NARASINGH CHOUDHURY AUTONOMOUS COLLEGE, JAJPUR, ODISHA

PROGRAMME OUTCOME
COURSE OUTCOME
(UG& PG)

OUR COLLABORATORS

csayn Climate Smart Agriculture Youth Network

TRI-CHANDRA MULTIPLE CAMPUS
Ghantaghar, Kathmandu, Nepal

HOMA THERAPY

SchEMS 1999

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WORLD ENVIRONMENT DAY 2022

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PROGRAMME OUTCOME AND COURSE OUTCOME OF UG BOTANY AS PER NEP=2020

PROGRAMME OUTCOME

- To prepare the students for a career in Botany.
- To prepare the students for Higher Education and Research in Botany.
- To develop a conceptual understanding of the subject and to develop an inquisitiveness in the subject.
- To enable the student to acquire basic skills necessary to understand the subject and to master the skills to handle equipment's utilized to learn the subject.
- To generally promote wider reading on the subject and allied inter disciplinary subject.

Core-I **Semester-I**

Microbiology and Phycology

Course Outcomes

- The students learn about the diverse nature of microbes and their interaction with other organisms.
- The students certainly get the opportunities to learn the basics of the nature and impact of viruses.
- The students shall be able to understand the potential of various microbes and the approaches to use them for human welfare.
- The students would be able to identify the important microbes including bacteria, cyanobacteria, and algae available in local environments and understand their beneficial roles.
- The students shall learn about the immense potential the algal resources and understand the methods of cultivation and use of algae.

Core-II **Analytical Techniques in Plant Sciences**

Course Outcomes:

- Proper understanding of the microscopy and knowledge to analyze plant samples using electron microscopy and flow Cytometer.

- Separation of biomolecules and cell organelle and appropriate application of the knowledge of centrifugation for the same.
- Basic knowledge on the use of radioisotopes for analysis of biological samples.
- Extraction and qualitative and quantitative analysis of extracts as well as the assay mixtures using spectrophotometer.
- Skilfulapplicationofchromatographictechniquesforseparationofaminoacids, pigments and Course Outcomes
- Students will understand biomolecules.
- Proper method for characterizing protein and nucleic acids and skill on handling electrophoresis equipment for preparation of gels.

Core- III **Semester- II**

Cell Biology

Course Outcomes

- the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
- Students will understand the components of cellwall &cytoskeleton
- Students will understand how these cellular components are used to generate and utilize energy in cells.
- Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes.
- Students will understand the cellular components underlying mitotic and meiotic cell division.

Core-IV **Mycology and Phytopathology**

Course Outcomes

- Have an idea on the vast fungal diversity in nature and method of their identification and culture.
- Know the life cycle of commonly occurring fungal genera and the disease caused by them.
- Have knowledge on the types of fungal associations and their importance.
- Have knowledge and skill on the application of Fungi and fungal biomolecules in human welfare.
- Have skill to understand the host-parasite relationship and its role in establishment of viral, fungal and bacterial diseases in plants.
- Understand the causes and conditions for commonly occurring plant

diseases and the methods of their control.

Core- V **Semester= III**

Archegoniatae

Course Outcomes:

- Able to understand the mechanism of the evolution of the higher plants and their adaptation to land habit.
- Knowledge on the diversity of archegoniates and their and their pattern of habitat specific distribution.
- Knowledge on the characteristics of bryophytes and skill to differentiate the genera on the basis of their morphology and anatomy.
- Ability to identify the members of pteridophytes and knowledge on their characteristic features.
- Understand the unique features and distribution of gymnosperms. Capacity to analyze various types of fossils on the basis of their characters

Core- VI **Anatomy of Angiosperms & Economic Botany**

Course Outcomes:

- The ability to examine the internal anatomy of plant systems and organs.
- Develop a critical understanding of the evolution of the concept of organization of shoot and root apex.
- Evaluate the adaptive and protective morphological systems of plants.
- Be able to know the origin and evolution of crops and the importance of wild relatives in crop improvement.
- Develop a basic knowledge on germplasm and the basics for their conservation.
- Have an understanding of plants as a source of food, beverages, spices, and materials and its application in human welfare.

Core- VII **Genetics**

Course Outcomes:

- Learn the basic principles of inheritance at the molecular, cellular and organismal levels.
- Understand the mechanism of inheritance and its relationship with the expression of morphological traits.

