



(Bachelor Of Sciences) (B. Sc. (BOTANY))
(B.Sc.) (Botany) Semester III

| | | | |
|-----------------------------|---------------------------|---------------------|---|
| Course Code | US03CBOT21 (T) | Title of the Course | PHYCOLOGY, MYCOLOGY AND PHYTOPATHOLOGY |
| Total Credits of the Course | 04 | Hours per Week | 04 |

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| Course Objectives: | <p>1. to make acquainted with the basic characteristic features of lower group of plants such as Algae and Fungi with suitable examples of each sub categories.</p> <p>2. to give exposure for applied role and importance of such lower groups of plants.</p> <p>3. to make aware for various plant pathological features of our important agricultural crops.</p> |
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| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | <p>Phycology: General characteristics of Cyanophyta, Xanthophyta, Chlorophyta, Charophyta, Phaeophyta and Rhodophyta. Type study: <i>Nostoc, Vaucheria, Chlamydomonas, Chara, Ectocarpus</i> and <i>Polysiphonia</i>. (Classification (as per G. M. Smith), Occurrence, Morphology, thallus organization, Cell structure, Reproduction and life-cycle). Significant contributions of renowned 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.</p> | 25% |
| 2. | <p>Mycology: General Characteristic features of Chytridiomycota, Oomycota, Zygomycota, Ascomycota, Basidiomycota. Type study: <i>Synchytrium, Phytophthora, Albugo, Aspergillus, Neurospora, Agaricus, Alternaria</i>. (Classification (classification as per G. C. Ainsworth, 1973), Occurrence, Morphology, thallus organization, Cell structure, Reproduction and life-cycle). Bioluminescence, Fairy Rings and Mushroom Cultivation.</p> | 25% |
| 3. | <p>Symbiotic association and Applied mycology: Symbiotic associations: Lichen - Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction. Symbiotic associations: Mycorrhiza - Ectomycorrhiza, Endomycorrhiza and their significance. Applied Mycology: Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites</p> | 25% |





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| | (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology. | |
| 4. | <p>Phytopathology: Major Plant Diseases: Differentiation between bacterial, viral and fungal diseases using morphological symptoms. Study of the following diseases (symptoms, causal organism, disease cycle and disease control). Bacterial diseases – Citrus Canker, Angular leaf spot of cotton. Viral diseases -Leaf curl of papaya, Yellow vein mosaic in bhindi. Fungal diseases- White rust of crucifers, Red rot of sugarcane, Tikka disease of groundnut, and Stripe rust of wheat. Phytoplasma diseases: Little leaf brinjal.</p> | 25% |

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

| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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





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| 1. | Learn about the General characteristics of Cyanophyta, Xanthophyta, Chlorophyta, Charophyta, Phaeophyta and Rhodophyta with the one or more examples of life forms for each. |
| 2. | Explore the Role of algae in the environment, agriculture, biotechnology and industry. |
| 3. | Learn about the General Characteristic features of Chytridiomycota, Oomycota, Zygomycota, Ascomycota, Basidiomycota with their type study. |
| 4. | Study the symbiotic association and applied mycology. |
| 5. | Study the major plant diseases and its significance. |

Suggested References:

| Sr. No. | References |
|---------|--|
| 1. | Dutta A. C. Botany |
| 2. | Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K. |
| 3. | Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). |
| 4. | B. R. Vashistha, Algae |
| 5. | B. R. Vashistha, Fungi |
| 6. | Gangulee and Kar, College Botany Vol 2 |
| 7. | John Wiley & Sons, Introductory Mycology, (Asia) Singapore. 4th edition. |
| 8. | Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd. |
| 9. | Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India. Kumar, H.D. (1999). |
| 10. | Singh R. S. Plant Pathology |
| 11. | Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition. |

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

On-line Resources





SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25))
Syllabus with effect from the Academic Year 2021-2022

www.biologydiscussion.com





(Bachelor Of Sciences) (Botany)
(B.Sc.) (Botany) Semester (III)

| | | | |
|-----------------------------|---------------------------|---------------------|---|
| Course Code | US03CBOT22 (T) | Title of the Course | PLANT ANATOMY, PHYSIOLOGY, TAXONOMY AND BIOINFORMATICS |
| Total Credits of the Course | 04 | Hours per Week | 04 |

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| Course Objectives: | <ol style="list-style-type: none"> 1. to make aware about plant tissue organization and its role. 2. to come across physiological functioning of plant system such as transpiration, dormancy, germination, growth hormone, vernalization and photoperiodism etc 3. to explore angiosperm domain through learning families and its features. 4. to integrate plant knowledge and computational methodology to solve many biological problems through learning the basic concept of bioinformatics. |
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| Course Content | | |
|----------------|---|----------------|
| Unit | Description | Weightage* (%) |
| 1. | <p>Plant Anatomy: Introduction and scope of Plant Anatomy: Applications in systematics, forensics, and pharmacognosy. Plant tissues: Classification of tissues; Simple and complex tissues. Plant Histology: Internal organization of plant body: The three tissue systems, types of cells and tissues. Meristem: Introduction, classification, cytological characters. Parenchyma: Shape and arrangement, structure and contents. Collenchyma: Position in the plant body, structure, and arrangement. Sclerenchyma: structure and types. Xylem: cell types and their cytology. Phloem: cell types and their cytology.</p> | 25% |
| 2. | <p>Plant Physiology: Transpiration and Guttation. Seed dormancy and germination. Plant growth and growth regulators: Growth and development: Definitions; phases of growth and factors; Plant hormones: Auxins, Gibberellins, Cytokinins, Abscissic acid and Ethylene. History of their discovery, mechanism of action, chemical nature (basic structure), bioassay and physiological roles. Physiology of flowering: Photoperiodism, flowering stimulus, florigen concept, vernalization.</p> | 25% |





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| 3. | <p>Plant Taxonomy: Biological concept of species. General Characters, with Floral formula and floral diagram citing Examples and Economic importance of following: (classification as per B&H)</p> <p><u>Dicotyledonae:</u> <u>Polypetlae:</u> Annonaceae, Brassicaceae, Meliaceae, Leguminosae, Myrtaceae. <u>Gamopetalae:</u> Rubiaceae, Asteraceae, Lamiaceae, <u>Apetalae:</u> Euphorbiaceae, and <u>Monocotyledonae:</u> Liliaceae.</p> | 25% |
| 4. | <p>Introduction to Bioinformatics: Introduction: What is bioinformatics? Definition, A multidisciplinary approach, Branches of Bioinformatics, History, Aim, Scope and Research areas of Bioinformatics, applications of bioinformatics. Bioinformatics in India-the flourishing approach. Databases in Bioinformatics: Introduction, Biological Databases, Classification, format of Biological Databases, Biological Database Retrieval System.</p> | 25% |

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





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

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| 1. | Know about Plant Tissue organization and its functional aspects. |
| 2. | Understand various Physiological behaviour of plants and its expression. |
| 3. | Familiarize with Biological Concept of species and some systematics of plant families. |
| 4. | Learn about Introductory Bioinformatics and its databases. |

Suggested References:

| Sr. No. | References |
|---------|---|
| 1. | Gangulee, Das and Dutta, College Botany Vol 1 |
| 2. | B. P. Pandey, Taxonomy of angiosperms |
| 3. | V. Verma, Plant Physiology |
| 4. | De Robertis and De Robertis, Cell and Molecular Biology |
| 5. | Sharma, Munjal and Shankar, A Text book of Bioinformatics (Rastogi publication) |

