Programme Outcome, Programme Specific Outcome & Course Outcome

For AY 2020-2021

Department of Botany, Sonamukhi College, Sonamukhi, Bankura, West Bengal

Under Bankura University

Program Outcome (PO)	➢ Knowledge develop about prokaryotes, Algae, Fungi & plant diversity starting from unicellular microbes to Gymnospermic & Angiospermic plants in term of their classification, habitat, morphological & anatomical structures, functions and relationship with the environments including their economic values. ➢ Students gather practical knowledge both in laboratory and also in the fields in different fields: plant characterization, identification; plant anatomy , wide range of physio-chemical analysis of plant material in context of plant physiology & biochemistry, plant pathological observation, Mendelian genetics & its derivatives, analyze data using appropriate statistical methods, pharmacognosy , bacterial isolation & staining procedures,biofertilizer, mushroom culture, gardening, fossil study & analysis, ecological adaptability study. ➢ Students able to think logically and scientifically into structural outline, gather appropriate knowledge and skill for their future career, planning & conduction independent project proposal and made appropriate report on it. ➢ Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form. ➢ Analyze the problems design proper procedures for solution for any experimental studies. ➢ Able to know about and apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations. ➢ Understand the valuable impact of the plant diversity in social and environmental aspects and demonstrate the knowledge and need of sustainable development. ➢ Concern about the ethical principles and commit to environmental & research ethics and responsibilities and norms of the biodiversity conservation. ➢ Skill Enhancement Course develop skill in some area like mushroom culture technology, Gardening, biofertilizer etc.
Program Specific Outcome (PSO)	➢ Concept develop about Phycology & Microbiology, Biomolecules & Cell Biology, Morphology & Anatomy of Angiosperms, Mycology &

	Plant Pathology, Molecular Biology, Reproductive Biology, Plant Metabolism, Natural Resource Management, Plant Breeding, Genetics. ➢ Basic concept of research and handling common practices and equipments in biological laboratory. ➢ Methods of data collection and maintenance in laboratory. ➢ Process of Reporting, Presentation and Publication of the scientific outcomes and to grow knowledge about Research Ethics. ➢ Application of knowledge to overcome environmental pollution and destruction of environment. ➢ Concept about significance of crop improvement through genetic engineering in the present context of growing population.
Course Outcome: B.Sc. Hons in BOTANY SEM-I	
Course	**Outcome**
Course code:SH/BOT /101/C-1; Course Title: Phycology and Microbiology	➢ Study characterization and economic importance of various groups of algae. ➢ Progress of phycological study in Indian perspective. ➢ Theoretical and practical knowledge of diverse range of algal members with the emphasis on their morphology and reproduction. ➢ Develop understanding on the concept of microbes their nutrition, growth , metabolism , reproduction and recombination process . ➢ Study classification of virus and bacteria based on their structures or properties. ➢ Prepare microbial samples for microscopic observation and temporary and permanent slides for different algal samples. ➢ Understand the economic importance of microbes in human welfare.
Course Code:SH/BOT /102/C-2; Course Title: Biomolecules &Cell Biology	➢ Understand Basic concept of biomolecules and cell biology. ➢ This course gives a vast knowledge about cell and its different bio molecules. ➢ Important information about bioenergetics, enzyme which are really important for the living world. ➢ A concept about cell and cell organelle, cell cycle, cell division and multiplications, which is directly involved ➢ Gather knowledge about the biochemical analysis of different biomolecules, Chromosome study, different physical processes involve in cell.