- Understand the relationships between molecule/cell level phenomena("modern" genetics) and organism-level patterns of heredity ("classical" genetics)
- Know about the variations by polyploidy, chromosomal aberration and gene mutations.
- Test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations

Core- VIII **Semester- IV**

Basic Molecular Biology

Course Outcomes:

On completion of the course the students shall

- Be able to describe Organization and structure and replication of DNA and RNA.
- Have theoretical and practical knowledge the prokaryotic and eukaryotic nucleic acids.
- Have a clear understanding on the structure and function of organellar genome.
- Understand the processes of bidirectional, semi-conservative and semi discontinuous mode of replication and the importance of the genetic code.
- Have ability to understand the mechanism of translation in prokaryotes and eukaryotes.

Core- IX **Plant Ecology & Phytogeography**

Course Outcomes:

- Have ability to understand the ecological functioning ofecosystems and would certainly help students to maintain the local ecosystems.
- Have information on species' geographical range and how the size and life history influenced by the various components of ecosystems.
- Anunderstandingofthefactorsthatinfluencepatternsofabundanceanddistribution in populations.
- Have knowledge on the process of soil formation and approaches to study the nature of soils.

Have skill to evaluate the dynamics of change of population characteristics.

Core- X **Plant Systematics**

Course Outcomes:

- Knowledge on various levels of taxonomic hierarchy and the relationships among various hierarchical levels with respect to their similarities and variations of characters.
- The skill to use various taxonomic literature, Flora and herbaria, keys of both physical and digital types for plant identification and floristic studies.
- Critical thinking on the ancient, traditional and modern classification systems and evaluation of their applicability in taxonomic placement of taxa.
- Knowledge on the evolution of the concepts in classifying plants and weighing the potential of various tools.
- Ability to build the phylogeny among various taxa of different levels of hierarchy and identifying the apomorphy and plesiomorphy.
- Critical observations of the morphology of plant materials for taxonomic description and identification to the family, genus and species level.

Core- XI **Semester- V**

Reproductive Biology of Angiosperms

Course Outcomes:

- Have an understanding on the fundamental concepts of Economic Botany.
- Develop a basic knowledge on the evolution of crops/varieties.
- be aware about the importance of germplasm diversity and learn the methods for their conservation.
- Increase appreciation of diversity of plants and plant products used in everyday life of human and the methods for their enhanced production.
- Have an understanding of plants as a source of food, beverages, spices, and materials.

Core- XII **Basic Plant Physiology**

Course Outcomes

- The governing principles behind various physiological processes in plants.
- About various uptake and transport mechanisms (water and solutes) in plants and the factors governing these processes.
- The role of various plant hormones, signaling compounds, and stress responses.
- The skills to manipulate the plant hormones in plants for desired morphological and physiological responses.
- The climatic and physiological requirements for molecular signaling of plants for growth, differentiation, maturity.

Core- XIII **Basic Plant Biotechnology**

Course Outcomes

- Have knowledge the about methods of Plant Tissue culture and its application.
- Be able to describe the Somatic embryogenesis; Embryo culture and embryo rescue
- Have skill to isolate plant Protoplast and differentiate the normal and hybrid protoplasts
- Have knowledge the Gene Construct; construction of genomic and c DNA libraries, screening DNA libraries
- Gain knowledge on methods for developing transgenic plants and application of transgenics for human welfare.

Core- XIV **Semester-VI**

Basic Plant Metabolism

Course Outcomes:

- The students shall be able to explain the importance of biochemical pathways and regulatory pathways.
- The students can explain the role of enzymes in metabolic activities.
- The students shall have ability to differentiate various carbon metabolic pathways.
- The students shall have proper level of knowledge on carbon oxidation and energy synthesis.

- The students can explain the processes of lipid metabolism and its importance in the germinating seeds.
- The students shall be able to understand and explain the aminoacid metabolic pathways.

Core- XV **Natural ResourceManagement**

Course Outcomes:

- Be able to understand importance of each component of natural resources and try to use the available resources judiciously.
- Know about different biological conventions and treaties emphasizing the conservation of biological diversities.
- Clearly understand the importance of sustainable use of natural resources and procedures for their assessment.
- Have skill to use renewable energy sources for the betterment of the human civilization and actively participate in popularization of the methods of energy and resource conservation.
- Know the national and international efforts for management and accounting of natural resources.

