

Bsc Botany

Philosophy of the Programme

The main philosophy behind the Bsc Botany Programme is to contribute to meeting the general educational objectives of Ahmadu Bello University and the Nigerian Nation, which include the acquisition and spread of knowledge, and the promotion of research and education, (*with emphasis on Botany as an important component of the Biological Sciences*). The Programme is designed not only to satisfy the intellectual demands of the students but also to facilitate their acquisition of basic and specialist science skills that instill qualities of self-confidence and self reliance, so that the products of the degree Programme can play active and informed roles in personal, community, national and international development strategies.

Since a broad and interdisciplinary orientation can hardly go with extreme specialization, the Programme is designed to discourage over-specialization by allowing for sufficient choice of electives within and outside each Programme. The recommended electives for each Programme have therefore been deliberately chosen to ensure relevance not only to academic content of each Programme, but also to endow the products of the Programmes with the knowledge that will enable them make valuable contributions to contemporary biological issues of national and international interest.

Objectives

In pursuit of the specific objectives of producing these self-reliant young biological scientists and contributing to scientific knowledge, the following are the specific academic objectives of the B.Sc. Botany degree Programme:

- To educate academically sound upcoming plant biologists with high scholastic aptitudes especially in the agro-allied areas of Plant ecology, Plant Physiology, Plant Breeding and Plant Pathology, aspects of Horticulture and Conservation of Plant Germplasm.
- To contribute to discoveries and innovations in these aspects of the science of botany through research.
- To provide expert counsel and consultancy services to national and international organizations on issues relating to the biology of plants.
- To instill qualities of self-confidence and self-reliance in crops of prospective young Nigerian botanists.

Some graduates of the department's Botany Programme have gone ahead to enroll for postgraduate studies in specialized disciplines in agriculture and related fields such as Crop Protection, Agronomy and Plant Science.

Admission Requirements:

For admission to any of the three degree Programmes in the Department of Biological Sciences, a student must satisfy the minimum University/Faculty of Science requirements of a credit in Biology

and credits in at least four other subjects including Chemistry, Physics, English and Mathematics at the GCE 'O' level or SSCE. Students that have successfully completed remedial Programmes that are approved by the University Senate and meet the GCE "O"-Level/SSCE requirements are also offered admission.

For direct entry admission into the 200 Level of study, a prospective candidate must satisfy the requirements stated above and in addition possess two or more G.C.E. A-Level papers (or its equivalent), which must include Biology and Chemistry.

Graduation Requirements:

A student in the department requires a minimum of 120 credit units to graduate in a 4 year degree Programme, and 90 credit units for those that come in at 200 Level of a study Programme. For a full time student, at least 12 credit units of core and elective courses must be registered for, during each semester. These credit units are earned from assessments of exams based on lectures, laboratory/project work, as well as field components of the Programme. Two field courses of one credit unit at the 300 level and two credit units at the 400 level of study to satisfy the requirements for professional field experiences are offered to the students as core requirements for graduation.

Details of the Contents of course Units Offered by the Department

1. BIOL 111 – Plant Biology:

Principal groups of plants, representative life cycles, form and function, physiology & modes of nutrition, reproduction, growth and development (2 credit units).

2. BIOL 112 – Ecology:

Basic biological concepts, theories and principles of ecology, energy flow in the ecosystem, trophic levels and biogeochemical cycles, types of habitats, simple treatment of interactions between organisms (symbiosis), pollution and explanation of pollution terms; sanitation and sewage treatment, conservation needs and methods of conserving natural resources, soil and its components, effects of humans on the environment. (2 credit units).

3. BIOL 113 – Animal Biology:

History and scope of zoology, invertebrate and vertebrate structures, function and levels of organization including physiology, nutrition, respiration, excretion, circulatory systems, hormones and reproduction (2 credit units).

4. BIOL 114 – Introductory Evolution and Genetics:

The cell concept, ultrastructure of the cell, mitosis and meiosis. Chromosomes; genes; their relationships and importance, Mendelian laws, explanation of key genetics terms e.g. genotype, phenotype, heterosis/hybridity, dominance, alleles etc., concept of multiple alleles (e.g. blood groups), sex linkages and sex linked characters, mutation (including their advantages and disadvantages), gene expression. General importance and application of genetics in agriculture and medicine (2 credit units).

