towards a Sustainable Future" by Richard T. Wright and Dorothy F. Boorse (Indian Edition)</li><li>4. "Waste Management: Technology and Sustainable Development" by M. Dutta</li><li>5. "Entrepreneurship Development" by S.S. Khanka</li></ol> |

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On-line resources : Shodhganga,INFLIBNET

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