	with growth and development of an organism.
Course Outcome: B.Sc. Hons. in BOTANY SEM-II	
Course	**Outcome**
Course Code: SH/BOT /201/C-3; Course Title:Mycology & Phytopathology	➢ Understand the overall properties of true fungi and differentiate them from plants and animals & acquire knowledge about the allied fungi like slime molds. ➢ Gather knowledge regarding internal structures about different group of fungi and infected plant parts through practical works. ➢ Understand the interaction of fungal members with other organisms by studying lichen and mycorrhiza. ➢ Apply their knowledge for using different fungal organisms in agriculture, food industry, medicine or in other human welfare. ➢ Identify the common fungal diseases of crop plant and their causal organisms and device suitable control measures.
Course Code: SH/BOT /202/C-4 Course Title: Archegoniate (Bryophyta, Pteridophyta,& Gymnosperm) and Palaeobotany	➢ Understanding the concept of extinct and extant primitive archegoniates (Bryophytes, Pteridophytes & Gymnosperms). ➢ Understand about the morphology, anatomy of different vegetative parts and reproductive organs with life cycle of different genus. ➢ Knowledge about the evolution among the plants and evolution of land plants. ➢ Gather knowledge about the organogenesis of living archegoniates. ➢ Gather knowledge about the primitive earth and its inhabitants with reference to geological time scale.
Course Outcome: B.Sc. Hons. in BOTANY SEM-III	
Course	**Outcome**
Course Code: SHBOT / 301/C-5 Course Title: Morphology & Anatomy of Angiosperms	➢ Plant morphology is useful in the visual identification of plants which help in taxonomy. ➢ Comparative studies help to learn the plant evolution. ➢ Plant anatomy allows to conceptually integrate organism structure and function of plant cells and plant parts. ➢ Applied aspects of meristem culture. ➢ Provides evidences in forensic investigation. ➢ Enables to detect adulterant in crude drugs.
Course Code: SHBOT / 302/ C-6 Curse Title: Economic	➢ Understand the concept of origin of cultivated plants, crop domestication, evolution of new crop or varieties

Botany	and importance of germplasm diversity. ➢ Identify different crop plants based on their morphologies and know their uses in human welfare. ➢ Understand application of several industrially important plants and their processing mechanisms. ➢ Gather knowledge about the structures of different economically important plant parts and their chemical constituents through practical works.
Course code: SHBOT /303/C-7 Course Title: Genetics	➢ Gather detail knowledge about Mendelian and non-Mendelian genetics with several practical approaches. ➢ Knowledge about the nucleic acids & how nucleic acids transport genetic information among offspring. ➢ Understand scientific cause behind several abnormal chromosomal syndromes. ➢ Understand basic concept about the gene mapping. ➢ Understand basic causes of gene mutation its detection & DNArepair mechanism. ➢ Understand basic concept about developmental biology.
Course Code:SHBOT / 305/SEC-1 Course Title: Biofertilisers	➢ Know about Biofertilizers which are best defined as biologically active products which help in crop production without any side effects. ➢ They will be aware off about social justice and wellbeing of rural communities. ➢ Develop concepts regarding green manuring and organic fertilizers. ➢ This branch of Bio-Science also secures public health and food security. ➢ It helps in financial viability of farming. ➢ Make aware about vermicomposting and VAM for better crop production.
Course Outcome: B.Sc. Hons. in BOTANY SEM-IV	
Course	**Outcome**
Course Code: SHBOT / 401/C-8 Course Title: Molecular Biology	➢ The course provides a solid foundation in cell biology, molecular biology, microbiology, biochemistry, and molecular genetics. ➢ This training will enable to make meaningful contributions to global medical and environmental issues. ➢ It will provide exciting laboratory or administrative positions in the biotechnology and biomedical /pharmaceutical industries. ➢ It also provides an excellent foundation for pursuing an advanced degree or attending a professional school, e.g. dental, medical or veterinary schools. ➢ Understand DNA replication, transcription, gene expression. ➢ Students will be benefited to enter into advance courses and into research laboratory.

