BARASAT GOVT COLLEGE

POST GRADUATE DEPARTMENT OF BOTANY

M.Sc. (Botany) CBCS Syllabus

Programme Specific Outcomes

- PSO1: The course is a perfect amalgamation of classical (phycology, mycology bryology, pteridology, systamatics) and highly advanced (microbiology, pathology, cytogenetics, biochemistry, biotechnology, molecular biology, biostatistics, bioinformatics, instrumentation etc.) subjects which enable the students to familiarize with various life forms of plant kingdom as well as bacteria and viruses, their interrelationship, phylogeny along with their commercial uses and industrial applications.

- PSO2: After successful completion of this course, students would become familiar with different ecological and environmental issues, various policies and regulations and explore the linkages between biodiversity conservation, ecosystem services, climate change and sustainable livelihood.

- PSO3: The syllabus is designed to acquaint the students with UGC-CSIR NET, GATE, SLET and other subject-based national and state level examinations as well as the experience in research methodologies, dissertation work and seminar presentations also boost them up to pursue a career in higher education or in research.

- PSO4: Exposure to the hands-on training in numerous modern biological techniques, statistical procedures, as well as *in silico* and wet lab instrumentations also enhance their career opportunities in industry and other R&D organizations.

BARASAT GOVERNMENT COLLEGE

POST GRADUATE DEPARTMENT OF BOTANY

Course outcome of the M.Sc. in Botany, CBCS Syllabus

With Effect from 2019-20

SEMESTER-I

Course Code: BOTPCOR01T
Name of the Course: (Departmental 1) INTEGRATED LIFE SCIENCES (ILS)

Course outcome:

1. After successful completion of this course students will be able to better understanding and knowledge about basic common arenas of life sciences such as basic cell structure, function, cell signaling, cancer biology, immunology, development, molecular biological techniques, Mendelian genetics and basic biostatistics.

2. It is a very preliminary course that will greatly assist the students' vision and acceptance for more complex courses based on this foundation in subsequent semesters

3. This course includes modern techniques and topics of life science apart from the plant science that will familiarize students with very broader aspects of life sciences which will be beneficial to all students in all India based examinations like NET, GATE etc.

Course Code: BOTPCOR02T
Name of the Course: (Departmental 2) DIVERSITY OF PLANT LIFE-ALGAE & BRYOPHYTES

Course outcome:

1. After successful completion of this course student will be able to understand the diversity of the major life forms of algae and bryophytes.

2. This course will provides better understanding and knowledge regarding morphological, anatomical and genetic structure, phylogeny, interrelationships of algae and bryophytes.

3. Students will be aware of the role of algae and bryophytes in environment as well as their commercial uses and industrial applications through this course.

Course Code: BOTPCOR03T
Name of the Course: (Departmental 3) FUNGAL & OOMYCETE BIOLOGY

Course outcome:
After successful completion of this course student will be able to

1. Understand the modern trends in diversity, structure organisation, ultrastructure of the fungi and their major roles in ecosystem processes, from the degradation of organic matter and nutrient cycling to plant symbioses and as pathogens of plants, animals, and humans.

2. Learn about the classification, diversity, hosts ranging, phylogeny and parasitic lifestyles of Oomycetes, the most diverse and widespread group of parasites in terrestrial and aquatic habitats,

3. Explore the role of Fungi and oomycetes as pathogen causing various type of plant diseases and learn about disease management.

4. Learn about the general account and ecological and economic importance mycorrhiza and and lichen.

Course Code: BOTPCOR04T
Name of the Course: (Departmental 4) PLANT VIRUSES & BACTERIA

Course outcome:
After successful completion of this course student will be able to

1. Understand the general structure and functions of the prokaryote, microbial growth and different microbial growth controlling factors and about the different types of culture media, the role of microorganisms in food and pharmaceutical industry, their sources, methods of disinfection, sterilization and preservation of food and pharmaceutical formulations.

2. Understand the microbial genetics and the different diseases caused by the plant bacteria and their control

3. Understand the architecture of viruses, their classification, general replication strategies of viruses, their intricate interaction between viruses and host cells and different assay and purification techniques of the plant viruses.

4. Explore the role of viruses for the development of virus resistant plants, and as tools for cloning vectors and for gene transfer.