5. BIOL 211 – General Ecology:

Relationships between individuals or groups within a species, and between individuals or groups of different species (symbiosis), some aspects of applied ecology e.g. biological control, game and rangeland management, population dynamics: growth survivorship curves, life tables, age structure, carrying capacity and environmental resistance; the ecology of humans: resources, pollution, population. (2 credit units; Prerequisite – BIOL 112).

6. BIOL 212 – General Physiology:

Chemicals of life: aspects of the chemistry of organic compounds of biological importance, general characteristics of enzymes; nutrition, digestion and absorption in animals; biological oxidation; composition, structure, properties and functions of proteins, lipids, carbohydrates and nucleic acids. Biosynthesis: photosynthesis and protein synthesis. Cell membrane structure and function. (3 credit units; Prerequisites – BIOL 111, 113)

7. BIOL 213 – Biological techniques:

Handling and care of microscopes, hand lens; microscopic examination of materials; hand sectioning, care and uses of biological tool kits and simple physiological apparatus; dissection guides, biological illustrations. (2 credit units; Prerequisite – None, except 200 Level standing).

8. BIOL 214 – General Genetics:

Chromosomal basis of inheritance; cytoplasmic inheritance; fertilization and genetic interactions; chemical basis of inheritance (DNA, RNA); Genetic linkage and recombination; mutation, cytogenetic effects of radiation and chemical agents. (2 credit units, Prerequisite – BIOL 114).

9. BIOL 215 Biological Nomenclature and Taxonomy:

Historical background, pre-Linnean, Linnean and Darwinian, taxonomic hierarchies; species concept, categories below species, and categories above species; biological nomenclature, new systematics; numerical and biochemical taxonomy, keys and keying. (2 credit units, Prerequisites –BIOL 111 and BIOL 113).

10. BIOL 216 Hydrobiology:

Principles of aquatic biology with particular reference to limnology, the physical properties of water and their biological significance, thermal stratification of lakes, waves and currents and their effects on substratum, dissolved oxygen and carbon dioxide and inorganic ions in freshwater, the carbonate-bicarbonate system and pH, eutrophic and oligotrophic lakes, the chemical composition of African lake waters, freshwater communities, factors influencing the distribution and productivity of aquatic macrophytes, phytoplankton, benthic algae, zooplankton in freshwater, the marine, brackish water/estuarine communities and chemical factors, colonization and succession in aquatic ecosystems, adaptations and inter-relationships (2 credit units; Prerequisite – BIOL 211).

11. BIOL 218 Biostatistics:

Variability in biological data: continuous and discontinuous variables; Statistical sampling procedure – observations and problems of estimation; Representation and summarization of biological data; Frequency distribution; Measures of central tendency and dispersion; Probability theory; Normal, binomial and Poisson distribution; t-test, F-test and chi-squared test; Analysis of variance (ANOVA) and covariance; Principles of experimental design; Correlation; linear and curvilinear regression; Transformation. (2 credit units; Prerequisite O-Level Maths and 200 Level standing).

12. BOTY 221 – Cryptogamic Botany:

Review of the Thallophyta, Bryophyta and Pteridophyta; characteristics of the groups and their phylogenetic relationships; the development of more advanced structures and their origin from lower plant groups; comparative study of life histories to emphasize the differences between the groups; some aspects of palynology. (2 credit units; Prerequisite – BIOL 111).

13. BOTY 222 – Spermatophyta:

Review of the gymnosperms and angiosperms; similarities and differences between gymnosperms and angiosperms, the development of the spermatophytes, and differences between the group and cryptogams; characteristics of classes, phylogenetic relationships; comparative studies within the group. (3 credit units, Prerequisite – BIOL 111).

14. ZOOL 231 – Invertebrata:

General classification of invertebrates, characteristics of the main invertebrate classes; levels of organization, biology of some selected invertebrates of economic importance, e.g. mollusca and arthropoda; phylogenetic relationships, evolution and adaptive biology of major invertebrate groups. (2 credit units; Prerequisite – BIOL 113).

15. ZOOL 232 – Vertebrata:

Evolution, classification and general characteristics of the fishes (Agnatha, Chondrichthyes, Osteichthyes) and the Tetrapods (Amphibia, Reptilia, Aves and Mammalia) with special reference to taxa of 4aculates4on origin; evolutionary adaptations for terrestrial life. (2 credit units; Prerequisite – BIOL 113).

