BARASAT GOVT COLLEGE

POST GRADUATE DEPARTMENT OF BOTANY

B.Sc. Botany (Hons) CBCS Syllabus

With effect from 2018-19

Programme Specific Outcomes

- The undergraduate course in Botany (Honours) has been designed, keeping in pace with the new and emerging areas of plant science. After successfully completing the course the students will obtain a resilient foundation in classical as well as contemporary aspects of plant science. The core courses are designed to build comprehensive knowledge regarding the nature and basic concepts of all the plant groups, their taxonomy, diversity, metabolism, biochemistry, genetics and other advanced interdisciplinary areas which will be fruitful for their future studies.

- Laboratory courses included in the curriculum will help the students in developing practical skills for handling of laboratory equipments, collection, analysis and interpretation of scientific data (both field and laboratory data).

- Since the programme also offers a wide range of elective courses (Discipline specific electives) to the students, skills learnt during the entire course will immensely help the students in solving practical as well as societal problems that will eventually lead to a job in academia or industry.

BARASAT GOVERNMENT COLLEGE
Course Outcome or Learning Outcome
Three year B.A. /B.Sc. degree course
Under CBCS semester system
HONOURS COURSE IN BOTANY
With effect from the session: 2018 – 2019

Course Name: **Core Course-1**
Course Code: **BOTACOR01T & BOTACOR01P**
Topic Name: **Phycology and Microbiology**

Course Outcome:

1. By studying this course, students acquire knowledge about the general structure, ultrastructure and activities of the viruses, different prokaryotic organisms (cyanobacteria, other forms of eubacteria and archaea) and some primitive eukaryotic algal life forms.
2. They learn the beneficial roles of algae, bacteria and viruses as well as the harmful and detrimental effect of these organisms on human beings, other animals, plants and our environment.
3. After completion of the course students will understand about the diversity, phylogeny interrelationships and evolution of the viruses, algae and bacteria and their roles in triggering the evolution of other eukaryotic organisms.

Upon successful completion of the course students will have the practical knowledge on -
1. Models of viruses, bacteria, Gram staining of bacteria, endospore
2. Preparation of media sterilization of media for culturing
3. Various genera of algae like Nostoc, Volvox, Oedogonium, Fucus, Polysiphonia from various classes of algae
4. Illustration, magnification and study of characteristic features of the aforesaid members

Course Name: **Core Course-2**
Course Code: **BOTACOR02T & BOTACOR02P**
Topic Name: **Biomolecules and Cell Biology**

Course Outcome:

1. This course will familiarize the students with very basic aspects of cell biology and bio molecules.
2. It will introduce the students to basic common arenas of life sciences such as basic cell structure, function and basic biochemical techniques.
3. It is a very preliminary course and augments the students' vision and acceptance for more complex courses based on this foundation.

Upon successful completion of the course students will have the practical knowledge on -
1. carbohydrates, proteins and lipids - various qualitative tests to confirm these biomolecules
2. Study of plant cells from plants like Rhoeo, Crinum, measurement of cell size
3. Study of cell organelles by electron micrographs, stages of mitosis and meiosis, Feulgen staining of DNA etc.

Course Name: **Core Course-3**
Course Code: **BOTACOR03T & BOTACOR03P**
Topic Name: **MYCOLOGY AND PHYTOPATHOLOGY**

Course Outcome:

Upon successful completion of the course, students will be able to:
1. Understand fungi as most important eukaryotic microorganisms on earth, playing role in ecosystem processes, degradation of organic matters and nutrient recycling, plant symbiosis and as pathogens of plants, animals and humans.
2. Familiar with general characteristics and diversity among different fungal group.
3. Acquainted with diverse application of fungi in biotechnology, industry, agriculture and medical mycology.
4. Understand the symptoms, host pathogen interactions, environmental relation and prevention of diseases in plants caused by pathogens.