Course Code: SHBOT / 402/ C-9 Course Title: Plant Ecology & Phytogeography	➢ To understand the concept of ecology and its biotic and abiotic components, its compositions, and interactions. ➢ Knowledge about the population and its dynamics and its interaction with environmental factors. ➢ Concept of plant succession process upto its climax. ➢ Knowledge about the energy source in ecosystem. ➢ Knowledge about the phyto geographical division in India. ➢ Experimental study about the ecological adaptation of plants.
Course Code: SHBOT /403/C-10 Course Title: Plant Systematics	➢ Useful to understand the theory and practice of describing, naming and classifying the angiospermic taxa. ➢ To know about the basic concepts and principles of systematics. ➢ Understand the distinguishing features of different angiosperm families and their affinities. ➢ Essential for the fundamental understanding of biodiversity and its conservation. ➢ Help to know the local or regional flora. ➢ Help to understand the rules of ICN in botanical nomenclature. ➢ To create an understanding of the evolutionary trends of angiosperm. To know practically how to prepare specimens for future references.

Course Code: SHBOT / 405/SEC-2 Course Title: MushroomCulture Technology	➢ Help to identify various types of mushroom edible as well as poisonous. ➢ Mushroom has excellent medicinal properties, rich in protein, fibre and amino acid that is why it is economically very important and interesting area of research. ➢ Help to create awareness about the mushroom among people. ➢ To study on mushroom farming is a profitable business. ➢ Continuous research is required in the field of mushroom as they are very rich in nutritional value and help in cure many terminal diseases. ➢ Mushroom culture needs little investment and is labour intensive. ➢ The production and culture of new species of mushroom is increasing.
Course Outcome: B.Sc. Hons. in BOTANY SEM-V	
Course	**Outcome**
Course Code: SHBOT/501/C-11 Course Title: Reproductive Biology & Angiosperms & Palynology	➢ To understand the complete structure & function of anther & ovule. ➢ Knowledge about structure and types of pollen and NPC system, scope of palynology. ➢ To know the basic & special structures of ovules and their functions. ➢ Knowledge about the post-pollination changes in flower, endosperm & seed formation. ➢ Knowledge about self incompatibility & how to overcome it in horticulture. ➢ Concept about polyembryony & apomyxis and its types.
Course Code:SHBOT/502/C-12 Course Title: Plant Physiology	➢ Understand the process of water movement within plant tissues required for their growth and development. ➢ Understand the process of translocation of solutes in plants. ➢ Know about mineral nutrition associated with plant growth and their uptake process. ➢ Understand the function of growth regulators in plant developmental process. ➢ Learn about the flower development process and different types of photoreceptors. ➢ Perform different experiment related to plant physiological process.

Course Code:SHBOT/503/DSE-1 Course Title: Natural Resource Management	➢ Help to aware different types of natural resources and its threats & managements. ➢ Help students to understand how to maintain a balance in the eco-system towards the sustainable development. ➢ To avoid further destruction of the environment. ➢ Help to know the updated concept of ecological footprint, carbon footprint, GIS, GPS technology, RAMSAR SITE. ➢ Aware of about various national and international strategies for conservation of natural resources.
Course Code:SHBOT/503/DSE-2 Course Title: Plant Breeding	➢ Provides knowledge about the different crop plants ➢ Know about the different breeding equipment. ➢ Understand the relation between crops and human beings and how much plant breeding is necessary for our growing population. ➢ By acquiring knowledge on plant breeding, they could be able to apply their knowledge in crop development.
Course Outcome: B.Sc. Hons. In BOTANY SEM-VI	
Course	**Outcome**
Course Code: SHBOT/601/C-13 Course Title: Plant Metabolism	➢ Understand the concept of plant metabolism. ➢ To know the role of enzymes in different metabolic processes. ➢ Detail knowledge about procedures of photosynthesis, respiration, nitrogen fixation, signal transduction etc. and their impact on environment. ➢ Gather knowledge about the different biosynthetic pathway which will bw helpful in research level.
Course Code: SHBOT/602/C-14 Course Title: Plant Biotechnology	➢ Know about the scope and importance of biotechnology for plant improvement. ➢ Understand the concepts and principles of plant tissue culture. ➢ Know about the methods and tools associated with recombinant DNA technology. ➢ Acquire skills on techniques of construction of recombinant DNA, cloning vectors and isolation of gene of interest. ➢ Understand about the different methods of gene transfer. ➢ Know how rDNA technology helps for the production of pharmaceuticals, growth hormone, vaccine and gene therapy in expression system. ➢ Understand the concepts of transgenic crops with improved quality traits.