16. BIOL 300 – Students' Industrial Work Experience (SIWES)

Students spend a six-month period of attachment to gain real life practical experiences of processes, procedures and activities in a biology-related establishment (e.g., laboratories, research institutes, industries, etc.) (6 credit unit; Prerequisite –300 Level standing).

17. BIOL 311 – Field Course I:

Biological sampling techniques in local habitats; also involves visits to research institutes, industries etc. within the locality (20-km radius of Zaria). (1 credit unit; Prerequisite – None, except 300 Level standing).

18. BIOL 313 – Biogeography and Soil Biology:

- i) Distribution of world flora, floristic regions of the world and zoogeographic regions of the world; comparison of tropical and temperate flora, dispersal and colonization of land by plants and animals; island biogeography; relationships between vegetation, soil types and climate; relationships between plant distribution and world fauna.
- ii) Classification and characteristics of soils, soil analysis, plant and soil water relationships. Soil sampling techniques in local habits; Adaptations of organisms to subterranean life. (2 credit units; Prerequisite – BIOL 211 and BIOL 215).

19. BIOL 315 – Microbial and Molecular Biology:

Genetic studies of microorganisms; Metabolic pathways, genes and chromosomes, nucleic acids, replication, transcription and translation, gene expression and regulation, gene sequencing, protein synthesis. (3 credit units; Prerequisite – BIOL 214).

20. BOTY 321 Algae:

A detailed account of the systematics, morphology, reproductive systems, life histories and ecology of freshwater and marine algae, including considerations of their biological and economic importance. (2 credit units; Prerequisite – BOTY 221).

21. BOTY 323 – Mycology:

A detailed account of the systematics, morphology, life cycles, and dissemination of fungi with special reference to those of economic importance; and consideration of standard mycological techniques. (2 credit units; prerequisite – BOTY 221).

22. BOTY 325 – Plant Physiology I:

Seed morphology and germination; growth patterns of plants from seed to senescence with all metabolic activities involved; development of roots, stems and leaves; growth apices; flowering; formation and dispersal of seeds and fruits; rhythms of growth and growth correlations; factors affecting growth; methods of growth analysis. (2 credit units; Prerequisite – BIOL 212).

23. BOTY 327 – Bryophyta, Pteridophyta and Gymnospermae:

Study of the life cycles, morphology and anatomy of Bryophyta, Pteridophyta and Gymnospermae; origin and evolution of vascular elements and the seed habit; characteristics of selected species of economic or botanical importance. (3 credit units; Prerequisite – BOTY 221).

24. BIOL 400 – Research orientation and Project:

Each final year students is required to carry out an original research project under the supervision of an academic staff member. The findings of the research are presented by the student at a departmental seminar. A thesis (based on the project) is prepared, bound and submitted by the student for evaluation by the department, and is defended in a viva voce

before an External Examiner. (6 credit units; Prerequisite – None, but to be eligible to undertake this course unit, a student who came in at the 100 Level of study must accumulate a total of 66 earned credit units, or 42 earned credit units if he/she came in at the 200 Level.)

25. BIOL 411 – Field Course II:

Field trips are conducted to fulfill the requirements of field ecology, hydrobiology, entomology, plant soil relations, etc. The trips include visits to game and forest reserves and National Parks, Research Institutions of pure and applied biology, seashores and human-made lakes, etc. (2 credit units; Prerequisite – BIOL 311)

26. BIOL 412 – Principles of Plant and Animal Breeding:

Importance of plant and animals breeding, cytogenetical principles of breeding, heterosis, inbreeding consequences, incompatibility mechanisms, sterility, breeding methods, disease and pest resistance and their inheritance, major farm and domestic plants and animals and breeding practices used to sustain the desired qualities in them. (3 credit units; Prerequisites BIOL 315).

27. BIOL 413 – Population Biology and Evolution:

Biological properties of a species; Natural selection, variations, isolation mechanisms (including their breakdown resulting in hybridization, adaptation, origin of life, origin of species, and adaptive radiation, Evolution of selected groups of plants and animals, including human. (3 credit units, Prerequisites – BIOL 211, 214).

28. BIOL 414 – Conservation and Development of Natural Resources

Deforestation and Afforestation; principles, problems and prospects of forestry conservation practices in Nigeria. Desertification and its control. World outlook on conservation (Biodiversity conservation: international biodiversity conventions); management and utilization of forest resources; plant genetic resources in breeding: seed preservation, viability and health. Food crops and domestic animals and their wild relatives; Captive breeding in botanical and zoological gardens, and wildlife parks and arboreta. Field gene banks. Safe movement of germplasm. Conservation of mineral resources. (2 credit units; pre-requisite – BIOL 311).