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

On-line Resources

www.biologdiscussion





(Bachelor Of Sciences) (Botany)
(B.Sc.) (Botany) Semester (III)

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|-----------------------------|---------------------------|---------------------|-------------------------|
| Course Code | US03CBOT23 (P) | Title of the Course | BOTANY PRACTICAL |
| Total Credits of the Course | 04 | Hours per Week | 08 |

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| Course Objectives: | 1. To get hands on training to use various botany laboratory equipment. 2. To do experiment as per the given syllabus through fresh/preserved specimen/slides/models/charts etc |
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| Course content [equal Weightage (%) for each practical] | |
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| PART 1 (Practical based on US03CBOT21) | |
| No. | AIM |
| 1. | Study of <i>Nostoc</i> and <i>Vaucheria</i> (Classification, Thallus morphology, reproduction through mounting or permanent slides/charts/photographs). |
| 2. | Study of <i>Chlamydomonas</i> and <i>Chara</i> (Classification, Thallus morphology, reproduction through mounting or permanent slides/charts/photographs). |
| 3. | Study of <i>Ectocarpus</i> and <i>Polysiphonia</i> (Classification, Thallus morphology, reproduction through mounting or permanent slides/charts/photographs). |
| 4. | Study of <i>Synchytrium</i> , <i>Aspergillus</i> and <i>Neurospora</i> , <i>Alternaria</i> . (Classification, Thallus morphology, reproduction through mounting/permanent slides/charts/photographs). |
| 5. | Study of types of Lichens (through specimen/ charts/slides) |
| 6. | Study of types of mycorrhizal association. (through specimen/ charts/photographs) |
| 7. | Study of white rust of crucifers (specimen showing symptoms on plant parts, causal organisms through sectioning and or permanent slides/charts/photographs). |
| 8. | Study of early blight of potato (specimen showing symptoms on plant parts, causal organisms through sectioning and or permanent slides/charts/photographs). |
| 9. | Study of late blight of potato (specimen showing symptoms on plant parts, causal organisms through sectioning and or permanent slides/charts/photographs) |
| 10. | Study of Rust of wheat (specimen showing symptoms on plant parts, causal organisms through sectioning and or permanent slides/charts/photographs). |
| 11. | Study of Tikka disease of ground nut (specimen showing symptoms on plant parts, causal organisms through sectioning and or permanent slides/charts/photographs). |
| 12. | Preparation of potato dextrose culture medium and slants. |
| 13. | To enumerate the steps involved for Culturing of fungi. |





| Course content (contd.) | |
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| No. | PART 2 (Practical based on US03CBOT22) AIM |
| 1 | Study of mitosis in onion root tips using squash preparation. (to understand role of Meristem) |
| 2 | Study of parenchyma, chlorenchyma and aerenchyma using free hand sectioning. |
| 3 | Histochemical localization of lignin, crystals and Callose. |
| 4 | Study of collenchyma in the young stem of sunflower and localization of cellulose. |
| 5 | Study of Sclerenchyma in maceration. |
| 6 | Study of xylem cells in maceration. |
| 7 | To compare the rate of transpiration using Farmer/Ganong photometer |
| 8 | Seed viability test (tetrazolium test) |
| 9 | To understand mechanism of action, chemical nature and physiological role of Plant hormones (Auxins, Gibberellins, Cytokinins, Abscissic acid and Ethylene). |
| 10 | To understand photoperiodism (LDP/SDP/DNP) through models/charts. |
| 11 | Study of diagnostic characters of the members of family Annonaceae, Brassicaceae, Meliaceae, Myrtaceae. |
| 12 | Study of diagnostic characters of the members of family Leguminosae (sub families: Papilionaceae, Caesalpinae, Mimosaceae). |
| 13 | Study of diagnostic characters of the members of family Rubiaceae, Asteraceae, Lamiaceae. |
| 14 | Study of diagnostic characters of the members of family Euphorbiaceae, and Liliaceae |
| | Botanical Excursion |

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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 | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |





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| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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| Course Outcomes: Having completed this course, the learner in the laboratory course, will be able to | |
| 1. | Gain hands-on experience of using various optical instruments and making temporary mountings. |
| 2. | Identifying various pathogens for plant diseases. |
| 3. | Study the characteristics of algae, fungi and lichens. |
| 4. | Study the characteristics of some selected plant families and their economic role through specimens/charts/field specimens. |
| 5. | Carried out field visits to explore ecological understanding and learn range of biodiversity. |

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| Suggested References: | |
| Sr. No. | References |
| 1. | Practical botany Vol 1 and 2 Ashok kumar Bendre |

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| On-line resources to be used if available as reference material |
| On-line Resources |
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(Bachelor Of Science) (Botany)
 (B.Sc.) (Botany) Semester (IV)

| | | | |
|-----------------------------|---------------------------|---------------------|---|
| Course Code | US04CBOT21 (T) | Title of the Course | ARCHEGONIATES, ECONOMIC AND NUTRACEUTICAL BOTANY |
| Total Credits of the Course | 04 | Hours per Week | 04 |

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| Course Objectives: | 1. to learn about evolved land plants from lower group with their ecological significance. 2. to learn economic important plants and their significant role on wide scale. 3. to get knowledge about nutritional value of some plants and their great role in human health. |
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| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | <p>Archegoniates: Introduction to Archegoniates: Unifying features of archegoniates; Transition to land habit; Alternation of generations.</p> <p>Bryophytes: General characteristics; Adaptations to land habit; Classification; Range of thallus organization. Type Studies- Classification of Bryophytes (up to family), morphology, anatomy and reproduction of <i>Marchantia</i>, <i>Pellia</i>, <i>Anthoceros</i>, and <i>Funaria</i>. Ecological and economic importance of bryophytes with special reference to Sphagnum</p> | 25% |
| 2. | <p>Pteridophytes: General characteristics; Classification; Early land plants -Rhynia. Type Studies- Classification of Pteridophytes (up to family), morphology, anatomy and reproduction of <i>Psilotum</i>, <i>Selaginella</i>, <i>Marsilea</i> (Developmental details not to be included). Apogamy, and Apospory, Heterospory and Seed habit, Telome theory, Stelar evolution.</p> <p>Gymnosperms: General characteristics, Type study-classification of Gymnosperms (up to family), morphology, anatomy and reproduction of <i>Pinus</i> and <i>Gnetum</i> (Developmental details not to be included). Ecological and economic importance.</p> | 25% |





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| 3. | <p>Economic Botany: Major crops: Introduction with their distribution, botanical name, family, parts used and economic importance of followings: Cereals: Wheat and Rice. Legumes: Chick pea, Pigeon pea and fodder legumes. Sources of sugars and starches: potato, sugarcane. Spices: fennel, saffron, clove, and black pepper. Beverages: Tea, Coffee. Sources of oils and fats: Groundnut, Coconut, Linseed, Soybean, Mustard. Natural Rubber: <i>Hevea sp.</i> Drug-yielding plants: <i>Cinchona</i>, <i>Digitalis</i>, <i>Papaver</i> and <i>Cannabis</i>. Timber plants: <i>Teak</i> and <i>Pine</i>. Fibers: Cotton, Coir and Jute. Essential oil yielding plants: <i>Rosa</i>, <i>Vetiveria</i>, <i>Santalum</i> and <i>Eucalyptus</i></p> | 25% |
| 4. | <p>Nutraceuticals: Bridging the gap between food and drug. Brief idea about some Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina. Introduction to Nutraceuticals as Science: Historical perspective, classification, scope & future prospects. Applied aspects of the Nutraceutical Science. Sources of Nutraceuticals. Properties, structure and functions of various Nutraceuticals: Glucosamine, Octacosanol, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate and omega fatty acids. Use of grape products, flaxseed oil as Nutraceuticals.</p> | 25% |

