

# DEPARTMENT OF BOTANY

## B. Sc. Botany

Botany is a scientific study of plants. It includes the study of their structure, how they grow, how they can be effectively classified, the things that impact their development etc. Botany is the branch of biology, which is study of all living organism.

### Programme Outcomes:

#### Knowledge outcomes:

After completing B.Sc. Botany, students will be able to:

- PO1:** identify cryptogamic plants;
- PO2:** apply the knowledge of nursery management for propagation of economically important plants;
- PO3:** cultivate some basic food crops;
- PO4:** identify and utilize some basic medicinal plants;
- PO5:** identify and control plant diseases;
- PO6:** identify and control weed plants;
- PO7:** identify phanerogamic plants.

#### Skill outcomes:

After completing B.Sc. Botany, students will be able to:

- PO8:** collaborate effectively on team-oriented projects in the field of life sciences;
- PO9:** communicate scientific information in a clear and concise manner, both orally and in writing;
- PO10:** explain biodiversity, climate change and plant pathology;
- PO11:** apply Physiology, Ecology and Plant breeding techniques in plant sciences;
- PO12:** apply knowledge of medicinal and economic Botany in day to day life;
- PO13:** apply the knowledge to develop the sustainable and eco-friendly technology in Industrial Botany.

#### Generic outcomes:

After completing B.Sc. Botany, students will be able to:

- PO14:** have developed their critical reasoning, judgment and communication skills;
- PO15:** apply their knowledge about cytology;
- PO16:** enhance the scientific temper among the students so that they may participate in different competition at local and national level.

### Program Specific Outcomes

- PSO1:** Students get acquainted with techniques which are used in industrially important plant products;
- PSO2:** Students get conceptual knowledge of entrepreneurship in mushroom cultivation, bio-fertilizers and bio-pesticide's production, fermentation, etc.
- PSO3:** Understand the diversity of the plants and structural organization of plants like monocots and dicot;
- PSO4:** Understand plant structures in the context of physiological and biochemical functions of plants.

## Course Outcomes

### F. Y. B. Sc. Sem I

#### Course 101: Plant Diversity

After successfully completing this course, students will be able to:

- CO1: outline the Eichler classification system;
- CO2: position the plants in five kingdom system;
- CO3: describe prokaryotic and Eukaryotic cell structure;
- CO4: classify the members of plants groups in to cryptogams and Phanerogams;
- CO5: describe the general characters, structure and importance of Bacteria,
- CO6: describe the general characters, structure and importance of Virus;
- CO7: describe Nostoc and Spirogyra and their characters;
- CO8: describe Mucor and Agaricus and their characters;
- CO9: describe characters and importance of Lichen.

#### Course 102: Plant Diversity, Nursery management and utilization

After successfully completing this course, students will be able to:

- CO1: describe Funaria and its characters;
- CO2: describe Nephrolepis and its characters;
- CO3: practice cutting, layering, budding and grafting;
- CO4: describe the importance of Fertilizers and pesticides;
- CO5: describe the importance of methods of irrigation;
- CO6: describe the morphology of root, stem, leaves and flowers;
- CO7: describe the cultivation of Sugarcane, Paddy, Mango and Brinjal.

#### Course: Botany Practical (103)

After successfully completing this course, students will be able to:

- CO1: examine the growth of bacteria in curd under microscope;
- CO2: identify the thallus structure in Nostoc and Spirogyra;
- CO3: identify Mucor and Agaricus;
- CO4: identify the Lichen Usnea;
- CO5: identify Funaria and Nephrolepis;
- CO6: demonstrate the methods of vegetative propagation;
- CO7: illustrate the root, stem, leaves, flowers and its types.

### F. Y. B. Sc. Sem II

#### Course 201: Physiology, Ecology and Anatomy of Plants, Medicinal plants and plant pathology:

After successfully completing this course, students will be able to:

- CO1: describe imbibitions, osmosis and plant movement;
- CO2: describe Light and Dark reaction;
- CO3: describe C<sub>3</sub> and C<sub>4</sub> cycle;
- CO4: describe the ecological adaptation, morphology and anatomy of Hydrophytes, Mesophytes and Xerophytes;
- CO5: describe the tissue system and vascular bundle in plants;
- CO6: describe the types of stele;
- CO7: describe the Ergastic matter;
- CO8: describe the medicinal plants;
- CO9: describe the plant pathology.