Core- XVI **Semester- VII**

Applied Molecular Biology

Course Outcomes:

- Be able to describe methods of recombinant DNA Technology.
- Have theoretical and practical knowledge of the isolation, purification and estimation of Plasmid DNA.
- Have a clear understanding on the methods of expression of a recombinant Protein in E.coli.
- Understand the processes of the DNA replication recombination and repair.
- Have ability to understand the mechanism of the methods for confirmation of gene cloning and gene expression.
- Be able to describe the application DNA molecular markers :RFLP, RAPD and AFLP techniques

Core- XVII **Applied Biochemistry**

Course Outcomes:

- The students shall be able to explain the importance of carbohydrate sources and their different uses.
- The students shall be able to explain the importance of lipids from plants sources and their different uses.
- The students shall be able to explain the importance of nucleic acid from plant sources and their different uses.
- The students shall be able to explain the importance of proteins/enzymes from plant sources and understand the under laying mechanisms.
- The students can explain the processes of lipid metabolism and its importance in the germinating seeds.
- The students shall be able tounderstand and explain the importance of enzyme kinetics and industrial use.

Core- XVIII **Biostatistics**

Course Outcomes:

- The methods for primary and secondary data collection.
- Process the data and simulate the data to field conditions.
- How to select correct statistical method for analysis of a set of data
- The skill to build conclusion by outcome of the data analysis

The skill to analysis complex datasets by multivariate analysis

Core- XIX **Applied Ecology**

Course Outcomes:

- Have skill to analyse a plant community and determine its importance in the habitat
- Develop a proper understanding of the potential of solid wastes and the processes used to reuse.
- Clearly understand the importance of protection of surface waters and maximize the water reuse and recycling.
- Know importance of bio-energy and skill to plan the harvesting and use of alternate energy.
- Understand the mathematical models for ecosystem analysis and skill to develop the predictive models.

Core- XX **Semester- VIII**

Applied Plant Physiology

Course Outcomes:

- The path ways of nutrient uptake and the physiological principles regulating the uptake.
- The skill to identify the secondary metabolites for plant defense and apply the same for plant defense induction.
- About the biotic and abiotic components to induce resistance in plants.
- The skills to manipulate the plant hormones in plants for desired morphological and physiological responses.
- The progress in augmenting plant production

Core- XXI **Applied Biotechnology**

Course Outcomes:

- Have knowledge about methods of plant tissue culture, organogenesis and somatic embryogenesis and their application in crop improvement.
- Be able to understand the process of protoplast isolation, fusion and culture, selection of hybrid cells and regeneration of hybrid plants
- Learn the method of gene transfer for developing transgenic plants
- Gain knowledge on transgenics for herbicide resistance, resistance to biotic stress abiotic stress and other quality improvement
- Gain knowledge on metabolic engineering for augmentation of secondary metabolite biosynthesis and their industrial potential.

Core- XXII **Applied Microbiology**

Course Outcomes:

- The students would be able to understand the roles of microbes and production of microbial products
- The students certainly get the opportunities to learn the basics of idea on bioreactors and utility
- The students shall be able to understand the application of various disinfectants and instruments used for sterilization.
- The students would be able to identify the important microbes for bioremediation of pollutants

Core- XXIII Bioinformatics

Course Outcomes:

- The students shall have ability to correlate with evolutionary development.
- The students shall be able to compare the diversity of different aspects in analyzing the genetic and proteomic data.
- The students shall have skill to differentiate the primitive and modern traits of species.
- The students shall be able to use computer and different biological softwares and tools for solving biological problems.
- The students can categorize and apply computational approaches in understanding biological data.
- The students can analyze aspects in drug discovery.

Dr. Sarada Prasad Mohapatra

HOD, Botany

PROGRAMME OUTCOME AND COURSE OUTCOME OF MSC BOTANY COURSES

Programme Outcome-

1. The MSc programme imparted by the Institution alms at the future prospect of the students in both academic and research arena.
2. The syllabus designed in such a way that it will help the students to have a basic as well as applied aspects of plant sciences as per the modern concept which will also help them to get into a better Institution for higher study both in National and International level.
3. This is a 2 year programme in which the syllabus is divided into various sub categories keeping an eye on the basic and applied research.
4. This is a comprehensive framework which helps a student to know about the handling of high resolution laboratory equipments.
5. To enable a student to undergo interdisciplinary research and to know about A to Z of both career in Botany and other allied area.

Semester-I Core Papers

Paper-BOT-101 Diversity of Life

Course Outcomes:

The course will impart theoretical knowledge on diversity of microorganisms, their life forms, economic importance and various plant diseases caused by them. Students will learn the basics of microbial techniques like isolation, culture and preservation of bacteria, algae and fungi. Students will learn about origin, evolution and reproductive strategies of bryophytes.