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

| Course Outcomes: Having completed this course, the learner will be able to | |
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| 1. | Unifying features of archegoniate, General characteristics of Bryophytes, Pteridophyte and Gymnosperms. |
| 2. | Understand the type study specimen from each group such as <i>Marchantia</i> , <i>Pellia</i> , <i>Anthoceros</i> , <i>Funaria</i> , <i>Psilotum</i> , <i>Selaginella</i> , <i>Marsilea</i> , <i>Pinus</i> and <i>Gnetum</i> . |
| 3. | Explore the economic importance of major crops. |
| 4. | Aware about Brief idea on some Nutraceutical rich supplements, with applications of Nutraceutical in daily life. |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1. | Gangulee and Kar, College Botany Vol 2 : |
| 2. | Kokate ,Purohit and Gokhle, Pharmacognosy : |
| 3. | B. R. Vasistha and N. S. Parihar, Text Book of Pteridophyta |
| 4. | P.C. Vasistha, Text book of Gymnosperm |
| 5. | S.L.Kochhar Economic botany in the tropics |
| 6. | Robert E.C.Wildman,Handbook of Nutraceuticals and Functional foods by |





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

On-line Resources

www.biologydiscussion.com





(Bachelor Of Science) (Botany)
(B.Sc.) (Botany) Semester (IV)

| | | | |
|-----------------------------|---------------------------|---------------------|--|
| Course Code | US04CBOT22 (T) | Title of the Course | PLANT ANATOMY, EMBRYOLOGY, TISSUE CULTURE AND BASIC MOLECULAR BIOLOGY |
| Total Credits of the Course | 04 | Hours per Week | 04 |

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| Course Objectives: | 1. to learn internal anatomy of various plant organs and its growth. 2. to learn reproduction biology through basic embryology study. 3. to get knowledge on basics of plant tissue culture techniques. 4. to learn basic molecular biology |
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| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Plant Anatomy: Structure of epidermal cells; Structure, function and types of Stomata. Structure, distribution, types and function of Laticifers. Structure, distribution, functions and ecology of Nectaries. Structure and activity of Vascular Cambium. Structure and function of Periderm. Secondary growth of stem of <i>Leptadenia</i> and <i>Boerhaavia</i> . | 25% |
| 2. | Plant Embryology: Introduction, History (contributions of G. B. Amici, W. Hofmeister, E. Strasburger, S. G. Nawaschin, P. Maheshwari, B. M. Johri, W.A. Jensen, J. Heslop Harrison) and scope. Induction of flowering; flower as a modified determinate shoot. Structure of Microsporangium and Megasporangium Structure and development of male and female gametophyte Pollination: Self and cross pollination, Pollination in Commelina, Sunflower and Fig. Double fertilization. Endosperm. | 25% |
| 3. | Plant Biotechnology Scope and importance of Biotechnology Application of Biotechnology in medicine, agriculture and industry Biotechnology in biodiversity conservation. Plant Tissue culture : Definition, principle of totipotency of cell | 25% |





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| | Laboratory and Aseptic conditions, equipments. General process of Tissue culture Protoplast culture | |
| 4. | <p>Basic Molecular Biology: Nucleic acids: Historical perspective. DNA as the carrier of genetic information (Griffith's, Hershey & Chase, Avery, McLeod & McCarty, Fraenkel Conrat's experiment). DNA: Structure of DNA: Miescher to Watson and Crick- historic perspective, Salient features of double helix structure of DNA, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA in Prokaryotes, Viruses, and Eukaryotes. Organelle DNA: mitochondria and chloroplast DNA. RNA: Types and Structure of RNA. A brief introduction to Central dogma of molecular biology.</p> | 25% |

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

| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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





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| 1. | Understand the Plant's internal organization and secondary growth. |
| 2. | Know about Plant embryology and its significance. |
| 3. | Exposed towards the Plant biotechnology and its application. |
| 4. | Get knowledge on Basic molecular biology and its central dogma. |

Suggested References:

| Sr. No. | References |
|---------|--|
| 1. | A. Fahn, Plant anatomy: |
| 2. | Gangulee, Das and Dutta, College Botany Vol 1: |
| 3. | Kavi Kishore P.B., Plant tissue culture and biotechnology: |
| 4. | P.S. Verma and Agarwal, Genetics: |
| 5. | P.K.Mahapatra, Text book of Env. Biotechnology: |

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

On-line Resources

www.biologydiscussion.com





(Name of the Degree) (Programme Name)
(Degree abbreviation) (Programme Name) Semester (Use Roman numerals)

| | | | |
|-----------------------------|----------------------|---------------------|-------------------------|
| Course Code | US04CBOT23(P) | Title of the Course | Botany Practical |
| Total Credits of the Course | 04 | Hours per Week | 08 |

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| Course Objectives: | 1. To get hands on training to use various botany laboratory equipment. 2. To do experiment as per the given syllabus through fresh/preserved specimen/slides/models/charts etc |
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| Course content (equal Weightage % for all experiments) | |
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| PART 1 | |
| (Practical based on US04CBOT21) | |
| No. | AIM |
| 1 | To study <i>Marchantia</i> . (Morphology of thallus, whole mount of rhizoids & Scales, V. S. of thallus through Gemma cup, whole mount of Gemmae, V. S. of Antheridiophore, V. S. of Archegoniophore, L. S. of Sporophyte through permanent slides). |
| 2 | To study <i>Pellia</i> (Morphology of thallus, V. S. of thallus, V. S. of thallus passig through reproductive structures, L. S. sporophyte through Permanent slides). |
| 3 | To study <i>Anthoceros</i> . (Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), V. S. of thallus (permanent slide)). |
| 4 | To study <i>Funaria</i> . (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 | To study <i>Psilotum</i> . (Study of specimen, transverse section of synangium through permanent slide). |
| 6 | To study <i>Selaginella</i> . (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 | Study of life history of <i>Marsilea</i> through permanent slides. |
| 8 | To study <i>Pinus</i> . (Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores). |
| 9 | To study <i>Gnetum</i> . (Morphology (stem, male & female cones), transverse section of stem, vertical |





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| | section of ovule (permanent slide)). |
| No. | Part 1 Paper Code: US04CBOT23 (P) contd..... AIM |
| 10 | To study economic important plants (part1). 1. Cereals: Wheat (habit sketch, L. S/T.S. grain, starch grains, micro- chemical tests), Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests). 2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, microchemical tests). 3. Sources of sugars and starches: Sugarcane (habit sketch; cane juice- micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests). |
| 11 | To study economic important plants (part2). 4. Spices: Black pepper, Fennel and Clove (habit and sections). 5. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans). 6. Sources of oils and fats: Coconut- T.S. nut, Mustard–plant specimen, seeds; tests for fats in crushed seeds. 7. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs). |
| 12 | To study economic important plants (part3). 8. Rubber: <i>Hevea sp.</i> specimen, photograph/model of tapping, samples of rubber products. 9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis. Tobacco: specimen and products of Tobacco. 10. Woods: <i>Tectona</i> , <i>Pinus</i> : Specimen, Section of young stem (Photograph). 11. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; Whole mount of fiber and test for cellulose, Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber). |
| | Botanical excursion (Students are expected to visit nearby forest area or area of botanical interest for field experience. Prepare the excursion report and submit during examination) |
| | PART 2 (Practical based on US04CBOT22) |
| No. | AIM |
| 1 | Study of Epidermal system: (types of epidermis; types of trichomes-through permanent slides/charts/specimen/micrographs). |
| 2 | Study the types of stomata through peeling and imprints. |
| 3 | Study of laticifers in Papaya, <i>Euphorbia</i> and <i>Calotropis</i> . |
| 4 | Study of Cyathial nectary using free hand sectioning. |
| 5 | Study of vascular cambium and phloem tissue in T.S. (free hand sectioning). |
| 6 | Study of secondary tissues in the stem of <i>Leptadenia</i> and <i>Boerhaavia</i> (free hand sectioning). |
| 7 | To study the structure of Anther. |





