OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

FACULTY OF SCIENCE

DEPARTMENT OF BOTANY

REVISED PROGRAMME FOR THE MASTER OF PHILOSOPHY DEGREE IN BOTANY

(M.Phil. BOTANY)

2026

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- **Introduction**

The Department of Botany offers Bachelor of Science, Master of Science and Doctor of Philosophy Degree Programmes in Botany. The Department in rising to the challenges of the growing demand for qualified and competent personnel in the profession seeks to revise the postgraduate programme in Botany by introducing the M.Phil. Degree in Botany. The newly introduced programme will no doubt afford more people the opportunity of postgraduate study equipping them with wealthy experiences and skills.

- **Philosophy of the Programme**

The philosophy of the programme is to equip graduates from Botany with a thorough grounding in modern descriptive and experimental Botany and allied disciplines, and also to prepare them in specialized areas of Botany and related disciplines with a view to advancing frontiers of knowledge and engender a sense of selfless public service.

- **Objectives of the Programme**

The objectives of the programme are to:

(a) provide opportunities for Botany/Biology graduates who desire academic/administrative careers in Plant Physiology, Ecology, Genetics, Plant Anatomy and Taxonomy, Bryology,

Algology, and Pteridology;
(b) produce scholars with necessary skills in Botanical enterprises in order to promote self-reliance and to demonstrate high quality leadership qualities; and
(c) produce needed personnel to handle more efficiently and effectively undergraduate and graduate programmes in the fields of Plant Physiology, Ecology, Genetics, Plant Anatomy and Taxonomy, Bryology, Algology, and Pteridology.

- **Degree offered in the Department**
  M.Phil. Botany

- **Admission Requirements**

Applicants must satisfy the general regulations governing graduate programmes in Obafemi Awolowo University and as contained in the Postgraduate College Handbook. In addition, the following conditions must be fulfilled:

- A M.Sc. Botany degree holder from Obafemi Awolowo University or any of the approved universities who has obtained a weighted average of between 50% and 59% (C) in the coursework.
- A M.Sc. degree holder from a **cognate** department who has a Ph.D. grade (60 B) in the coursework.

- **Schemes of Examination**

The programme consists of course work, seminar presentations, an independent research project and thesis writing which will culminate in an oral examination of the candidate by a panel of internal and external examiners.

- **Duration of the Programme**

The M.Phil. degree programme is due to be completed within a period of not more than four semesters after first registration. In special circumstances, an extension of not more than two semesters can be granted after due consideration and approval by the Postgraduate College.

- **Minimum Requirements for the Award of M.Phil. Degree in Botany**

A candidate must successfully fulfill the following requirements to be awarded the degree in any area of specialization in Botany:

- A candidate who is an M.Sc. Botany degree holder of Obafemi Awolowo University, Ile-Ife will be required to take a minimum of twelve (12) units of coursework.
- A candidate who is an M.Sc. Botany degree holder from a cognate department or any other recognized university will take at least twenty seven (27) units of courses which

include:

- Four compulsory courses with a total of 9 units.
- Four relevant courses (12 units) in his/her area of specialization.
- Supervised thesis of 6 units.

- Submit and defend a thesis proposal on his/her research.
- Carry out research in his/her area of specialization, present at least two seminars, submit a thesis, and be examined by a panel of internal and external examiners.
- **Highlights of the Amendments to the M.Phil. Postgraduate Programme in Botany**

  Constant curriculum review leads to curriculum revision which could entail modification and addition of courses and programmes in line with the demands of contemporary times and/or the society in which the curriculum operates. This programme will also empower candidates who have deficiency in obtaining the Ph.D grade to achieve their vision of a Doctoral degree. These have informed the inclusion of M.Phil. Degree programme in Botany.