Upon successful completion of the course students will have the practical knowledge on -
1. Micrometry and study fungal genera from different classes like Rhizopus, Aspergillus, Penicillium, Ascobolus, Alternaria, Puccinia, Agaricus, Albugo etc.
2. Lichens - crustose, foliose and fruticose types and mycorrhizae
3. Study of different common plant diseases caused by fungi, bacteria and viruses

Course Name: **Core Course-4**
Course Code: **BOTACOR04T & BOTACOR04P**
Topic Name: **Core Course IV: Archegoniate**

Course Outcome: Understand the origin and diversification of cryptogams
1. Understand the importance of diseases caused by representative pathogens
2. Identification of the diseases based on the symptoms and their control measures
3. Understanding of disease control strategies with special reference to principles of plant viral disease management

Upon successful completion of the course students will have the practical knowledge on -
1. Lower plants like Bryophytes, Pteridophytes and Gymnosperms, their vegetative and reproductive structures with special emphasis on Marchantia, Anthoceros, Sphagnum, Funaria
2. Pteridophytic members like Psilotum, Selaginella, Equisetum Pteris from permanent slides, specimens as well as fresh speciemen
3. Gymnosperms like Cycas, Pinus and Gnetum from permanent slides and jar specimens

Course Name: **Core Course-5**
Course Code: **BOTACOR05T & BOTACOR05P**
Topic Name: **Morphology and Anatomy of Angiosperms**

Course Outcome: (1) Understand different structural categories among the plants around us.
(2) Understand the relationships between internal and external structures of plants.
(3) It is very important to have enough knowledge about our life sustainers.
(4) Indirectly attempts to learn about plants creats a feeling for plants which us essential for our survival.
(5) The practical impacts of Anatomy and morphological study give us knowledge to protec the plant

Upon successful completion of the course students will have the practical knowledge on -
1. Anatomical details of plant parts through permanent and temporary slides, staining methods
2. Root anatomy, leaf anatomy, Kranz anatomy in leaves
3. Distribution and types of parenchyma, collenchyma and sclerenchyma
4. Xylem and phloem tissue , wood and periderm secondary growth etc.

Course Name: **Core Course-6**
Course Code: **BOTACOR06T & BOTACOR06P**
Topic Name: **Economic Botany**

Course Outcome: 1.They will study the relationship between people (individuals and cultures) and plants around the the world, encompassing the past, present and potential use of plant .
2. They will know the ways that people use plants as food, medicine etc.
3.They not only study what plants people use as food in different areas but also how they use the plant as food and also their history, origin, cultivation and domestication. They will get knowledge about gene bank means to preserve germplasm.
4.They will know about germplasm diversity thereby importance of germplasm diversity.
5. They also come to know the extraction procedure of respective plant products. 9eg tea, coffee, sugarcanes ect

Upon successful completion of the course students will have the practical concept in -
1. Cereals. legumes, sources of sugar and starches in sugar yielding plants
2. Sources of oils and fats in plants
3. Beverages, essential oils, spices, rubber, drug yielding plants
4. Wood and fibre yielding plants

Course Name: **Core Course-7**
Course Code: **BOTACOR07T & BOTACOR07P**
Topic Name: **Core Course VII: Genetics**

Course Outcome:
1. Have a solid foundation in classical and modern molecular genetics as the focus is on understanding central principles and fundamental mechanisms for the organization, replication, expression, variation, and evolution of the genetic material at a molecular level.
2. Have an advanced understanding of the modern concept of gene
3. Have an understanding of transmission genetics (including linkage analysis), quantitative
4. genetics and population genetics.

Upon successful completion of the course students will have the practical knowledge on -
1. Various stages of mitosis and meiosis from temporary and permanent slides
2. Mendelian ratio, laboratory exercises of chi square and probability tests
3. Mapping of chromosomes, anomalies in genetics through permanent slides
4. Genetic diseases etc.

Course Name: **Core Course-8**
Course Code: **BOTACOR08T & BOTACOR08P**
Topic Name: **Core Course VIII: Molecular Biology**

Course Outcome:
1. This course will familiarize the students with very basic aspects of molecular biology.
2. This course will focus on understanding the fundamental mechanisms for the organization, replication, expression, variation, and evolution of the genetic material at a molecular level.

Upon successful completion of the course students will have the practical understanding of -
1. Preparation of Lysogeny broth (LB) medium
2. Isolation of DNA from plants sources, estimation of DNA
3. Laboratory principles on RNA polymerases,
4. Experiments of Griffith, Hershey & Chase, Conrat, Fraenkel, Stahl & Meselson and Avery etc.