Paper-BOT-102 Diversity of Vascular Plants

Course Outcomes:

Students will learn about evolution of gametophytes, sporophytes and conducting tissues of fossil and living pteridophyte as well as gymnosperm. Students will have knowledge on basics of paleo botany and palynology along with their applications.

Paper-BOT-103 Cell & Molecular Biology of Plants

Course Outcomes:

The students will be learning about the structure and function of cell wall and plasma membrane, cell organelles such as chloroplast, mitochondria and others. Students will have knowledge on nuclear organization, DNA structure, replication

and repair, transcription, translation and protein sorting. Understanding about regulatory mechanism of cell cycle and apoptosis of the students will be enhanced.

Paper-BOT-104 Plant Biochemistry / SWAYAM Course on Biochemistry

Course Outcomes:

Students will be learning about concepts of reaction kinetics, thermodynamics and their biological applications, fundamentals of biochemistry including metabolism and bioenergetics. Students will gain knowledge on structure and properties of carbohydrate, proteins, lipids and secondary metabolites. Students will learn the basics of enzyme kinetics and regulation of enzyme activity.

Semester-II

Paper- BOT-201 Cytogenetics, Plant Breeding &Biostatistics

Course Outcomes:

Students will learn about genetic recombination and mapping techniques, karyotype analysis, chromosomal aberrations, DNA damage and repair mechanism. Students will gain knowledge on plant breeding techniques for crop improvement. Students will have basic knowledge on regulation of gene expression, molecular markers and their application. Students will learn about sampling techniques, testing of hypothesis, correlation and regression.

Paper- BOT-202 Biotechnology & Genetic Engineering of Plants

Course Outcomes:

Students will learn about clonal propagation, production of haploids, soma clonal variants, development of somatic hybrids and hybrids for crop improvement. Students will gain knowledge on recombinant DNA technology and agrobacterium mediated gene transfer for development of transgenic plants. Students will learn techniques like electrophoresis, blotting techniques, spectroscopy, chromatograph, ELISA etc.

Paper- BOT-203 Plant Physiology

Course Outcomes:

Students will learn about mechanism of membrane transport, transport through xylem and phloem, mechanism of photosynthesis, respiration and nitrogen metabolism. Students will gain knowledge on stress physiology, photoreceptors, flowering and senescence in plants.

Paper- BOT-204 Plant Taxonomy, Ecology & Evolution

Course Outcomes:

Students will learn about ICBN and rules for plant nomenclature, merits and demerits of major system of classification, Taxonomic evidence and range of floral structures of different orders. Students will gain knowledge on habitat, population characteristics, structure and attributes of community, ecological succession, structure and function of ecosystem. Students will learn about theories of evolution and maintenance of gene frequency in population.

Semester-III

Paper BOT-301 Plant Development, Reproduction and Economic

Course Outcomes:

Students will learn about plant cell development, differentiation of apical meristems & vascular tissues, flower development and its genetic regulation. Students will gain knowledge on development of fruit, senescence and its regulation, development of male and female gametophyte, pollen-stigma interactions and double fertilization. Students will learn about center of origin of plants and various economic uses of domesticated and wild plants.

Paper-BOT-302 Conservation Biology

Course Outcomes:

Students will learn about importance of biodiversity and drivers of biodiversity change, convention of biological diversity, IUCN categories of plants, Biodiversity Act and rules, Strategies for resources conservation and management, in situ and ex situcoservation. Students will gain knowledge on various types of IPR and their protection strategies.

Paper-BOT-303

(Free Elective Courses)

Plants & Environment (A)

Course Outcomes:

Students will learn about components of environment, biogeography and biogeographical zones of India, mangroves and their role for environmental protection, phytoremediation and phytomining, methods. Students will gain knowledge on pollution of water, air and soil, remote sensing and its application in plants and environment, plants and pollution control, biomass and bioenergy, aerobiology and pollen allergy.

Environmental Studies (B)

Course Outcomes:

Students will learn about components of the environment, Concept of ecosystem, Environmental protection and sustainable development, sources, monitoring and control of environmental pollution, renewable and nonrenewable resources, environmental hazards and disaster management, environmental laws, environmental education and awareness.