Course Code: BOTPCOR05P
Name of the Course: (Departmental 5) LABORATORY COURSE

Course outcome:
After successful completion of this laboratory course student will be able to

1. Understand the diversity of algae, bryophytes, fungi, oomycetes, bacteria and viruses in various habitats, their morphology and identification.

2. Use different modern molecular techniques, serological detection techniques and phylogenetic softwares for identification and determination of phylogenetic relationship.

3. Conduct various commonly used molecular biology techniques in plant sciences.

Course Code: BOTPAEC01M
Name of the Course: (AECC) UNDERSTANDING AND PRESENTING SCIENTIFIC LITERATURE

Course outcome:
After successful completion of this course student will be able to

1. Understand about journals and publishers in plant sciences and related disciplines, citation indexes, tools for literature searches, different bibliographic format, plagiarism etc.

2. Distinguish between open access and peer reviewed journals.

3. Develop habit of reading current review/research papers, understanding, and discussion among other students.

4. Learn how bibliographic formatting can be done using proprietary software like End Note or other open source ones, use of MS word and PowerPoint presentation making.

5. Improve presentation skill of scientific topics using ICT tools with the tips and guidance of teachers

SEMESTER-II

Course Code: BOTPCOR06T
Name of the Course: (Departmental 6) ANGIOSPERM SYSTEMATICS

Course outcome:
After successful completion of this laboratory course students will be able to

1. Understand the origin and diversification of flowering plants.

2. Learn about the advanced aspects of the principles of taxonomy (identification, nomenclature, classification of flowering plants), evolution (speciation, reproductive biology, adaptation, convergence, biogeography), and phylogenetics (phenetics, cladistics, morphology and molecules).

3. Do systematic survey of plant families, understand the evolutionary processes and patterns in the major families and develop expertise on the representative families and local flora.

4. Understand about the molecular systematic including nuclear, mitochondrial, chloroplast genomes, different methods and tools used in phylogeny reconstruction.

Course Code: BOTPCOR07T
Name of the Course: (Departmental 7) PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY

Course outcome:
After successful completion of this laboratory course students will be able to
1. Understand the issues of plant ecology and the environmental interaction of plant system

2. Learn about the interspecies competition, resilience study, biodiversity assessment, themes of conservation based on ecology.

3. Develop awareness regarding environmental biology including different types of pollution, their impact on plants and animals, environmental issues, policies and regulation which will be really beneficial for environment and society.

Course Code: BOTPCOR08T
Name of the Course: (Departmental 8) PLANT PATHOLOGY & CROP PROTECTION

Course outcome:
By the end of the course, the students will be able to:

1. Understand the importance of diseases caused by representative pathogens

2. Understand the molecular mechanism of host –pathogen interaction and disease resistance, and its translational use for the development of disease resistant plants through genetic engineering

3. Identify the diseases based on the symptoms and their control measures, disease control strategies with special reference to principles of plant viral disease management

Course Code: BOTPCOR09T
Name of the Course: (Departmental 9) DIVERSITY OF PLANT LIFE - PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY &PALYNOLOGY

Course outcome:
By the end of the course, the students will be able to:

1. Learn about the diversity of the major life forms of pteridophytes and gymnosperms as well as their fossil members, their biology, phylogeny, interrelationships, role in environment as well as their commercial uses and industrial applications.

2. Understand the evolutionary interrelationships between these groups and angiosperms both from extant and extinct genera.

3. Explore the knowledge of different aspect of palaeobotany and palynology.

Course Code: BOTPCOR010P
Name of the Course: (Departmental 10) LABORATORY COURSE

Course outcome:
By the end of the course, the students will be able to:

1. Handle and analyze plant and diseased materials in the laboratory/herbarium and in the field.

2. Use scientific terminology accurately through effective oral and written communication and the use of dichotomous keys in a regional floristic manual.

3. Have expertise in techniques related to plant pathology.

4. Students get exposure to the diversity of Pteridophytes, Gymnosperms, plant fossils and palynological samples and as well as their handling techniques.

Course Code: BOTPSEC01T
Name of the Course: (SEC-1) BIODIVERSITY AND CONSERVATION

Course outcome:
By the end of the course, the students will be able to:

1. Understand of the concept and principle of biodiversity science, causes as well as current crisis, and consequences of biodiversity loss.