Course Name: **Core Course-9**
Course Code: **BOTACOR09T & BOTACOR09P**
Topic Name: **Plant Ecology and Phytogeography**

Course Outcome:
(1) Helps to understand the ecosystem and environment around us in detetail.
(2) Understand the landscape detail and it's vegetation composition at our local area as well as India as a whole.
(3) Learn biodiversity and its conservation strategies.
(4) This course helps to boost our awareness for environment protection.

Upon successful completion of the course students will have the practical knowledge on -
1. the instruments which are used to study abiotic factors of the environment
2. Measurement of carbon dioxide, dissolved oxygen in collected water sample
3. Morphological and anatomical adaptations in plants
4. Quadrat study to arrive at species frequency. richness etc.
5. The local phytogeography through field visit in or outside the state

Course Name: **Core Course-10**
Course Code: **BOTACOR10T & BOTACOR10P**
Topic Name: **Plant Systematics**

Course Outcome: (1) Helps to identify the plants with their local and and global names.
(2) Helps to understand the diversity among the plants around us bearing flowers and fruits.
(3) Helps to study the distribution patterns and the availability of different groups of plants having ecological or economic values.
(4) The course includes excursions that increases the interactions of students as as teachers with plants. It increases the plants lovers..
(5) It has a positive impact towards the protection of our environment.

Upon successful completion of the course students will have the practical concepts on -
1. Morphological characters in angiosperms to identify different families of flowering plants
2. Plants under the families Scrophulariaceae, Fabaceae, Acanthaceae, Malvaceae, Rubiaceae, Asteraceae, Solanaceae, Brassicaceae,
3. Identification up to genus level vide Bentham and Hooker's system of classification

Course Name: **Core Course-11**
Course Code: **BOTACOR11T & BOTACOR11P**
Topic Name: **Reproductive Biology of Angiosperms**

Course Outcome: Upon completion of the course the students will have following concepts
1. Reproductive development in plants, anther and pollen biology
2. Ovule, pollination and fertilization
3. Compatibility in sexual reproduction
4. Detailed knowledge of embryo, endosperm and seed

Upon successful completion of the course students will have the practical knowledge on -
1. Laboratory techniques to study anther, pollen, pollen viability
2. Gives hands on knowledge of anther, pollen, tapetum, both female and male gametophytes and embryogenesis

Course Name: **Core Course-12**
Course Code: **BOTACOR12T & BOTACOR12P**
Topic Name: **Plant Physiology**

Course Outcome: After successful completion of this core course students will be able to understand
1) The basic concepts of plant Physiology like water relation,
2) transport of solute and ions in plants
3) Plant hormones, chemical nature, biosynthesis and actions
4) Phytochromes and blue light response in plants
5) Transport of food through phloem etc

Upon successful completion of the course students will have the laboratory knowledge on -
1. Determination of water potential, osmotic potential.
2. Study of transpiration, factors affecting transpiration
3. Indole Acetic Acid bioassay in Avena coleoptile,
4. Study of amylase activity in seed germination etc

Course Name: **Core Course-13**
Course Code: **BOTACOR13T & BOTACOR13P**
Topic Name: **Plant Metabolism**

Course Outcome: After successful completion of this course the students will be able understand
1) Metabolic activities taking place in plants and their relationship
2) Detailed concepts of photosynthesis and respiration 3) Concepts of ATP synthesis, bioenergetics
4) Signal transduction in plants, types and mechanism etc

Upon successful completion of the course students will have the practical knowledge on -
1. Isolation of photosynthetic pigments and absorption spectra of these pigments
2. Effect of light intensity, carbon dioxide on the rate of photosynthesis
3. Rate of respiration in different parts of plants
4. Demonstration of nitrate reductase, lipases in plant samples

Course Name: **Core Course-14**
Course Code: **BOTACOR14T & BOTACOR14P**
Topic Name: **Plant Biotechnology**

Course Outcome: On completion of the course the student will be knowledgeable about Principles and methods of micropropagation, basics of r-DNA technology and several applied aspects of plant biotechnology.