Table 1: Compulsory Courses

New Code	Course Title	Units
BOT 800	Seminar	2
BOT 801	Entrepreneurship for science students	2
BOT 802	ICT and Research Methodology	2
BOT 803	Thesis	6
BOT 804	Special Research Techniques in Botany	3
Total units15		

Table 2:12 units of other selected courses mainly chosen from **BOT 805 – 837**

Harmattan Semester

Course Code	Course Title	Unit
BOT805	Developmental Plant Anatomy	3
BOT 807	Nutrient Metabolism in Plants	3
BOT809	Growth and Developmental Physiology of plants	3
BOT 811	Advanced Herbarium Studies	3

BOT813	Critical Studies in Nigerian Flora	3
BOT815	Ecology of Cryptogrammic Plants	4
BOT 816	Statistical Plant Ecology	4
BOT817	Special Research Techniques in Ecology	3
BOT819	Ecology of Epiphytes	3
BOT821	Advance Cytogenetics	3
BOT823	Genetics of Weed and Pests	3
BOT825	Advanced Plant Anatomy	3
BOT827	Advanced Plant Systematic	3
BOT829	Biogeography	3
BOT831	Experimental Methods in Cytogenetics	3
BOT833	Phytoremediation	3
BOT835	Landscape Restoration	3
BOT837	Advanced Pteridology	3
Total 56		**units**

Rain Semester

Course Code	**Course Title**	**Unit**
BOT806	Anatomy of Phloem Cells	3
BOT 808	Plant Growth Regulatory Substances	3
BOT 810	Advanced Plant Physiology and Metabolism	3
BOT 812	Principles and Procedure of Plant Taxonomy	3
BOT814	Forest and Savanna Ecology	4
BOT818	Weed and Colonizers	3
BOT820	Physiological Plant Ecology	3
BOT822	Radiation Genetics	3
BOT824	Evolutionary Mechanisms	3
BOT826	Secondary Growth in Plants	3

BOT828	Palynology	3
BOT830	Plant Biotechnology	3
BOT832	Gametogenesis and Embryology in Plants	3
BOT834	Ecosystems Pollution and Plant Degradation	3
BOT836	Advanced Algology	3
Total 46		**units**

10. COURSE DESCRIPTION

- **1. BOT 800: Seminar in Botany (2 Credit units)**

A candidate will be required to present a propositional seminar and a final seminar on his/her research findings and must participate in all departmental seminars.

2. BOT 801: Botany and Entrepreneurship (2 Credit units)

The definition and study of creativity and innovation; sources of Innovative opportunities; Creativity and Product development process; Product planning and execution; market, target and consumers. Presentation of creativity ideas; the world of business and Intellectual properties, the Business classification and Ownership Forms; Financial Aspects of Running a Small Business and Marketing. Pre-business feasibility analysis and opportunity assessment; Government Policies and Incentives for SME's and Entrepreneurs; Getting started with your business. The areas to be covered include but not limited to the aspects listed below:

- Horticulture
- Landscape and environmental restoration
- Seed production and marketing

iv. Raising /selling of medicinal plants
v. Raising /selling of economic trees like timber, oil palm, etc
vi. Selling of economic grass and fodder
vii. Extraction of plant constituents such as oil, dye
viii. Using plants for soap production

- Production of fibre for textile industry
- Production of animal feeds
- Raising aquatic plants for aquarium

- Raising and using lower plants in pollution monitoring
- Raising of spices such as alligator pepper, *Ocimum* species, etc for spices
- Plant breeding for crop improvement

- **BOT 802- ICT and Research Methodology (2 Credit units)**

This course should cover essentials of Spreadsheets, Internet technology Statistical Packages, Precision and Accuracy of Estimates, Principles of Scientific Research, Concepts of Hypotheses Formulation and Testing, Organization of Research and Report Writing.

4. BOT 803 – Thesis (6 Credit units)

This comprises a research project in the relevant area of specialization of the candidate. This must be defended before a panel of external and internal examiners.

5. BOT 804: Special Research Techniques in Botany (3 Credit units)

Practical work with accompanying lectures where necessary on the basic techniques used in the modern investigations of problems in various aspects of Botany

6. BOT 805: Developmental Plant Anatomy (3 Credit units)

Review of root, stem and leaf initiations in plants. Studies on the epidermal tissue system, theirfunctions and distribution – stomata, cuticle, trichomes, epidermis, epiblems, piliferous layer. The ground or fundamental tissue systems, their function and distribution – cortex, endodermis, pericycle, pith and pith rays (parenchyma, collenchyma and sclerenchyma). The vascular tissue system: elements of vascular bundles – xylem: protoxylem and metaxylem; phloem – protophloem and metaphloem. Cambium; and types of vascular bundles. A comprehensive knowledge of leaves – leaf epidermis, mesophyll palisade parenchyma, spongy parenchyma and vascular bundles of gymnosperms and angiosperms