Course Code:SHBOT/603/DSE-3 Course Title: Industrial & Environmental Microbiology	➢ Understand the role of different microorganisms in industry and environment. ➢ Acquire knowledge about different types of fermentation processes and function of different bioreactors. ➢ Understand the overall processing of industrial products derived from microbes and apply their knowledge in future. ➢ Apply their concept for overcoming environmental pollution and bioremediation of contaminated soils. ➢ Develop their skill in handling microorganisms with proper sterilization process.
Course Code: SHBOT/603/DSE-4 Course Title: Research Methodology	➢ Knowledge about the basic concept of research, its categories in different aspects. ➢ Basic experiences to handling common practices & instruments in biological laboratories. ➢ Knowledge about various techniques to study the plant cell/tissue. ➢ To know about the procedures of data collections and its maintenance in laboratory. ➢ Knowledge about the reporting, presentation & publication of scientific outcome and aware about research ethics.

Course outcome (CO) B.Sc. Programme in Botany		
Course	SEM	Outcome
Course Code:SPBOT/101/C-1A Course Title:Plant Biodiversity: Microbes,Algae,Fungi and Archaegoniate	I	➢ Study characterization and economic importance of various groups of algae. ➢ Theoretical and practical knowledge of diverse range of algal members with the emphasis on their morphology and reproduction. ➢ Develop understanding on the concept of microbes their nutrition, growth , metabolism , reproduction and recombination process . ➢ Prepare microbial samples for microscopic observation and temporary and permanent slides for different algal samples. ➢ Understand the economic importance of microbes in human welfare. ➢ Understanding the concept of extinct and extant primitive archegoniates (Bryophytes, Pteridophytes & Gymnosperms). ➢ Understand about the morphology, anatomy of different vegetative parts and reproductive organs with life cycle of different genus. ➢ Knowledge about the evolution among the plants and evolution of land plants.
Course Code: SPBOT/201/C-1B	II	➢ To understand the concept of ecology and its biotic andabiotic components, its compositions, and

Course Title: Plant Ecology, Morphology and Taxonomy		interactions. ➢ Knowledge about the population and its dynamics andits interaction with environmental factors. ➢ Concept of plant succession process upto its climax. ➢ Knowledge about the energy source in ecosystem. ➢ Knowledge about the phytogeographical division in India. ➢ Experimental study about the ecological adaptation of plants. ➢ Useful to understand the theory and practice of describing, naming and classifying the angiospermic taxa. ➢ To know about the basic concepts and principles of systematics. ➢ Understand the distinguishing features of different angiosperm families and their affinities. ➢ Help to know the local or regional flora. ➢ Help to understand the rules of ICN in botanical nomenclature. ➢ To create an understanding of the evolutionary trends of angiosperm. To know practically how to prepare specimens for future references.
Course Code: SPBOT/301/C-1C Course title:Genetics and Plant Breeding	III	➢ Gather detail knowledge about Mendelian and non-Mendelian genetics with several practical approaches. ➢ Knowledge about the nucleic acids & how nucleic acidstransport genetic information among offspring. ➢ Understand scientific cause behind several abnormal chromosomal syndromes. ➢ Understand basic concept about the gene mapping. ➢ Understand basic causes of gene mutation its detection & DNArepair mechanism. ➢ Understand basic concept about developmental biology. ➢ Provides knowledge about the different crop plants ➢ Know about the different breeding equipment. ➢ Understand the relation between crops and human beings and how much plant breeding is necessary for our growing population. ➢ By acquiring knowledge on plant breeding, they could be able to apply their knowledge in crop development.
Course Code : SPBOT/304/SEC-1 Course Title:Biofertilizer	III	➢ Know about Biofertilizers which are best defined as biologically active products which help in crop production without any side effects. ➢ They will be aware off about social justice and wellbeing of rural communities. ➢ Develop concepts regarding green manuring and organic fertilizers. ➢ This branch of Bio-Science also secures public health and food security.