Upon successful completion of the course students will have the practical knowledge on -
1. Preparation of MS medium, sterilization, inoculation methods
2. Construction of restriction maps, isolation of genomic DNA-its gel electrophoresis
3. Study of methods of gene transfer through photographs

Course Name: **Discipline Specific Elective-1**
Course Code: **BOTADSE01T & BOTADSE01P**
Topic Name: **NATURAL RESOURCE MANAGEMENTS**

Course Outcome: (1) Understand different categories of resources around us and how the help us.
(2) Understand how to use the resources in a sustainable way protecting our environment and nature.
(3) Helps to boost our awareness about the protection our environment satisfying our needs as well.
(4) We can learn about the environmental rules and legislation and different environment related issues.

Upon successful completion of the course students will have the practical knowledge on -
1. Estimation of solid waste generated in the domestic system
2. Study of vegetation cover, collection of data, identifying dominant woody species
3. Calculation and analysis of ecological footprint

Course Name: **Discipline Specific Elective-2**
Course Code: **BOTADSE03T & BOTADSE03P**
Topic Name: **Industrial and Environmental Microbiology**

Course Outcome: 1. Upon successful completion of this course the student will be familiarize with different microbial industrial products- their formulation, processing and purification.
2. They will understand the general structure and functions of different types of bioreactors (fermenters) and their controlling factors for industrial uses, microbial fermentations for the production and estimation (qualitative and quantitative) of different enzymes, organic acid alcohol and antibiotic.
3. Students should acquire the knowledge of different aspects of environmental microbiology to assess the quality of water, waste water management, role of different soil microorganisms and their beneficial roles in agriculture and sustainable environmental practices.

Upon successful completion of the course students will have the practical knowledge on -
1. Principles and functioning of instruments in microbiology laboratory
2. Hands on sterilization techniques and preparation of culture media

Course Name: **Discipline Specific Elective-3**
Course Code: **BOTADSE04T & BOTADSE04P**
Topic Name: **Analytical techniques in Plant Sciences**

Course Outcome: After successful completion of this course students will be able to understand techniques used in Plant Sciences which are
1. Imaging, Flow cytometry, FACS, FISH,
2. Centrifugation, its types and various utility
3. Use of radio isotopes,
4. Spectrophotometry its principles and significances
5. Biostatistics etc.

Upon successful completion of the course students will have the practical knowledge on -
1. Blotting techniques, DNA fingerprinting, sequencing, PCR
2. Separation of nitrogenous bases by paper chromatography
3. Protein estimation, separation of protein by PAGE
4. Principle governing freeze fracture technique, freeze etching, negative and positive staining, FISH etc

Course Name: **Discipline Specific Elective-4**
Course Code: **BOTADSE05T & BOTADSE05P**
Topic Name: **Bioinformatics**

Course Outcome: After successful completion of the course students will be able to understand reagarding
1. Use of databases in biological sciences
2. Biological sequence databases like NCBI, search tools like BLAST, nucleotide and protein databases
3. Sequence alignments, molecular phylogeny
4. Significance of bioinformatics

Upon successful completion of the course the students will have a practical knowledge on - 1. Different databases available in the internet
2. Sequence retrieval from databases, alignment of the sequences
3. Finding sequence homology and gene annotation, construction of phylogenetic tree etc.

Course Name: **Skill Enhancement Course-1**
Course Code: **BOTSSEC01M**
Topic Name: **Plant Diversity and Human Welfare**

Course Outcome: (1) Understand biodiversity- kind and importance for us and our environment.
(2) Understand how our environmental equilibrium is lost silently with biodiversity.
(3) Learn much about biodiversity conservation that develops awareness about biodiversity conservation.
(4) Learn about the activities of different organizations in relation to environmental conservation like IUCN, UNESCO, UNEP, WWF, NBPGR.
(5) Learn in detail the utility and impacts of different plant products needed at our daily life.