### **Course 202: Plant Diversity and Weed management:**

After successfully completing this course, students will be able to:

- CO1:** describe weed management;
- CO2:** describe Cycas and its characters;
- CO3:** describe the types of phyllotaxy and aestivation;
- CO4:** describe the types of Inflorescence and placentation;
- CO5:** describe some angiospermic families;
- CO6:** describe the methods of in-situ and ex-situ conservation;
- CO7:** describe botanical garden;
- CO8:** describe the importance of forest and their conservation.

### **Course: Botany Practical 203**

After successfully completing this course, students will be able to:

- CO1:** demonstrate the plant physiological experiments;
- CO2:** identify and categorize hydrophytes, mesophytes and xerophytes;
- CO3:** identify different types of tissue;
- CO4:** identify different types of stele;
- CO5:** identify different types of vascular bundle;
- CO6:** identify and prepare slide of different types of Ergastic matter;
- CO7:** identify different medicinal plant;
- CO8:** diagnosis of different diseases in plants;
- CO9:** identify weed plants;
- CO10:** identify and prepare the slides of Cycas;
- CO11:** identify the morphological characters of plants;
- CO12:** identify the Morphological characters and floral dissection of some angiospermic families.

## **S. Y. B. Sc. Sem III**

### **Course 301: Plant Physiology and Plant Ecology**

After successfully completing this course, students will be able to:

- CO1:** explain water potential and root absorption;
- CO2:** explain respiration, its types and mechanism;
- CO3:** explain ascent of sap and transpiration;
- CO4:** explain types and components of ecosystem;
- CO5:** explain energy flow in ecosystem;
- CO6:** explain plant communities- Halophytes, Epiphytes and Lithophytes;
- CO7:** explain Ecological factors;
- CO8:** explain Soil erosion and conservation.

### **Course 302: Plant anatomy, Plant Embryology and Genetics**

After successfully completing this course, students will be able to:

- CO1:** explain the structure of primary tissue of roots, stem and leaves in monocot and dicot plants;
- CO2:** explain normal and anomalous secondary growth in some plants;
- CO3:** explain microsporangium and male gametophyte;
- CO4:** explain megasporangium and female gametophyte;
- CO5:** explain fertilization;
- CO6:** explain Mendel's laws of inheritance and his experiments in heredity;
- CO7:** explain genetic material and its structure.

### **Course 303: Diversity of Gymnosperms and Angiosperms**

After successfully completing this course, students will be able to:

- CO1:** describe the gymnosperms Pinus and Gnetum;
- CO2:** describe weak stem plants and bracts;
- CO3:** describe special types of inflorescence and fruits;
- CO4:** explain Pollination and its types;
- CO5:** describe the defensive devices of plants;
- CO6:** explain aims and objectives of plant taxonomy;
- CO7:** describe and classify with reason some angiospermic families.

### **Course ID: Nutrition and Dietetics**

After successfully completing this course, students will be able to:

- CO1:** explain classification of food groups and its importance;
- CO2:** describe nutritive value of food groups;
- CO3:** explain the concept of balance diet;
- CO4:** explain the use of RDI in planning balance diet;
- CO5:** explain the macro nutrients – carbohydrate, protein, fats and lipids;
- CO6:** describe the micro nutrients – vitamins, minerals and water;
- CO7:** explain food preservation and its methods;
- CO8:** explain meal planning and its principles.

### **Course 304 Botany practical**

After successfully completing this course, students will be able to:

- CO1:** demonstrate the physiological experiment;
- CO2:** explain the working method of ecological instruments;
- CO3:** recognize ecological peculiarities of Orchid and Avicennia;
- CO4:** identify the primary tissue structure in stem of Sunflower and Maize;
- CO5:** identify the anomalous secondary in some plants;
- CO6:** identify the permanent slides of embryology;
- CO7:** prepare the slide of Pinus and Gnetum;
- CO8:** identify the weak stem plants, bracts, defensive devices of plants and special types of inflorescences;
- CO9:** identify the morphological characters of some angiospermic families and its floral dissection.