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| | (Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation). |
| 8 | To study the Pollen grains. (Fresh and acetolyzed, showing ornamentation and aperture, pseudomonads, polyads, pollinia ultrastructure of pollen wall through slides/photographs/fresh material/ micrograph). |
| 9 | To Study of Pollen viability: (Tetrazolium test, Germination test: Calculation of percentage germination in different media using hanging drop method). |
| 10 | To study the structure and types of Ovule. (Types-anatropous, orthotropous, amphitropous, campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril through permanent slides/specimens/photographs). |
| 11 | To study the Female gametophyte. (ultrastructure of mature egg apparatus, Types through permanent slides/ photographs). |
| 12 | To dissect out embryo from suitable materials. |
| 13 | Histochemical localization of Tannin, Gum, Sugar, Mucilage, Starch, Lipids, Cellulose and Proteins. |
| 14 | To study the steps for Preparation of LB medium and raising E. Coli. |
| 15 | To study the steps for DNA isolation from cauliflower head. |
| 16 | To study the steps for Preparation of MS medium. |
| 17 | To study the steps for Isolation of protoplasts. |

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| Teaching-Learning Methodology | <p>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.</p> |
|-------------------------------|---|

| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |





| | | |
|----|--|-----|
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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

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|----|---|
| 1. | In the laboratory, student carryout experiments to understand |
| 2. | The life cycle of bryophytes, pteridophytes and gymnosperms. |
| 3. | Internal organization of plants such as types of stomata, nectary, laticifers, lenticels, cambium and secondary growth. |
| 4. | Various embryological parameters through experiments and models/slides/charts. |
| 5. | Histochemical studies through analytical experiments. |
| 6. | Preparation study for molecular studies. |

Suggested References:

| Sr. No. | References |
|---------|--|
| 1. | Practical botany Vol 1 and 2 Ashok kumarBendre |

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

On-line Resources





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : V

| | | | |
|-----------------------------|---------------|---------------------|----------------------------|
| Course Code | US05CBOT21(T) | Title of the Course | MICROBIOLOGY AND PHYCOLOGY |
| Total Credits of the Course | 4 | Hours per Week | 4 |

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| Course Objectives: | 1. To study the basics about microorganisms. 2. To understand the prokaryotic and eukaryotic systems. 3. To study the similarities and differences among bacteria, cyanobacteria and viruses. |
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| Course Content | | |
|----------------|---|----------------|
| Unit | Description | Weightage* (%) |
| 1. | MICROBIOLOGY: Discovery of Microorganisms, Structure and classification of microbes, Systematic position of microorganisms in biological world; classification of microorganisms and characteristic features of different groups. Methods in Microbiology: Basic principles of staining of Bacteria and Fungi, sterilization methods, culture media, pure culture methods, methods for population estimation, growth determination. | 25% |
| 2. | VIRUSES AND BACTERIA: Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV). Bacteria: Discovery, general characteristics; Types-archaebacteria, eubacteria, wallless forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction). | 25% |
| 3. | CYANOPHYTA: General characters, Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and classification of cyanophycean algae, Heterocysts, Nitrogen fixation by blue green algae, Culturing of algae, Algal bloom. | 25% |
| 4. | PHYCOLOGY-AN OVER-VIEW: General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food, flagella; methods of reproduction; 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 | 25% |





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| | algae in the environment, agriculture, biotechnology and industry. | |
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| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Permanent slides, Charts, quiz, assignments, seminars, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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| Course Outcomes: Having completed this course, the learner will be able to | |
| 1. | Understand about micro-organisms and basic principles of staining. |
| 2. | Understand cellular organization and reproduction in prokaryotes and Eukaryotes |
| 3. | Able to identify and compare the characteristics of viruses, Bacteria, Cyanobacteria and algae. |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1. | Lee, R. E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition |
| 2. | Wiley J M, Sherwood L M and Woolverton C J. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International. |
| 3. | Kumar, H. D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi |
| 4. | Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi. |
| 5. | Campbell, N. A., Reece J. B., Urry L. A., Cain M. L., Wasserman S. A. Minorsky P. V., Jackson |
| 6. | R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition. |





SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25))
Syllabus with effect from the Academic Year 2021-2022

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| 7 | Pelczar, M. J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi. |
| 8 | Singh, Pande and Jain, A text book of Botany. |
| 9 | Botany for degree students-Algae: B.R.Vashistha |

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

On-line Resources





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : V

| | | | |
|-----------------------------|---------------|---------------------|--------------------------------|
| Course Code | US05DBOT22(T) | Title of the Course | GENETICS AND MOLECULAR BIOLOGY |
| Total Credits of the Course | 2 | Hours per Week | 2 |

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| Course Objectives: | <ol style="list-style-type: none">1. To understand the structures and purposes of basic components of prokaryotic and eukaryotic cells2. The key roles of mitosis and meiosis during the life cycle.3. Contribution of different scientist in denoting basic concepts of genetics. |
|--------------------|--|

| Course Content | | |
|----------------|---|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Genetics: Introduction: Definition, scope, branches and application of genetics, selection of genetic material, Profiles of some geneticists and molecular biologists, Life cycle of some genetically important organisms like Bacteriophage, E. Coli, Yeast, Neurospora, Chlamydomonas, Maize and Arabidopsis. | 25% |
| 2. | Genetics: Linkage-Definition, History, Kinds, Linkage groups and significance. Crossing Over-Definition, Types, Mechanism, Kinds and significance. Maternal effects and cytoplasmic inheritance: Maternal effects in snails, Streptomycin resistance in Chlamydomonas, mitochondrial mutations in yeast, Kappa particles in paramecium, plastid inheritance in Mirabilis jalapa, male sterility in plants | 25% |
| 3. | Molecular Biology: Nucleic acids as carries of genetic information; Physical properties and structure of DNA and RNA. Replication of DNA: Enzyme and proteins involved in replication. Various models of DNA replication, including rolling circle, mode of replication, DNA repair mechanisms. | 25% |
| 4. | Molecular Biology: Transcription of DNA, post transcriptional modifications of RNA and control of transcription. Genetic code and its properties. | 25% |





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| | Translation: Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins. | |
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| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts, Preserved specimens, quiz, assignments, seminars, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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| Course Outcomes: Having completed this course, the learner will be able to | |
| 1. | Have knowledge of genetics, history, and lifecycle of genetically important organisms. |
| 2. | Understand the significance of linkage and crossing over. |
| 3. | Basics of molecular biology. |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1. | Watson J. D., Baker, T. A., Bell, S. P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition. |
| 2. | Snustad, D. P. and Simmons, M. J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition. |
| 3. | Klug, W. S., Cummings, M. R., Spencer, C. A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition |





