

SARDAR PATEL UNIVERSITY
Programme: B. Sc. (BOTANY)
Semester: III
Paper Code: US03CBOT21 (T)
Title of Paper: PHYCOLOGY, MYCOLOGY AND PHYTOPATHOLOGY
Total Credit: 4 (Four Lectures per week)
(Total Marks 100, Internal-30 marks, External 70-marks)
Syllabus with effect from: June 2019

	Paper Code: US03CBOT21 (T)
Unit	Title of Paper: PHYCOLOGY, MYCOLOGY AND PHYTOPATHOLOGY
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>
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>
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 (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.</p>

	Paper Code: US03CBOT21 (T) contd....
Unit	Title of Paper: PHYCOLOGY, MYCOLOGY AND PHYTOPATHOLOGY
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>

Suggested Readings

- Dutta A. C. Botany
- Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
- Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996).
- B. R. Vashistha, Algae
- B. R. Vashistha, Fungi
- Gangulee and Kar, College Botany Vol 2
- John Wiley & Sons, Introductory Mycology, (Asia) Singapore. 4th edition.
- Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
- Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India. Kumar, H.D. (1999).
- Singh R. S. Plant Pathology
- Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.

SARDAR PATEL UNIVERSITY
Programme: B. Sc. (BOTANY)
Semester: III
Paper Code: US03CBOT22 (T)
Title of Paper: PLANT ANATOMY, PHYSIOLOGY, TAXONOMY AND
BIOINFORMATICS
Total Credit: 4 (Four Lectures per week)
(Total Marks 100, Internal-30 marks, External 70-marks)
Syllabus with effect from: June 2019

	Paper Code: US03CBOT23 (T)
Unit	Title of Paper: PLANT ANATOMY,PHYSIOLOGY,TAXONOMY AND BIOINFORMATICS
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>
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>

	Paper Code: US03CBOT22 (T) contd.....
Unit	Title of Paper: PLANT ANATOMY,PHYSIOLOGY,TAXONOMY AND BIOINFORMATICS
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>
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.</p> <p>Databases in Bioinformatics: Introduction, Biological Databases, Classification, format of Biological Databases, Biological Database Retrieval System.</p>

Basic Text & Reference Books:

- College Botany Vol 1: Gangulee, Das and Dutta
- Taxonomy of angiosperms: B. P. Pandey
- Plant Physiology: V. Verma
- Cell and Molecular Biology: De Robertis and De Robertis
- A Text book of Bioinformatics by Sharma,Munjal and Shankar(Rastogi publication)

SARDAR PATEL UNIVERSITY
Programme: B. Sc. (BOTANY)
Semester: III
Paper Code: US03CBOT23 (P)
(Practical paper based on US03CBOT21)
Title of Paper: Botany Practical
Total credit-2 (four lectures per week)
(Total Marks-50, External-50 marks)
Syllabus with effect from: June 2019

No.	AIM	Paper Code: US03CBOT22 (P)
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.	

Title of Paper: Botany Practical
Total credit-2 (four lectures per week)
(Total Marks-50, External-50 marks)
Syllabus with effect from: June 2019

No.	Paper Code: US03CBOT24 (P) 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

SARDAR PATEL UNIVERSITY

Programme: B. Sc. (BOTANY)

Semester: IV

Paper Code: US04CBOT21 (T)

Title of Paper: ARCHEGONIATES, ECONOMIC AND NUTRACEUTICAL BOTANY

Total Credit: 4 (Four Lectures per week)

(Total Marks 100, Internal-30 marks, External 70-marks)

Syllabus with effect from: June 2019

	Paper Code: US04CBOT21 (T)
Unit	Title of Paper: ARCHEGONIATES, ECONOMIC AND NUTRACEUTICAL BOTANY
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>
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>

	Paper Code: US04CBOT21(T) contd....
Unit	Title of Paper: ARHEGONIATES, ECONOMIC AND NUTRACEUTICAL BOTANY
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, Digitalis, 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, Vetiveria, Santalum</i> and <i>Eucalyptus</i></p>
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>

Basic Text & Reference Books:

- College Botany Vol 2 : Gangulee and Kar
- Pharmacognosy : Kokate ,Purohit and Gokhle
- Text Book of Pteridophyta by B. R. Vasistha and N. S. Parihar
- Text book of Gymnosperm by P.C. Vasistha
- Economic botany in the tropics by S.L.Kochhar
- Handbook of Nutraceuticals and Functional foods by Robert E.C.Wildman

SARDAR PATEL UNIVERSITY

Programme: B. Sc. (BOTANY)

Semester: IV

Paper Code: US04CBOT22 (T)

Title of Paper: PLANT ANATOMY, EMBRYOLOGY, TISSUE CULTURE AND BASIC MOLECULAR BIOLOGY

Total Credit: 4 (Four Lectures per week)

(Total Marks 100, Internal-30 marks, External 70-marks)

Syllabus with effect from: June 2019

	Paper Code: US04CBOT22 (T)
Unit	Title of Paper: PLANT ANATOMY, EMBRYOLOGY, TISSUE CULTURE AND BASIC MOLECULAR BIOLOGY
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> .
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.
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 Laboratory and Aseptic conditions, equipments. General process of Tissue culture Protoplast culture

	Paper Code: US04CBOT22 (T) contd.....
Unit	Title of Paper: PLANT ANATOMY, EMBRYOLOGY, TISSUE CULTURE AND BASIC MOLECULAR BIOLOGY
4	<p>Basic Molecular Biology:</p> <p>Nucleic acids: Historical perspective. DNA as the carrier of genetic information (Griffith's, Hershey & Chase, Avery, McLeod & McCarty, Fraenkel Conrat's experiment).</p> <p>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.</p> <p>RNA: Types and Structure of RNA. A brief introduction to Central dogma of molecular biology.</p>

Basic Text & Reference Books:

- Plant anatomy: A. Fahn
- College Botany Vol 1: Gangulee, Das and Dutta
- Plant tissue culture and biotechnology: Kavi Kishore P.B.
- Genetics: P.S. Verma and Agarwal
- Text book of Env. Biotechnology: P.K.Mahapatra

SARDAR PATEL UNIVERSITY
Programme: B. Sc. (BOTANY)
Semester: IV
Paper Code: US04CBOT23 (P)
(Practical paper based on US04CBOT21)
Title of Paper: Botany Practical
Total credit-2 (four lectures per week)
(Total Marks-50, External-50 marks)
Syllabus with effect from: June 2019

No.	Paper Code: US04CBOT22 (P) 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 section of ovule (permanent slide)).

No.	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).
13	Botanical excursion

Title of Paper: Botany Practical

Total credit-2 (four lectures per week) (Total Marks-50, External-50 marks)

Syllabus with effect from: June 2019

No.	AIM	Paper Code: US04CBOT24 (P)
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. (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	Preparation of LB medium and raising E. Coli.	
15	DNA isolation from cauliflower head.	
16	To study the steps for Preparation of MS medium.	
17	To study the steps for Isolation of protoplasts.	