## **S. Y. B. Sc. Sem IV**

### **Course 401: Lower Cryptogams**

After successfully completing this course, students will be able to:

- CO1:** explain general characters and structure of phytoplankton;
- CO2:** explain general characters and economic importance of algae;
- CO3:** explain the classification of algae given by G. M. Smith;
- CO4:** explain and classify Oscillatoria, Oodogonium, Ectocapus and Batrachospermum;
- CO5:** explain the general characters, structure and economic importance of fungi;
- CO6:** explain the classification of fungi given by Alexopoulos;
- CO7:** explain and classify Pythium, Aspergillus, Peziza and Puccinia.

### **Course 402: Higher Cryptogams**

After successfully completing this course, students will be able to:

- CO1:** explain the general characters, classification and economic importance of bryophytes;
- CO2:** explain the general account of Hepaticopsida, Anthocerotopsida and Bryopsida;

- CO3:** describe the amphibian adaptation of bryophytes;
- CO4:** explain classification and life history of Riccia and Anthoceros;
- CO5:** explain the general characters, classification, Habitat and Habit of Pteridophytes;
- CO6:** explain the general account of Lycopsidea, Sphenopsida and Pteropsida;
- CO7:** explain the classification and life history of Equisetum, Marsilea and Selaginella.

#### **Course 403: Plant Geography, Economic Botany, Seed Plants and Plant Pathology**

After successfully completing this course, students will be able to:

- CO1:** describe minor forest product of Gujarat;
- CO2:** describe the cultivation of some economically importance plants ;
- CO3:** explain the uses of some medicinal plants;
- CO4:** explain and classify with reason some seed plant;
- CO5:** explain pathogens and symptoms of some plant diseases.

#### **Course ID: Biodiversity**

After successfully completing this course, students will be able to:

- CO1:** describe the introduction and scope of biodiversity. CO2: Describe the importance and values of biodiversity;
- CO2:** explain the general pattern of vegetation of Gujarat;
- CO3:** explain the conservation of biodiversity;
- CO4:** describe the endangered, endemic, threatened and rare species of Gujarat;
- CO5:** explain the biodiversity of Flora, Fauna, Mangroves and Medicinal plants of Gujarat;
- CO6:** explain In-situ and Ex-situ Conservation;
- CO7:** explain biodiversity act and biological Hot-Spots.

#### **Course 404: Botany practical**

After successfully completing this course, students will be able to:

- CO1:** identify Oscillatoria, Oodogonium, Ectocarpus and Batrachospermum;
- CO2:** identify Pythium, Aspergillus, Peziza and Puccinia;
- CO3:** identify Anthoceros, Marsilea and Selaginella;
- CO4:** identify the minor products of forest;
- CO5:** identify the economically important plants;
- CO6:** identify the medicinally important plants;
- CO7:** identify the morphological characters of some angiospermic families and its floral dissection;
- CO8:** identify some plant diseases.

### **T. Y. B. Sc. Sem V**

#### **Course 501: Algae and Fungi**

After successfully completing this course, students will be able to:

- CO1:** explain habit, habitat and thallus organization of algae;
- CO2:** explain classification according to Smith for some classes of algae;
- CO3:** describe the life history of some types of algae on basis of their classification with reason;
- CO4:** describe the general characters and classification of Fungi;
- CO5:** describe the general characters of division Eumycota;
- CO6:** explain the life history of some types of Fungi on the basis of their classification with reason.

#### **Course 502: Plant pathology and Bryophyte**

After successfully completing this course, students will be able to:

- CO1:** explain History of plant pathology and Indian plant pathologist;
- CO2:** explain Origin of plant diseases and it' reason;
- CO3:** explain the identification, characters and principles of control of plant diseases;
- CO4:** describe Fungicides and bio pesticides;
- CO5:** describe some bacterial and fungal diseases;
- CO6:** explain the general characters, classification and economic importance of bryophytes;
- CO7:** explain the general account of Hepaticopsida, Anthocerotopsida and Bryopsida;
- CO8:** describe the amphibian adaptation of bryophytes;
- CO9:** explain classification and life history of Marchantia, Porella, Notothyllus and Sphagnum.