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| 4 | Russell, P. J. (2010). i-Genetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition. |
| 5 | Griffiths, A.J.F., Wessler, S. R., Carroll, S. B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition. |
| 6 | Genetics, Verma and Agarwal, 9th edition |

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

On-line Resources : Articles from Google scholar





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : V

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|-----------------------------|---------------|---------------------|----------------------------------|
| Course Code | US05CBOT23(T) | Title of the Course | PLANT ECOLOGY AND PHYTOGEOGRAPHY |
| Total Credits of the Course | 4 | Hours per Week | 4 |

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| Course Objectives: | 1. To understand the basic concepts of ecology and its interactions. 2. To study the local and geographical distribution, structural adaptations of organisms in particular environmental factors. |
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| Course Content | | |
|----------------|---|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Plant Ecology: Introduction, Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis. Soil: Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development. | 25% |
| 2. | Water: Importance; States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table. Light, temperature, wind and fire. Variations; adaptations of plants to their variation. | 25% |
| 3. | Biotic interactions: Trophic organization, basic autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop. Plant communities: Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts. Ecosystems: Structure; Processes; Trophic organization; Food chains and Food webs; Ecological pyramids. Biogeochemical cycles: Carbon, Nitrogen and Phosphorus.. | 25% |
| 4. | Phytogeography: Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India | 25% |





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| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts, quiz, assignments, seminars, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|--|--|
| 1. | Understand ecological concepts, with significance of its interrelationships. |
| 2. | Do analysis of various components of ecosystems. |
| 3. | Learn the concepts of phytogeography at large scale. |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1. | Odum, E. P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition. |
| 2. | Singh, J. S., Singh, S. P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India |
| 3. | Sharma, P. D. Ecology and Environment. Rastogi Publications, Meerut, India. 13th edition. |
| 4. | Wilkinson, D. M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A. |
| 5. | Kormondy, E. J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition. |





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

On-line Resources : Articles from Google scholar





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : V

| | | | |
|-----------------------------|---------------|---------------------|------------------------------|
| Course Code | US05CBOT24(T) | Title of the Course | ANGIOSPERM PLANT SYSTEMATICS |
| Total Credits of the Course | 4 | Hours per Week | 4 |

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| Course Objectives: | 1. To study the concepts and importance of Plant systematic. 2. To learn the importance of herbarium preparation. 3. To learn describing plant, its classification and identification with classical as well as advanced methods. |
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| Course Content | | |
|----------------|---|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Significance of Plant systematics: Introduction to systematics; Plant identification, Evidences from palynology, cytology, phytochemistry and molecular data. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora. Documentation: Flora, Monographs, Journals; Identification Keys: Single access and Multi-access. | 25% |
| 2. | Taxonomic hierarchy: Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary). Botanical nomenclature: Principles and rules (ICBN); Ranks and names; typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids. | 25% |
| 3. | Systems of classification: Plant classification approach (cladistics, phenetics, phyletics). Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist. Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series). | 25% |
| 4. | Phylogeny of Angiosperms: Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary | 25% |





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| | relationship (phylogenetic tree, cladogram). | |
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| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts, quiz, Herbaria, Preserved specimens, seminars, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|--|---|
| 1. | Understand the significance of angiosperm plant Systematics with their taxonomic hierarchy. |
| 2. | Learn nomenclature, systems of classification and phylogeny of angiosperm plants. |
| 3. | Understand classical and modern taxonomical studies. |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1 | Singh, (2012). Plant Systematics: Theory and Practice Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition |
| 2 | Jeffrey, C. (1982). An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge. |
| 3 | Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics- A Phylogenetic Approach. Sinauer Associates Inc., U.S.A. 2nd edition. |
| 4 | Shah G. L. (1978); Flora of Gujarat State. Part I & II. Pub. By Sardar Patel University, Gujarat. |
| 5 | Singh, Pandey and Jain: A Text Book of Botany-Angiosperms. |





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|----|---|
| 6 | B. P. Pandey, A text book of botany-Angiosperms. |
| 7 | Heywood (ed.) Modern Methods in Plant Taxonomy.. |
| 8 | Jeffery, C. An Introduction to Plant Taxonomy |
| 9 | Jones, S.B., Luchsinger, A.L.1987. Plant Systematics |
| 10 | Judd, W.S; Campbell, C.S., Kellogg, E.A; Stevens, P.F. 1999. Plant Systematics: A Phylogenetic approach |
| 11 | Lawrence, G.H.M. Vascular Plant Systematics. |
| 12 | Gurucharn Singh, (1999), Plant Systematics; Oxford & IBH pub. New Delhi |

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

On-line Resources : Articles from Google scholar





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : V

| | | | |
|-----------------------------|---------------|---------------------|------------------|
| Course Code | US05CBOT25(P) | Title of the Course | BOTANY PRACTICAL |
| Total Credits of the Course | 6 | Hours per Week | 12 |

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| Course Objectives: | <ol style="list-style-type: none">1. To study the diversity and activity of microorganisms in natural environments, their mutual interactions, survival and adaptation.2. To understand the distribution and abundance of living things in physical environment.3. To understand the affinities among organisms. |
|--------------------|--|

| Course Content | | |
|----------------|---|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Microbiology and Phycology <ol style="list-style-type: none">1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle.2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule.3. Gram staining: Endospore staining with malachite green using the (endospores taken from soil bacteria).4. Phycology: Study of vegetative and reproductive structures of <i>Blue green algae</i>, <i>Green algae</i>, <i>Brown algae</i> and <i>Red algae</i> through electron micrographs, temporary preparations and permanent slides | 33.33% |
| 2. | Ecology <ol style="list-style-type: none">1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.2. Determination of pH of various soil and water samples (pH meter, universal indicator and pH meter)3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from two soil samples by rapid field tests.4. Determination of organic matter of different soil samples by Walkley & Black rapid titration method.5. Comparison of bulk density, porosity and rate of infiltration of water in soils of three habitats.6. Determination of dissolved oxygen of water samples from polluted | 33.33% |





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| | <p>and unpolluted sources.</p> <p>7. Study of morphological adaptations of hydrophytes and xerophytes (four each).</p> <p>8. Study of biotic interactions of the following: Stem parasite (<i>Cuscuta</i>), Root parasite (<i>Orobancha</i>); Epiphytes, Predation (Insectivorous plants).</p> <p>9. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).</p> <p>10. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.</p> <p>11. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus.</p> <p>12. Field visit to familiarize students with ecology of different sites.</p> | |
| 3. | <p>Genetics and Plant systematics</p> <p>1. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).</p> <p>2. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs.</p> <p>3. Establishing nucleic acid as genetic material through photographs/charts/models (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)</p> <p>4. Study of the following through photographs: Assembly of Spliceosome machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.</p> <p>5. Morphological studies of the representatives of angiosperm families growing in the college campus.</p> <p>6. Learn the how to identify taxa using local/regional Flora as reference.</p> <p>7. Preparation of the report of the assigned project.</p> | 33.33% |
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|-------------------------------|---|
| Teaching-Learning Methodology | Field visits, Charts, Permanent slides, Herbaria, Preserved specimens, Photographs, online content from internet. |
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| Evaluation Pattern | | |
| Sr. | Details of the Evaluation | Weightage |





| No. | | |
|-----|--|-----|
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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