- **BOT 806: Anatomy of Phloem Cells (3 Credit units)**

Studies on the origin and distribution of phloem should be reviewed. Primary phloem, sieve elements secondary phloem, structure and components of secondary phloem, companion cells, phloem fibres and sieve elements and parenchyma cells. periderm and Paridrm – meaning and occurrence. Phellogen and phelloderm and initiation of periderm. Activity of phellogen, distribution of lenticels, ultra structure of plant cell wall, the pit fields chemical aspect of cell wall lignin, cellulose, hemicelluloses and principal uses of phloem cells.

8. BOT 807: Nutrient Metabolism in Plants (3 Credit units)

Plant, soil and water relationships; Nutrient uptake; Mechanisms and theories of nutrient uptake; Roles of major and minor plant nutrients in plant metabolism. Nutrient interactions and deficiency symptoms. Biofortification and Genetic improvement of plants for enhanced micronutrient content. Analytical techniques in plant nutrition studies and Hydroponics. Techniques in radio labelling/ tracer studies.

9. BOT 808: Plant Growth Regulatory Substances (3 Credit units)

The auxins, chemical nature and roles of auxin translocation. Gilbberellins: chemical nature and roles of Gilbberellins, translocation of Gilbberellins. The cytokinins: roles of the cytokinins and synthesis of cytokinins. Absicic acid: roles of absicic acid. Vitamins; Ethylene: effects of ethylene. Other hormone – like substances in plants; Mechanism of hormone action; Interactions among hormones and Ecological importance of hormonal actions

10. BOT 809: Growth and Developmental Physiology in Plants (3 Credit units)

Plant growth: Effects of irradiance, light quality, temperature, duration of light on reproductive growth. Seasonal and geographic aspects of photoperiodism. Long-day and short-day plants as the basic categories. Photoperiodic induction, mechanism of photoperiodism. Rhythmic behaviour of plant processes. Growth and vernalization and apical dominance. Cyclical periodicity abscission and mechanism of abscission. Dynamics of primary vegetative growth; Totipotency; Measures of indices of growth and rates of growth. Alternative ways of plant growth for their products for world market; Hormones in horticulture and agriculture.

11. BOT 810: Advanced Plant Physiology and Metabolism (3 Credit units)

Photosynthesis and carbon dioxide fixation; Photosynthesis and the entrance of energy into the cell; Respiration--energy storage, utilization and loss. Recent advances in the area of photosynthesis, respiration and Nitrogen metabolism.

12. BOT 811: Advanced Herbarium Studies (3 Credit units)

The herbarium and economic botany, Conservation and Taxonomy, Types of herbaria, the Herbarium building, purpose of a herbarium and the Herbarium labels, Herbarium materials, Preservation techniques. Introduction to Herbarium techniques and management. Storage methods; Seed banks and their management. Photography in Herbarium practice. Herbarium legislation. Collection of plants; preparation of herbarium specimens and preparation of microscope slides.

Geographical and morphological methods in presentation of data, literature mapping, tabulations,

Symbolic and graphical methods. Identification: keys, comparison with named materials, nomenclature. Use of methods of numerical taxonomy in construction of taxonomic groups. Relevance of taxonomy in plant identification and usage.

13. BOT 812: Principles and Procedures of Plant Taxonomy (3 Credit units)

Historical background: The natural system and the value of character. Phenetric and phylogenetic concept in taxonomy including rules and nomenclature, the categories in taxonomy. Evolution, identification of flowering plants and Recent trends in plant taxonomy.

14. BOT 813: Critical Studies in Nigerian Flora (3 Credit units)

An intensive investigation into the taxonomy and ecology of a critical group of plants, vascular or non-vascular

15. BOT 814: Forest and Savanna Ecology (4 Credit units)

Natural and man-made forests; Habitat characteristics; Biodiversity and Global warming. Fire as a management tool in forests and savanna forest fires. Timber and non-timber forest products (NTFPs). Forestry administration and management programmes in Nigeria. Community forests, Forestry policies and legislation, Forest conservation and the Nigerian protected area system. Desertification and deforestation- explanation causes and impacts on plants composition and distribution.