29. BIOL 415 – Plant and Animal Cytogenetics:

Karyotype and identity of chromosomes, polyploidy, changes in structure of chromosomes; sex chromosomes and sex determination; Karyotyping in humans, Polytene chromosomes, and effects of radiation and chemical agents. Chemical mutagens, effects of radiation on biomolecules. Radiation effects on chromosomes. (3 credit units; Prerequisites BIOL 214).

30. BIOL 416 – Special Options: (Restricted Electives in Specialized Areas)

Students are required to take 3 credits of directed studies in any one of the areas listed below. Availability of each area depends on the availability of staff on ground. (2 credits; Prerequisite – None, except 400 Level standing).

Examples of options offered are:

- a) Environmental pollution

- b) Biological control methods
- c) Biological Conservation and gene banks
- d) Biotechnology
- e) Radiation Biology
- f) Silviculture and afforestation
- g) Horticulture
- h) Plant tissue culture
- i) Weed Biology
- j) Pest Control
- k) Public Health
- l) Human Genetics
- m) Aquaculture
- n) Introductory Field Ornithology
- o) Beekeeping
- p) Immunology of insect vectors
- q) Principles of animal production
- r) Environmental impact assessment
- s) Introduction to bioinformatics
- t) Plant virology
- u) Trace elements in the biofare
- v) Insects and man
- w) Serological techniques in disease diagnosis

31. BIOL 417 – Nigerian Fauna and Flora:

Field identification and recognition of Nigerian plants and animals; Plant and animal indicators of Nigerian biomes (i.e., association of habitats with specific plants and animals); identification of plants through preserved herbarium specimens, identification of animals through signs left by them; e.g footprints, trails, runways and museum specimens, Life history strategies of selected Nigerian plants and animals; Nigeria's protected area system. (3 credit units; Prerequisite BIOL 311, 313).

32. BIOL 418 – General Practical Biology/Botany/Zoology

This course unit examines students on the basis of their pooled laboratory and field practical experiences during the entire degree Programme . (2 credit units; Prerequisite – None, except 400 Level standing).

33. BOTY 421 – Plant Physiology II:

Light and its effect on biological processes in plants, photoperiodism; plant tropisms and factors controlling them; effects of temperature – vernalization; water absorption, movement of water and minerals in plant body; transpiration and translocation; physiology of senescence and fruit ripening; abscission and cell death. (2 credit units; Prerequisite – BIOL 212).

35. BOTY 422 – Plant Pathology

The concept of diseases in plants, classification of plant diseases, detailed study of common local plant diseases, isolation and study of pathogens, Koch's postulates, general

epidemiology, plant disease physiology, control of plant diseases, disease resistance. (2 credit units; Prerequisite – BOTY 222).

36. BOTY 423 – Economic Botany

Plants of economic importance such as cotton, groundnut, cocoa, etc., their origin, distribution, agronomic practices, breeding, diseases and their control, processing and marketing, weed biology and control methods. Non-Timber Forest Plant Products of Nigeria (medicinal plants, spices, edible wild fruits and vegetables) (3 credit units; Prerequisites – BOTY 222).

37. BOTY 424 – Angiospermae:

Origin and evolution of angiosperms with special reference to their reproductive parts and vascular elements; morphology and anatomy of angiosperms; comparative study of classes of angiosperms; life histories of selected members which are of economic/botanical importance. (3 credit units; prerequisite – BOTY 222).

38. BOTY 425 – Comparative Plant Anatomy

Characteristics and classifications of tissues, meristem organization, evolution of vascular tissues, comparative wood anatomy, anatomical adaptations to specialized habitats, applied aspects of plant anatomy. (3 credit units; Prerequisite – BOTY 221, BOTY 222).

39. BOTY 426- Advanced Plant Physiology:

Bud and seed dormancy, biochemistry of seed germination, chemical control of plant growth – natural and artificial controls, the occurrence, structure and mode of action of growth regulators – promoters, inhibitors and herbicides; Introductory ecophysiology: plant pollutants and their modes of action. (3 credit units; Prerequisite – BOTY 421, 327).