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|----|---|
| 1. | Learn the basic principles of inheritance at the molecular, cellular and organism levels. |
| 2. | Abiotic and biotic factors that affect, the distribution, dispersal, and behavior of organisms, how ecological systems work at different spatial and temporal scales. |
| 3. | Biodiversity and evolution of organisms from single cell structures. |

Suggested References:

| Sr. No. | References |
|---------|--|
| 1 | Sharma, P. D. Ecology and Environment. Rastogi Publications, Meerut, India. 13th edition |
| 2 | Wilkinson, D. M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A. |
| 3 | Griffiths, A.J.F., Wessler, S. R., Carroll, S. B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition. |
| 4 | Genetics, Verma and Agarwal, 9th edition |
| 5 | Singh, (2012). Plant Systematics: Theory and Practice Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition. |
| 6 | Shah G. L. (1978); Flora of Gujarat State. Part I & II. Pub. By Sardar Patel University, Gujarat. |
| 7 | Singh, Pandey and Jain: A Text Book of Botany-Angiosperms. |
| 8 | B. P. Pandey, A text book of botany-Angiosperms |
| 9 | Kumar, H. D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi |
| 10 | Lawrence, G.H.M. Vascular Plant Systematics. |
| 11 | Gurucharn Singh, (1999), Plant Systematics; Oxford & IBH pub. New Delhi |
| | |





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

On-line Resources : Articles from Google scholar





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : V

| | | | |
|-----------------------------|---------------|---------------------|--|
| Course Code | US05DBOT26(T) | Title of the Course | TAXONOMY AND CONSERVATION OF ANGIOSPERMS |
| Total Credits of the Course | 2 | Hours per Week | 2 |

| | |
|--------------------|--|
| Course Objectives: | 1. To learn about various organizations working for the conservation of botanical wealth. 2. To learn herbarium preparations and plant preservation techniques. 3. To learn how to describe , classify and identify the plant species. |
|--------------------|--|

| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Indian Organizations as stake holder for Botanical wealth. Objectives, organizational set up, Regional Circles of Botanical survey of India, The central National Herbarium, The Indian Botanical Gardens, The Central Botanical Laboratory. Conservations of the Biological Diversity, Environmental impact studies and Future Strategies. | 25% |
| 2. | Herbarium Techniques: Field Equipments, Collection of Plant Specimens, Pressing of Specimens, Drying of Specimens, Mounting of Specimens, Herbarium Labels and Filing of Herbarium Sheets. | 25% |
| 3. | Basic Plant morphology and preservation techniques: Morphology of Leaf (types, shape, margins and aestivation), Inflorescence (racemose, cymose and special), flower (morphology of all floral parts, with floral diagram and floral formula) and Types of fruit. Preservation techniques for fruits, seeds and plant parts as museum specimen | 25% |
| 4. | Selected Family: Ranunculaceae, Capparidaceae, Rutaceae, Umbelliferae, Sapotaceae, Boraginaceae, Convolvulaceae, Poaceae. | 25% |

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|-------------------------------|---|
| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts and Preserved specimens, Herbaria, quiz, assignments, seminars, online content from internet. |
|-------------------------------|---|





| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|--|---|
| 1. | Describe and identify plants. |
| 2. | Know various organizational set ups working for the conservation of botanical wealth. |
| 3. | Learn preservation and documentation techniques. |

| Suggested References: | |
|-----------------------|--|
| Sr. No. | References |
| 1. | Singh, Pandey and Jain, A text book of Botany-Angiosperms. |
| 2. | B.P.Pandey, A text book of Botany-Angiosperms. |
| 3. | A.C. Datta, Botany for degree students |
| 4. | Gurucharn Singh, Plant systematic |

| On-line resources to be used if available as reference material |
|---|
| On-line Resources : Articles from Google scholar |
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Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : V

| | | | |
|-----------------------------|---------------|---------------------|--------------------|
| Course Code | US05DBOT27(T) | Title of the Course | BIOINSTRUMENTATION |
| Total Credits of the Course | 2 | Hours per Week | 2 |

| | |
|--------------------|---|
| Course Objectives: | 1. To know the basic principle, instrumentation and applications of various instruments used for analysis in biology. |
|--------------------|---|

| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | SPECTROPHOTOMETRY: Basic principles-Preparations of standard graph-deviation from Beer's law-Absorption spectrum-Instrumentation for colorimeter and spectrophotometer. | 25% |
| 2. | CENTRIFUGATION: Basic principle-RCF-Instrumentation-Desktop centrifuge-High speed Centrifuge- Ultracentrifuge-Analytical Centrifuge-Fixed angle rotors-vertical tube rotors-Swinging bucket rotors | 25% |
| 3. | CHROMATOGRAPHY: Basic principle, Instrumentation and applications of Paper chromatography-Thin layer chromatography ,Gas Chromatography and HPLC | 25% |
| 4. | ELECTROPHORESIS: Migration of ion in electric field-Factors affecting Electrophoretic mobility-Types –Paper Electrophoresis-PAGE-Agarose gel electrophoresis | 25% |

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| Teaching-Learning Methodology | Demonstration of instruments and techniques, Power point presentation, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|--|--|
| 1. | Know about basic principles and various separation techniques used in biological research. |
| 2. | Importance of advance instruments in biological research. |

| Suggested References: | |
|-----------------------|--|
| Sr. No. | References |
| 1. | An introduction to practical Biochemistry: Plummer |
| 2. | Instrumentation: Chatwal and Anand. |
| 3. | Modern experimental Biology: Boyer |
| 4. | Biophysical Chemistry-Principles and techniques by Upadhyay, Upadhyay and Nath |

| On-line resources to be used if available as reference material |
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| On-line Resources : Articles from Google scholar |
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Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : VI

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|-----------------------------|---------------|---------------------|----------------------------------|
| Course Code | US06CBOT21(T) | Title of the Course | PHARMACOGNOSY AND PHYTOCHEMISTRY |
| Total Credits of the Course | 4 | Hours per Week | 4 |

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|--------------------|--|
| Course Objectives: | 1. To study about identification, classification, chemical constituents, and uses of plant as drugs. 2. To understand the scopes in nutraceuticals. |
|--------------------|--|

| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Introduction to Pharmacognosy: Definition, history, scope, future and pharmacognostical scheme of Pharmacognosy. Organized and Unorganized drugs: Classification of drugs of natural origin: Alphabetical, Taxonomical, Morphological, Pharmacological, chemical, Chemotaxonomical and serotaxonomical classification. | 25% |
| 2. | Introduction to Primary and Secondary metabolites: Definition, classification, properties and test for identification of carbohydrates, proteins, lipids, alkaloids, glycosides, flavonoids, tannins, volatile oils and resins. | 25% |
| 3. | Traditional drugs of India: Study of biological source, chemical constituents and uses of following drugs: Aduca, Amla, Arjuna, Ashoka, Bhilama, Brahmi, Cassia, Chirata, Chitrak, Gokhru, Guggal, Kalejire, Lahsun, Methi, Palas, Punarnava, Shatavari, Shankpushpi, Tulsi, Tylophora. | 25% |
| 4. | Nutraceuticals: Definition, scope and future prospects. Classification-Inorganic mineral supplements, vitamin supplement, Digestive enzyme, Prebiotic, Probiotic, Dietary fibers, Cereals, Health | 25% |