2. Develop awareness regarding various means of conservation, restoration and sustainable utilization of biodiversity which can provide viable solutions to a range of societal challenges and provides an effective tool to bridge the knowledge gap for sustainable management of biodiversity.

3. Explore the linkages between biodiversity conservation, ecosystem services, climate change and sustainable livelihood.

SEMESTER-III

COURSE CODE: BOTPCOR11T
NAME OF THE COURSE: (Departmental 11)
MOLECULAR & CELLULAR GENETICS & PLANT BREEDING

Course outcome:

1. Learn the key concepts and fundamental mechanisms for the organization, replication, expression, variation, and evolution of genetic material at the molecular level, as well as methodologies for molecular genetic analysis and gene technologies.
2. Have a thorough understanding of the modern concept of gene, its variations in frequency, structure and regulation as well as methodologies for studying them via model systems.
3. Understand transmission genetics (including linkage analysis), quantitative and population genetics.
4. Gain a thorough understanding of the different modern instruments and equipment techniques used in Molecular Biology, Cytogenetics, and Plant breeding, Biotechnology as well as their applications.
5. Procure the skills to critically assess and review scientific Journals and general media presentations, as well as to retrieve and analyze molecular information and interpret genetic data on molecular biology-related topics.

COURSE CODE: BOTPCOR12T
NAME OF THE COURSE: (Departmental 12)
PLANT PHYSIOLOGY & BIOCHEMISTRY

Course outcome:

1. Introduction to the fundamentals of plant physiology and biochemistry.
2. Through this course the students are exposed to the importance of biological macromolecules.
3. Illustration of knowledge of stress adaptations in biological systems.
4. Role of Biomolecules and their functions are described through various physiological processes such as photosynthesis, photorespiration, nitrogen fixation, plant specific growth hormonal control etc.
5. Gain basic physiological and biochemical knowledge of plant systems, which will aid in the development of further concepts, and will be knowledgeable enough to select elective courses for the following semester based on their grasp of the subject.

COURSE CODE: BOTPDSE01T
NAME OF THE COURSE: (Departmental 13) DSE1
PHYTOCHEMISTRY AND PHARMACOGNOSY

Course outcome:

1. This course will explain basic metabolic pathways for production of metabolites in plants.
2. It will help the students to gain knowledge about therapeutically important active phytoconstituents.
3. Have a working knowledge of plant-based pharmaceutical adjuvants and its pharmacodynamics and pharmacokinetic aspects.
4. Know about pharmacovigilance in herbal therapy, crude drugs and concepts of its formulation using Ethnopharmacognosy, Ethnomedicine .

COURSE CODE: BOTPCOR14P
NAME OF THE COURSE: (Departmental 14) LABORATORY COURSE -Molecular & Cellular Genetics & Plant Breeding

Course outcome:

1. This practical course is designed to give students hands-on experience with various experiments in molecular biology, cytogenetics, and plant breeding, as well as to build technical skills in the selection and use of appropriate laboratory equipments and other materials.
2. Development of the competence to use instruments safely and responsibly to achieve the desired outcome.

COURSE CODE: BOTPCOR15P
NAME OF THE COURSE: (Departmental 15) LABORATORY COURSE-Plant Physiology & Biochemistry

Course outcome:

1. This course is designed to give students hands-on experience with various experiments in plant physiology, biochemistry, and developmental studies.
2. Students will learn to conduct their own experiments on major plant biochemical activities such as photosynthesis, respiration,compatible solute buildup under stress, enzyme activity measurement, and Km calculation, among others.
3. Procure knowledge about protein quantification and enzyme assay which will further help in their research activities.