### **Course 503: Plant biotechnology, Biostatistics and Molecular biology**

After successfully completing this course, students will be able to:

- CO1:** describe r-DNA methods;
- CO2:** describe Restriction endonuclease, Ligase and cloning vectors;
- CO3:** describe DNA- finger printing and PCR;
- CO4:** explain history and importance of biotechnology;
- CO5:** describe somatic hybridization and artificial seed;
- CO6:** describe anther culture and embryo culture;
- CO7:** describe clonal propagation and genetic engineering of plants;
- CO8:** describe genetic manipulation in plant cell and uses of biotechnology;
- CO9:** describe history, function, limitation, importance and classification of Biostatistics;
- CO10:** describe Measurement of Central tendency and standard deviation.

### **Course 504: Plant physiology and biochemistry**

After successfully completing this course, students will be able to:

- CO1:** explain Diffusion, Osmosis, plasmolysis and absorption;
- CO2:** explain Ascent of sap, translocation, photosynthesis and respiration;
- CO3:** explain growth and mineral nutrition;
- CO4:** describe growth promoters and growth retardants;
- CO5:** describe some physiological instrument;
- CO6:** explain pH and Buffer;
- CO7:** explain solution and colloidal system;
- CO8:** explain protoplasm as a colloidal system;
- CO9:** explain enzymes, amino acids and carbohydrates.

### **Course 505: Anatomy and Embryology**

After successfully completing this course, students will be able to:

- CO1:** explain Laticiferous tissues;
- CO2:** explain root stem transition;
- CO3:** explain vascular cambium and nodal anatomy;
- CO4:** explain Periderm and lenticell;
- CO5:** explain leaf abscission and anomalous secondary growth in some plants;
- CO6:** explain Megasporogenesis and types of embryo sac;
- CO7:** explain Double fertilization and endosperm;
- CO8:** explain Embryo and Embryogenesis in dicot and monocot;
- CO9:** explain nutrition of embryo and poly embryony.

### **Course 506: Angiosperm morphology, Systemic botany and environmental issues:**

After successfully completing this course, students will be able to:

- CO1:** explain plant morphology (Leaf, Calyx, Corolla and seed);
- CO2:** explain epiphytes, parasites and saprophytes;

- CO3:** explain history and types of classification of taxonomy;
- CO4:** explain fundamentals of nomenclature;
- CO5:** explain binomial nomenclature and ICBN;
- CO6:** explain and classify with reason some angiospermic families;
- CO7:** explain some environmental issues;
- CO8:** explain some acts related to environment protection.

#### **CAN Course: Horticulture**

After successfully completing this course, students will be able to:

- CO1:** explain aims, branches and importance of horticulture;
- CO2:** explain cutting, layering, budding and grafting;
- CO3:** explain preservation and its methods;
- CO4:** explain preparation of Jam, Jelly and Sauce;
- CO5:** explain causes of spoilage of fruits;
- CO6:** explain the role of hormones in horticulture;
- CO7:** describe cultivation of some fruit plants;
- CO8:** describe cultivation of some vegetable plants.

#### **Course Botany practical 11:**

After successfully completing this course, students will be able to:

- CO1:** identify and prepare the slides of some algae;
- CO2:** identify and prepare the slides of some Fungi;
- CO3:** identify and prepare the slides of some Bryophyte;
- CO4:** identify some bacterial, fungal and viral diseases.

#### **Course Botany practical 12:**

After successfully completing this course, students will be able to:

- CO1:** demonstrate and perform the physiological experiment;
- CO2:** demonstrate the some physiological instrument;
- CO3:** test the presence of reducing sugar, non-reducing sugar and amino acid by performing biochemical experiments;
- CO4:** mount embryo of any dicot plant;
- CO5:** identify the permanent slide of embryology.

#### **Course Botany practical 13:**

After successfully completing this course, students will be able to:

- CO1:** identify leaf shape, leaf margin and some local angiospermic plants;
- CO2:** identify anomalous secondary growth in some plants;
- CO3:** prepare permanent slides;
- CO4:** measure the dimensions of micro-organisms by using stage micrometer and ocular micrometer;
- CO5:** measure the microscopic structure and sketching it with the help of camera lucida;
- CO6:** prepare the slides of Nodal anatomy.

### **T. Y. B. Sc. Sem VI**

#### **Course 601: Pteridophytes and paleobotany**

After successfully completing this course, students will be able to:

- CO1:** explain the general characters and classification of pteridophytes;
- CO2:** explain the general characters of some classes belonging to Pteridophytes;
- CO3:** describe the life history of Selaginella, Ophioglossum and Azolla;

- CO4:** describe Fossilization and types of fossil;
- CO5:** describe the nomenclature of fossils and geological time table;
- CO6:** explain the life history and classification of Rhynia, Psilotum, Lepidodendron and Sphenophyllum.