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| | drinks, Antioxidants, Polyunsaturated fatty acids. Herbs as functional foods: Flax seeds, Ginkgo biloba, Spirulina, Ginseng, Garlic organo-sulphur compounds, Tea catechins, Citrus Limonoids, Soya products, Tomato lycopenes, Momordica charantia, Turmeric curcuminoids, Fenugreek. | |
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| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts, quiz, Preserved specimens, assignments, seminars, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| | |
|--|---|
| Course Outcomes: Having completed this course, the learner will be able to | |
| 1. | Know about identification, chemical ,constituents, and uses of plant drugs with their nutraceutical values. |
| 2. | Understand the importance and potential of medicinal plants |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1 | Pharmacognosy: C. S. Shah and J. S. Qadry |
| 2 | Pharmacognosy: C. K. Kokate, Purohit and Gokhle |
| 3 | Pharmacognosy: Mohmmad Ali |
| 4 | Textbook of Pharmacognosy and Phytochemistry: Shah and Seth |





5

Experimental Pharmacognosy: Rajesh Nema and C S Bhan

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

On-line Resources : Articles from Google scholar





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : VI

| | | | |
|-----------------------------|---------------|---------------------|------------------------|
| Course Code | US06CBOT23(T) | Title of the Course | ANATOMY OF ANGIOSPERMS |
| Total Credits of the Course | 4 | Hours per Week | 4 |

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|--------------------|---|
| Course Objectives: | 1. To understand the basic structural organization of plants, tissues and its growth 2. To learn adaptations and protective system in plant. |
|--------------------|---|

| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy. Structure and Development of Plant Body: Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: Polarity, Cytodifferentiation and organogenesis during embryogenic development. | 25% |
| 2. | The Tissue systems: Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers. Apical meristems: Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root | 25% |
| 3. | Vascular Cambium and Wood: Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late | 25% |





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| | wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels. | |
| 4. | Adaptive and Protective Systems: Epidermal tissue system, cuticle, epicuticular waxes, trichomes (uni- and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes. | 25% |

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| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts, quiz, assignments, seminars, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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|--|---|
| Course Outcomes: Having completed this course, the learner will be able to | |
| 1. | explain structural organization of plants, tissues, its growth and adaptations. |

| Suggested References: | |
|-----------------------|--|
| Sr. No. | References |
| 1 | Dickison, W. C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA. |
| 2 | Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA |
| 3 | Mauseth, J. D. (1988). Plant Anatomy. The Benjammin/Cummings Publisher, USA. |
| 4 | Evert, R. F. (2006) Esau's Plant Anatomy: Meristems, Cells, and Tissues of the |





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| | Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc. |
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| On-line resources to be used if available as reference material |
| On-line Resources : Articles from Google scholar |
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Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : VI

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|-----------------------------|---------------|---------------------|--------------------|
| Course Code | US06CBOT23(T) | Title of the Course | PLANT BIOCHEMISTRY |
| Total Credits of the Course | 4 | Hours per Week | 4 |

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|--------------------|---|
| Course Objectives: | 1. To learn about fundamental concepts of respiration, carbon assimilation , biological oxidation, nitrogen metabolism and enzymes. |
|--------------------|---|

| Course Content | | |
|----------------|---|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Carbon assimilation: Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric, covalent modulation and Isozymes). Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centers, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO ₂ reduction, photorespiration, C ₄ pathways; Crassulacean acid metabolism; Factors affecting CO ₂ reduction. Synthesis and catabolism of sucrose and starch. | 25% |
| 2. | Carbohydrate Metabolism: Glycolysis, Fermentation, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, TCA cycle, amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, Gluconeogenesis cyanide-resistant respiration, factors affecting respiration. | 25% |
| 3. | Lipid and Nitrogen metabolism: Lipid Metabolism: alpha, beta and omega oxidation of fatty acids. Nitrogen metabolism: Ammonification, Nitrification, Nitrate assimilation, Denitrification, Nitrogen fixation: Biological and nonbiological Nitrogen fixation, Biochemistry of nitrogen fixation, Non symbiotic and symbiotic nitrogen fixation, Nitrogen fixation in cyanobacteria, Biosynthesis of aminoacids-Reductive amination, Transamination. | 25% |





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| 4. | Enzymes: Historical background, Classification, nomenclature and importance of enzymes, role of enzymes as bio catalysts, physiological and biochemical properties, concept of holoenzymes, coenzymes, apoenzymes & prosthetic groups, mechanism and kinetics of action, enzyme inhibition, isozymes, allosteric enzymes, industrial aspects of enzymology. | 25% |
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|--------------------------------------|---|
| Teaching- Learning Methodology | Classroom interaction, Power point presentation, Charts, quiz, assignments, seminars, online content from internet. |
|--------------------------------------|---|

| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| | |
|--|--|
| Course Outcomes: Having completed this course, the learner will be able to | |
| 1. | Explain various plant processes and functions, metabolism, concepts of assimilation, biological oxidation and nitrogen fixation. |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1 | Nelson D L, Cox M M; Lehninger principles of biochemistry (forth edition) |
| 2 | Verma and Verma, Text book of Plant Physiology |
| 3 | Rodwell, Bender, Botham, Kennelly, Weil; Harper's illustrated biochemistry (31 st edition) |
| 4 | U. Satyanarayan, U. Chakrapani ; Biochemistry (fifth edition) |





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

On-line Resources : Articles from Google scholar





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : VI

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|-----------------------------|---------------|---------------------|---------------------|
| Course Code | US06CBOT24(T) | Title of the Course | PLANT BIOTECHNOLOGY |
| Total Credits of the Course | 4 | Hours per Week | 4 |

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|--------------------|---|
| Course Objectives: | 1. To learn classical and modern plant biotechnology processes for improvement in quality and quantity of the trait. 2. To pharmaceutical and food industry, in agriculture and in ecology |
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| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Plant Tissue Culture: Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation). | 25% |
| 2. | Recombinant DNA technology: Restriction endonucleases, prokaryotic and eukaryotic cloning vectors; genomic and cDNA libraries; Southern and Northern Analysis, various techniques of gene mapping and DNA fingerprinting (RFLP, RAPD, AFLP); chromosome walking, polymerase chain reaction; DNA sequencing. | 25% |
| 3. | Methods of gene transfer: <i>Agrobacterium</i> -mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes. | 25% |
| 4. | Applications of Biotechnology: Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible | 25% |





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| | vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Biosafety concerns | |
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| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts, quiz, laboratory visits, assignments, seminars, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|--|--|
| 1. | Understand classical and modern plant biotechnology processes, including breeding of healthy plants, plants with improved characteristics and plants for biomolecule production. |
| 2. | Understanding of applicative value of biotechnological processes in pharmaceutical and food industry, in agriculture and in ecology |

| Suggested References: | |
|-----------------------|--|
| Sr. No. | References |
| 1 | Bhojwani, S. S. and Razdan, M. K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands. |
| 2 | Glick, B. R., Pasternak, J. J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington. |
| 3 | Snustad, D. P. and Simmons, M. J. (2010). Principles of Genetics. John Wiley and Sons, U. K. 5th edition. |





SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25))
Syllabus with effect from the Academic Year 2021-2022

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|---|--|
| 4 | Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A. |
| 5 | B. D. Singh, Biotechnology |
| 6 | U.Satyanarayan, Biotechnology |
| 7 | P. K. Gupta, Elements of Biotechnology |

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

On-line Resources : Articles from Google scholar





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : VI

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|-----------------------------|---------------|---------------------|------------------|
| Course Code | US06CBOT25(P) | Title of the Course | BOTANY PRACTICAL |
| Total Credits of the Course | 6 | Hours per Week | 12 |