Paper-BOT-304

(Allied Elective Courses)

Plant physiology and Developmental biology

Course Outcomes:

Students will learn about physiology of photosynthesis, flowering and senescence, mechanism of action of plant growth regulators, development of male and female gametophyte and the process of fertilization

Semester-IV

Core elective papers

(optional):

Only One Special paper +

Dissertation + Seminar presentation

Paper-BOT-401 (A) Biochemistry and Molecular Biology -I

Course Outcomes:

Students will be learning about protein conformation, enzyme kinetics, regulation of enzyme activity, regulation of carbohydrate metabolism, oxidation of fatty acids, cell signaling and signal transduction. Students will gain knowledge on immunoglobulins, mechanism of immune response, vaccines and immunological techniques.

Paper-BOT-401(B) Plant Biotechnology -I

Course Outcomes:

The course aims to educate student on plant cell, tissue & organ culture, somatic hybridization and cybridization, techniques in molecular biology, recombinant DNA technology, vector-mediated gene transfer to plants.

Course Outcomes:

Students will be learning about micro propagation, microspore & ovary culture, embryo rescue, soma clonal variation and cell suspension culture, protoplast isolation, culture and fusion, DNA isolation and purification, RT-PCR, PCR, DNA Sequencing, SDS-PAGE, Cloning vectors Construction of recombinant DNA and expression, Mechanism of T-DNA transfer, Vectors based on ptIs& pRi.

Paper-BOT-401 (C) Cytogenetics -I

Course Outcomes:

Students will be learning about structure and properties of DNA and RNA, autopolyploid and allopolyploids, structural alteration in chromosome, DNA replication and repair mechanisms, gene regulation in eukaryotes, DNA isolation and purification, RT-PCR, PCR, DNA Sequencing.

Paper-BOT-401 (D) Environmental Biotechnology-I

Course Outcomes:

Students will be learning about Environmental Impact Assessment (EIA), Environmental Management Plan (EMP), major regions of atmosphere, technological methods of air pollution control, Soil structure and soil profile, soil remediation and disposal, Waste water treatment processes and Waste water use in aquaculture.

MICROBIAL TECHNOLOGY-I

Paper-BOT-401 (E) Microbial Technology-I

PAPER-BOT-401 (E)

Course Outcomes:

Students will be learning about classification of microorganisms and microbial culture methods, immunoglobulins and mechanism of immune response, immunological techniques, soil, water and aero microbiology, microbes in mining and bioleaching of metals, isolation of DNA, Agarose gel electrophoresis, PCR, fermenter and industrial application.

BIOSYSTEMATICS-I

Paper-BOT-401 (F) Biosystematics-I

Course Outcomes:

Students will be learning about microbial nutrient metabolism, bio fertilizers, nutritional types of microbes, nitrogen fixation, bio-reactors, downstream processing and microbes as food, microbe-microbe, plant microbe and animal-microbe interaction.

402 A

Course Outcomes:

Students will be learning about DNA replication, DNA damage, repair and recombination, Prokaryotic and eukaryotic translation, regulation of gene expression in prokaryotes and eukaryotes, gene correction and editing, molecular makers in genome analysis, designing of ribozymes, applications of antisense and ribozyme technologies.

402 B

Course Outcomes:

Students will be learning about chemical and physical method of DNA transfer, molecular markers, genetic maps, functional genomics and proteomics, gene chip technology.

402 C

Course Outcomes:

Students will be learning about cell cycle and its regulation, Genetic fine structure analysis. Split genes, replication of RNA and splicing, post translational modification, population genetics, antisense RNA technology and its application.

402 D

Course Outcomes:

Students will be learning about degradation of pesticides and hydrocarbons, Biomining and bioleaching, phytoremediation, bio energy and biofuels, in situ and ex situ conservation measures, role, objectives and core elements of EMS, bioassay, biosensor and mathematical tools for model building.

402 E

Course Outcomes:

Students will be learning about microbial nutrient metabolism, biofertilizers, nutritional types of microbes, nitrogen fixation, bio-reactors, downstream processing and microbes as food, microbe-microbe, plant microbe and animal-microbe interaction.

402 F

Course Outcomes:

Students will be learning about chromosome number, karyotype, levels of polyploidy, uses of chemical criteria in plant taxonomy, application of molecular markers for identification of species, characters and attribute of numerical taxonomy, cluster analysis, methods, collection of materials and documentation of data for floristics study.

Paper-BOT-403 Dissertation

Course Outcomes:

Students will learn how to design experiments, think critically and write dissertation. The course will be a preliminary training to do research.

Paper-BOT-404 Seminar presentation

Course Outcomes:

Students will acquire the skill of public speaking, content development for presentation and discussion with audience.

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