COURSE CODE: BOTPGEC01T
(GEC 1) Any one of the following:
INSTRUMENTATION

Course outcome:

1. Knowledge about molecular biology, genomics, proteomics, forward and reverse genetics, structural and computational analysis, statistical studies, biophysical approaches, and radiolabeling techniques, among other techniques utilised in biology.
2. Improved skills in selecting methodologies for analysing issues and designing experiments will prepare students for working in a research laboratory.
3. Beneficial for CSIR/UGC NET, etc. examinations

SEMESTER-IV

COURSE CODE: BOTPDSE02T
(Departmental 16)
DSE2
(i) PLANT VIROLOGY & MOLECULAR MYCOLOGY

Course outcome:

1. The student will be able to understand the economic and pathological importance of plant viruses, their nature and properties, classification,
2. Knowledge about nature of virus evolution as well as that of viruslike entities, the role of satellite viruses and satellite RNAs and viroid in plant disease etiology.
3. Recognization of many diseases caused by viruses, as well as their symptomatology, transmission, purification, assays, features, and control strategies.
4. Elucidation of the diversity and importance of fungi and oomycetes in the environment, as well as their biology, interrelationships, genomic organisation, commercial applications, and biological resources.

(ii) MOLECULAR GENETICS & ADVANCED CELL BIOLOGY

Course outcome:

1. Genetic information and the genome's various molecular features, regulation of genetic information expression, maintenance, organisation, and evolution.
2. In-depth understanding of cell cycle and Cancer biology, protein sorting, trafficking, signalling, and proteomics, as well as their applications in modern biology.
3. The most recent advances in gene technology, such as RNA biology and gene editing techniques.
4. Vivid idea about Genomics, Proteomics and Transcriptomics.

(iii) ADVANCED PLANT PHYSIOLOGY& BIOCHEMISTRY

Course outcome:

1. Students will learn about advanced plant physiology and biochemistry in this course.
2. This will broaden the knowledge of students interested in conducting additional research in this field.
3. This is an elective course and students may have the liberty to select it based on their interest in a particular topic.

COURSE CODE: BOTPDSE03T
(Departmental 17) DSE3

(i) MOLECULAR PLANT PATHOLOGY

Course outcome:

1. Principles of disease epidemiology, molecular foundation of pathogen attack and hijacking of plant Pathogen interactions.
2. Plant defense mechanism and its molecular diagnoses behind the interactive pathways.
3. Long-term control methods, chemical control and its hazards, and contemporary disease-resistant variety creation methods.
4. Identification of Pathogens by using serological methods.

(ii) APPLIED PLANT BREEDING AND PLANT TISSUE CULTURE

Course outcome:

1. Plant breeding principles and several types of breeding procedures.
2. Micro and macropropagation principles and methodologies.
3. Advanced knowledge about marker assisted breeding.
4. Knowledge of statistical principles and applications in biological research, as well as statistical software.

(iii) PLANT MOLECULAR BIOLOGY

Course outcome:

1. This course delves into a crucial aspect of plant molecular biology that hasn't been covered in depth in any of the other courses.
2. This is a very relevant course that teaches students about main aspects of plant biotechnology in a very concise and lucid manner, such as recombinant DNA technology, gene cloning, gene sequencing, genome projects, cloning vectors, proteomics, RNA interference, gene regulation, epigenetics, etc.
3. This course is structured in such a way that it will considerably assist students in answering CSIR/UGC NET questions.

COURSE CODE: BOTPCOR18P
[Departmental 18 (P) LABORATORY COURSE OF DSE 2 & 3]

Course outcome:

1. This course is designed to help students prepare for research.
2. The emphasis on practical courses that will follow a theoretical syllabus will allow students to build skills such as detecting problems in the field, solving them in the lab, and bringing the solutions back to the field as solutions.

COURSE CODE: BOTPCOR19P
[Departmental 19 (P)
LABORATORY COURSE -SEMINAR PRESENTATION]

Course outcome:

1. This course is designed to help students prepare for advanced topics related to their DSE choices.
2. After completing of this course and Departmental 20, the student's skill sets shall significantly improved, allowing them to pursue a career in higher education or research.
3. This course will concentrate on the presentation of the student's research findings/review from Departmental 20 as scientific communication is such an important part of scientific research, emphasis should be given to this particular area.

COURSE CODE: BOTPCOR20P

[Departmental 20 (P): DISSERTATION PROJECT WORK]

Course outcome:

1. Student’s exposure to the research field and solving problems by using web-based resources and physical databases (where applicable).
2. They will be able to design experiments and will be familiar with several tools and technologies that can be used to do so.
3. Exposure to the hands-on instruction in numerous biological techniques, statistical procedures, as well as in silico and wet lab instrumentations.