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|--------------------|---|
| Course Objectives: | <ol style="list-style-type: none">1. To study the structural arrangements in plants.2. To learn the histochemistry of tissues.3. To develop a plant <i>in-vitro</i> using plant biotechnological methods. |
|--------------------|---|

| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Plant Anatomy <ol style="list-style-type: none">1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/ museum specimens with the help of suitable examples.2. Apical meristem of root, shoot and vascular cambium.3. Distribution and types of parenchyma, collenchyma and sclerenchyma.4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres.5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular.8. Root: monocot, dicot, secondary growth.9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).11. Adaptive Anatomy: xerophytes, hydrophytes.12. Secretory tissues: cavities, lithocysts and laticifers. | 33.33% |
| 2. | Plant Biochemistry <ol style="list-style-type: none">1. Chemical separation of photosynthetic pigments.2. To study the effect of light intensity on the rate of photosynthesis.3. Effect of carbon dioxide on the rate of photosynthesis.4. To compare the rate of respiration in different parts of a plant.5. To demonstrate activity of Nitrate reductase in germinating leaves of | 33.33% |





| | | |
|----|---|--------|
| | <p>different plant sources.</p> <ol style="list-style-type: none">Detection of organic acids in plants.Estimation of reducing sugar/protein/DNA by suitable method.Demonstration of respiratory enzymes in plant tissuesAssay of amylase/urease/catalase/peroxidaseQualitative tests for carbohydratesQualitative tests for proteins.Qualitative tests for lipids | |
| 3. | <p>Plant Biotechnology and Pharmacognosy</p> <ol style="list-style-type: none">Preparation of MS medium. (Protocol)Demonstration of <i>in vitro</i> sterilization and inoculation methods using leaf and nodal explants of tobacco, <i>Datura</i>, <i>Brassica</i> etc.Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.Isolation of protoplasts. (Protocol)Construction of restriction map of circular and linear DNA from the data provided.Study of methods of gene transfer through photographs: <i>Agrobacterium</i>-mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment.Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.Identification and characterization of crude drugs as prescribed in theory course by performing suitable chemical tests.Chemical Tests for various classes of Phyto-constituents.Isolation of Caffeine/Quinine/Nicotine from suitable source.Field visit of Medicinal Plants.Visit to a biotechnology laboratory of repute. | 33.33% |

| | |
|-------------------------------|--|
| Teaching-Learning Methodology | Charts, Power point presentation, quiz, Preserved specimens, laboratory visits, assignments, seminars, online content from internet. |
|-------------------------------|--|

| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |





| | | |
|----|--|-----|
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

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

| | |
|----|---|
| 1. | Know about various tissues and structures found in plants. |
| 2. | Understand the skill requirements and applications of plant tissue culture. |

Suggested References:

| Sr. No. | References |
|---------|---|
| 1 | Experimental Pharmacognosy: Rajesh Nema and C S Bhan |
| 2 | Bhojwani, S. S. and Razdan, M. K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands. |
| 3 | Pharmacognosy: C. K. Kokate, Purohit and Gokhle |
| 4 | Glick, B. R., Pasternak, J. J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington |
| 5 | Verma and Verma, Text book of Plant Physiology. |

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

On-line Resources : Articles from Google scholar





Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : VI

| | | | |
|-----------------------------|---------------|---------------------|-----------------|
| Course Code | US06DBOT26(T) | Title of the Course | MICROTECHNIQUES |
| Total Credits of the Course | 2 | Hours per Week | 2 |

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|--------------------|--|
| Course Objectives: | 1. To study the fundamentals, types, sample preparations, techniques, and application of microscopy. |
|--------------------|--|

| Course Content | | |
|----------------|--|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Light microscopy: Properties of lenses, Optical corrections, Properties and types of objectives, Oculars and Illumination. Light microscopes: Bright field, dark field, fluorescence, phase contrast. | 25% |
| 2. | 2 Electron microscopy: Basic components of electron microscopes. Thermionic and field emission guns. Types of electron microscopes: TEM, SEM, STEM, ESEM and HVEM | 25% |
| 3. | Sample preparation and techniques for microscopy: Maceration, squash and clearing techniques. Classification of fixatives, formulas', (Plant and animal samples). Sample preparation for light microscopy: Fixation, dehydration and infiltration procedures. Embedding media for light microscopy. Stains and staining procedures- negative and positive staining procedures. | 25% |
| 4. | Microtomes: Types of microtomes: Rotary, sliding, cryostat. Histochemical localization of metabolites for light microscopy: Starch, proteins, lipids, total carbohydrates, lignins, polyphenols, nucleic acid, histones, cutin, suberin and waxes. Localization of enzymes: Peroxidase, acid phosphatase and succinic dehydrogenase. | 25% |





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|-------------------------------|--|
| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts, quiz, Preserved specimens, assignments, seminars, online content from internet. |
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| Evaluation Pattern | | |
|--------------------|--|-----------|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| | |
|--|--|
| Course Outcomes: Having completed this course, the learner will be able to | |
| 1. | know about basic concepts of microscopy, sample preparation and about microtome . |
| 2. | Learn different techniques for microscopic observation which will help them in practical applications. |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1 | Microscopy and Microtechnique: R Marimuthu, MJP Publisher, Chennai |
| 2 | The study of plant structure: Principles and selected methods- T. P. O' Brien and M E McCully |
| 3 | Botanical Microtechnique and Cytochemistry; Graeme P. Berlyn and Jerome P Micksche |
| 4 | Plant Microtechnique- Johansen, DA, McGraw Hill Book Co., New York |

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| On-line resources to be used if available as reference material |
| On-line Resources : Articles from Google scholar |





SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25))
Syllabus with effect from the Academic Year 2021-2022

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Bachelor of Science (BOTANY)
B. Sc. (BOTANY)
Semester : VI

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|-----------------------------|---------------|---------------------|--------------|
| Course Code | US06DBOT27(T) | Title of the Course | FLORICULTURE |
| Total Credits of the Course | 2 | Hours per Week | 2 |

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| Course Objectives: | 1. To develop good skill in students in floriculture and to aware them about potential of commercial market of floriculture. |
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| Course Content | | |
|----------------|---|----------------|
| Unit | Description | Weightage* (%) |
| 1. | Introduction to the basic concepts of floriculture Classification of floricultural and landscape plants Propagation of ornamental plants | 25% |
| 2. | Cut flower production like Chrysanthemum, Carnation, Orchids, Rose, Gerbera, Marigold. Postharvest handling of cut flowers | 25% |
| 3. | Dry flower production Bonsai techniques and care Foliage plants: Indoor and outdoor foliage plants, care for better growth. | 25% |
| 4. | Landscaping: Types of landscaping, elements for landscaping, designs for landscape area. Care for landscaping area. Plant selection for landscaping. Turf production and uses | 25% |

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| Teaching-Learning Methodology | Classroom interaction, Power point presentation, Charts, quiz, Preserved specimens, assignments, seminars, online content from internet. |
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| Evaluation Pattern | | |
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| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
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| 1. | Get applied knowledge of cut flowers, postharvest handlings. |
| 2. | Develop skill in floriculture techniques and garden area with landscaping knowledge |

| Suggested References: | |
|-----------------------|---|
| Sr. No. | References |
| 1 | Amitabha Mukhopadhyay and G. S. Randhawa, Floriculture in India |
| 2 | L.L. Somani, Floriculture and Landscaping at a Glance. |
| 3 | Prasad S. and U. Kumar, Handbook of Floriculture. |

| On-line resources to be used if available as reference material |
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| On-line Resources : Articles from Google scholar |
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