Course Name: **Skill Enhancement Course-2**
Course Code: **BOTSSEC02M**
Topic Name: **Ethnobotany**

Course Outcome: Upon completion of the course the students will be able to have
1. A detailed idea regarding ethnobotany, an interdisciplinary science
2. Methods used in ethnobotany
3. Role of ethnobotany in modern medicine
4. relevance and significance in of the paper

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Three year B.A. /B.Sc. degree course
Under CBCS semester system
GENERAL COURSE IN BOTANY
With effect from the session: 2018 – 2019

Course Name: **Generic Elective/Department Specific Core Course-1**
Course Code: **BOTHGEC01T & BOTHGEC01P / BOTGCOR01T & BOTGCOR01P**
Topic Name: **Biodiversity (Microbes, Algae, Fungi and Archegoniate)**

Course Outcome: Upon successful completion of the course including practical: Students will know about biological variety, variations and components of biodiversity as a whole.
1. They will be familiar with different groups of plant including viruses and bacteria.
2. Understand the general structure and difference between prokaryotes and eukaryotes.
3. Familiar with characteristics, diversity, growth form, classification, ecological and economic importance of algae, fungi, bryophytes, pteridophytes and gymnosperms.
4. After completion of laboratory study, students will be familiar with the diversity of algae, fungi, bryophytes, pteridophytes and gymnosperms in various habitats and identification using morphological techniques.

Course Name: **Generic Elective/Department Specific Core Course-2**
Course Code: **BOTHGEC02T & BOTHGEC02P / BOTGCOR02T & BOTGCOR02P**
Topic Name: **Plant Ecology and Taxonomy**

Course Outcome: Upon successful completion of the course including practical, students will be able to:
1. Understand the interactions of abiotic and biotic components of environment- maintaining an equilibrium essential for the very existence of all living beings including ours.
2. Gather knowledge of plant communities and ecosystems which are the basic footsteps of environmental studies.
3. Get knowledge of different aspects of environmental issues which help us to protect biodiversity in turn sustaining ourselves.
4. Identify plants, learning their names and characters in plant taxonomy.
5. Sound knowledge of Plant Ecology and Taxonomy together helps to boost knowledge and love for our environment.

Course Name: **Generic Elective/Department Specific Core Course-3**
Course Code: **BOTHGEC03T & BOTHGEC03P / BOTGCOR03T & BOTGCOR03P**
Topic Name: **Plant Anatomy and Embryology**

Course Outcome: Upon successful completion of the course including practical, students will be able to understand:
1. Study of the internal structure of plants and relationship of different group with their external structure as well as the surrounding environment.
2. The adaptations of different plants to survive in different environmental conditions thus helping to protect environment.
3. Study of structural organization of flowers to identify plants which is in turn important for study of plant biodiversity.
4. Knowledge of pollination and fertilization to know plant reproductive behaviors. It helps to understand whether any plant species is vulnerable or going towards criticalness in survivorship.

Course Name: **Generic Elective/Department Specific Core Course-4**
Course Code: **BOTHGEC04T &BOTHGEC04P / BOTGCOR04T & BOTGCOR04P**
Topic Name: **Plant Physiology and Metabolism**

Course Outcome: Upon successful completion of the course including practical, students will be able to understand:
1. General concepts of Plant Physiology and Metabolism which includes water relations, photosynthesis, respiration and nitrogen metabolism.
2. Structure function and synthesis of plant hormones as plant growth regulators.
3. Students will learn to carry out different plant physiological experiments photosynthesis, respiration, transpiration, plasmolysis etc.

Course Name: **Department Specific Elective-1**
Course Code: **BOTGDSE01T & BOTGDSE01P**
Topic Name: **Cell and Molecular Biology**

Course Outcome: Upon successful completion of the course including practical:
1. This course will familiarize the students with very basic aspects of cell biology.
2. Through this course the students will get a basic idea on the structural details and functional aspects of major cell organelles.
3. This course will also focus on understanding the fundamental mechanisms for the organization, replication, expression, variation, and evolution of the genetic material at a molecular level.
4. To acquire hands on training to different experiments of cell and molecular biology.

Course Name: **Department Specific Elective-2**
Course Code: **BOTGDSE04T & BOTGDSE04P**
Topic Name: **Analytical Techniques in Plant Sciences**

Course Outcome: After successful completion of this course including practical students will be able to understand techniques used in Plant Sciences like imaging, Flow cytometry, FACS, FISH, centrifugation, use of radio isotopes, spectrophotometry , biostatistics etc