#### **Course 602: Gymnosperm, Fossil Gymnosperm and Botanical techniques:**

After successfully completing this course, students will be able to:

- CO1:** explain the general characters of gymnosperm;
- CO2:** explain the affinities of gymnosperm with Pteridophytes and Angiosperm;
- CO3:** explain the classification and important characters of some orders belonging to gymnosperm;
- CO4:** describe classification and life history of Taxus, Ginkgo and Ephedra;
- CO5:** describe the general account of some fossil gymnosperm;
- CO6:** explain herbarium techniques and micro techniques;
- CO7:** explain camera lucida.

#### **Course 603: Cell biology and Genetics**

After successfully completing this course, students will be able to:

- CO1:** describe ultra structure and function of some organelles in plant cell;
- CO2:** describe cell cycle, mitosis and meiosis;
- CO3:** describe nucleic acids and structure and types of DNA and RNA;
- CO4:** explain DNA replication, transformation and transduction;
- CO5:** describe genetic code, mutation and Lac-operon;
- CO6:** describe chromosomal aberration and protein synthesis.

#### **Course 604: Plant ecology and phytogeography**

After successfully completing this course, students will be able to:

- CO1:** explain soil as an edaphic factor;
- CO2:** explain biotic factor relationship among the organisms;
- CO3:** explain characteristics and classification of plant community;
- CO4:** describe ecological niche;
- CO5:** describe quadrat and transect method of studying vegetation;
- CO6:** explain causes, process, kinds and rate of succession;
- CO7:** explain limiting factor and trend in succession, hydrosere and xerosere;
- CO8:** explain forest and desert vegetation in Gujarat;
- CO9:** explain Mangrove Himalaya vegetation in Gujarat;
- CO10:** explain remote sensing and biological clock.

#### **Course 605: Economic Botany and Pharmacognosy**

After successfully completing this course, students will be able to:

- CO1:** explain classification of fibers and some fiber yielding plants;
- CO2:** explain Definition, properties, types and uses of wood;
- CO3:** explain some timber and firewood plants;
- CO4:** explain the general characters and cultivation of beverages;
- CO5:** explain evaluation of drugs by different methods;
- CO6:** explain classification of drugs;
- CO7:** explain drugs obtained from different parts of the plants;
- CO8:** explain detailed study on some medicinal plants;
- CO9:** explain nutrition of embryo and poly embryony.

#### **Course 606: Taxonomy and Palynology**

After successfully completing this course, students will be able to:

- CO1:** explain aims of botanical garden;
- CO2:** explain botanical gardens of world and India;
- CO3:** explain BSI;
- CO4:** explain major systems of classification of angiosperm;
- CO5:** explain and classify with reason some angiospermic families;
- CO6:** explain pollen morphology and application of palynology;
- CO7:** explain importance of pollen and pollen allergy.

#### **CAN Course: Gardening**

After successfully completing this course, students will be able to:

- CO1:** explain soil, land scaping and garden;
- CO2:** explain plough, manure and irrigation;
- CO3:** explain pruning, framing and fancying;
- CO4:** explain flower arrangement and cultivation of some flowering plants.

#### **Course: Botany practical 14**

After successfully completing this course, students will be able to:

- CO1:** identify and prepare the slides of some Pteridophyte;
- CO2:** identify some fossil slides of pteridophyte;
- CO3:** identify and prepare the slides of some Gymnosperm;
- CO4:** identify some fossil slides of gymnosperm and fossil stone.

#### **Course: Botany practical 15**

After successfully completing this course, students will be able to:

- CO1:** demonstrate and perform some experiment related to plant ecology;
- CO2:** demonstrate some ecological instrument;
- CO3:** prepare the slides of different stages of Mitosis and meiosis.

#### **Course: Botany practical 16**

After successfully completing this course, students will be able to:

- CO1:** identify the plants important as fibers, timbers and beverages;
- CO2:** identify some plant drugs;
- CO3:** identify some medicinal plants;
- CO4:** identify the morphological characters of some angiospermic families and its floral dissection.