		➢ It helps in financial viability of farming. Make aware about vermicomposting and VAM forbetter crop production.
Course Code: SPBOT/401/C-1D Course title:Plant Physiology and Metabolism	IV	➢ Understand different physiological processes found in plant body. Such as water absorbtion, translocation, mineral nutrition, flowering, dormancy and germination etc. ➢ Perform different experiment related to plant physiological process. ➢ Understand the concept of plant metabolism. ➢ Detail knowledge about procedures of photosynthesis,respiration, nitrogen fixation, signal transduction etc. and their impact on environment. ➢ Gather knowledge about the different biosynthetic pathway which will be helpful in research level.
Curse Code: SPBOT/404/SEC-2 Course Title: Nursery and Gardening	IV	➢ Gather knowledge how nursery can be prepared. ➢ Develop skill regarding nursery and horticulture and will be helpful to earn money. ➢ Gather knowledge about different crop plant and garden plant.
Course Code :SPBOT/501/DSE-1A Course Title:Cell & Molecular Biology	V	➢ The course provides a solid foundation in cell biology, molecular biology, microbiology, biochemistry, and molecular genetics. ➢ This training will enable to make meaningful contributions to global medical and environmental issues. ➢ It will provide exciting laboratory or administrative positions in the biotechnology and biomedical /pharmaceutical industries. ➢ It also provides an excellent foundation for pursuing an advanced degree or attending a professional school, e.g. dental, medical or veterinary schools. ➢ Understand DNA replication, transcription, gene expression. ➢ Students will be benefited to enter into advance courses and into research laboratory. ➢ Understand Basic concept of bio molecules and cell biology. ➢ This course gives a vast knowledge about cell and its different bio molecules. ➢ A concept about cell and cell organelle, cell cycle, cell division and multiplications, which is directly involved ➢ Gather knowledge about the biochemical analysis of different bio-molecules, Chromosome study, different physical processes involve in cell.
Course Code :SPBOT/504/SEC-3 Course Title:Medicinal Botany	V	➢ Gather Knowledge about the medicinal values of different plants. ➢ Understand about the medicinal plants, its active components, uses. ➢ Gather practical knowledge to cultivate medicinal plants.

Course Code: SPBOT/601/DSE-1B Course Title: Economic Botany and Biotechnology	VI	➢ Identify different crop plants based on their morphologies and know their uses in human welfare. ➢ Understand application of several industrially important plants and their processing mechanisms. ➢ Gather knowledge about the structures of different economically important plant parts and their chemical constituents through practical works. ➢ Know about the scope and importance of biotechnologyfor plant improvement. ➢ Understand the concepts and principles of plant tissue culture. ➢ Know about the methods and tools associated with recombinant DNA technology. ➢ Acquire skills on techniques of construction of recombinant DNA, cloning vectors and isolation of gene of interest. ➢ Understand about the different methods of gene transfer. ➢ Know how rDNA technology helps for the production of pharmaceuticals, growth hormone, vaccine and gene therapy in expression system. ➢ Understand the concepts of transgenic crops with ➢ improved quality traits.
Course Code: SPBOT/604/SEC-4 Course Title: Mushroom Culture Technology	VI	➢ Help to identify various types of mushroom edible as well as poisonous. ➢ Mushroom has excellent medicinal properties, rich in protein, fibre and amino acid that is why it is economically very important and interesting area of research. ➢ Help to create awareness about the mushroom among people. ➢ To study on mushroom farming is a profitable business. ➢ Continuous research is required in the field of mushroom as they are very rich in nutritional value andhelp in cure many terminal diseases. ➢ Mushroom culture needs little investment and is labour intensive. ➢ The production and culture of new species of mushroom is increasing.