Animals to be included along with the plants i.e. survey of animals/plants found in such vegetation types, their habitat adaptation and food relationships; methods of animal/plants collection.

16. BOT 815: Cryptogamic Botany or Ecology of Cryptogamic Plants (4 Credit units)

Review of collection, taxonomy of tropical cryptogamic plants: algae, bryophytes and pteridophytes.Seasonality of growth, water relation, nutrients and temperature responses in cryptogams. Importance of cryptogams as indicators/remediation of environmental pollution

17. BOT 816: Statistical Plant Ecology (4 Credit units)

Data collection, cleaning and coding; information retrieval; Significance testing; Multiple and partial correlation and regression. Classification, clustering, ordination and Principal Components Analysis. Ecosystem modeling and Systems approach to ecological problems. Use of statistical packages and their applications.

18. BOT 817: Special Research Techniques in Ecology (3 Credit units)

Relationship between photosynthesis, carbon sequestration, carbon emission, tree volume and biomass measurements (estimation). Plant sampling techniques in aquatic, forest and savanna ecosystems. Elements of forest mensuration. Objectives of Environmental impact Assessment (EIA). Resources required for EIA. Basic principles of EIA. Site selection, environmental screening and preliminary assessment. Scoping of signification issues; Impact identification, prediction, measurement and evaluation. Identification of monitoring and mitigating measures. Documentation of EIA. Environmental impact statement. A selected survey with case studies

19. BOT 818: Weeds and colonizers (3 Credit units)

Weeds in relation to man. Origin and life cycles of weeds. Propagation and weed dissemination. Weed growth, development and establishment. Competitive ability of weeds. Weed-crop association in the tropics. Weed control (chemical, biological etc) and selectivity of herbicides.

20. BOT 819: Ecology of Epiphytes (3 Credit units)

Survey of major epiphyte groups with special emphasis on the vascular plants. Ecological and physiological problems associated with the epiphytic way of life. Contribution of epiphyte studies to general ecology.

21. BOT 820: physiological plant Ecology (3 Credit units)

In-depth consideration of the physiological aspects of plant-animal-physical/chemical environmental relationships. Emphasis is placed on field problems such as productivity limitations and environmental

stress.

22. BOT 821: Advanced Cytogenetics (3 Credit units)

Evolution of genophores. Chromosome structure and function. Supernumerary chromosomes. Meiotic and mitotic crossing overs. Genes and chromosomes. Evolution of karyotyope. New approaches to karyotyping. Structural changes in chromosomes--duplications and deficiencies, inversions and interchanges with emphasis on their evolutionary significance and their applications in gene-mapping. Balanced lethal systems (Oenothera cytogenetics, ClB and similar systems). Polyploidy: types, genetic behaviour, characteristics, evolutionary significance and induction of autopolyploidy and allopolyploidy. Applications of polyploidy. Origins, terminology, breeding behaviours and genetic ratios in aneuploids. Evolution of sex-determining mechsanisms.

23. BOT 822: Radiation Genetics in plants (3 Credit units)

Comparison of spontaneous and induced mutations. Mutation, selection and population fitness.Types of ionizing radiation and their cytogenetic effects. Effects of pre-irradiation and post-irradiation. Factors modifying irradiation of successive generations. Spontaneous and induced mutations in vegetatively propagated species. Methods of utilizing induced mutations in crops improvement.

24. BOT 823: Genetic of Weeds and Pests (3 Credit units)

The evolutionary and economic implications of weeds as the vegetation of the future.The interaction of genetic variability and environmental variability in evolution. Anthropogenic factors in the evolution of weeds. The weed-crop ecosystem and weed-crop co-evolution; weeds as alternate hosts to crop pests--the evolutionary-genetic angle. Modes of weed evolution; mutation, chromosome re-arrangements, aneuploid changes, polypoid changes; polyploidy and hybridization. Genetic and cytogenetic modes of weed evolution; examples from Nigeria-occurring Gramineae and Compositae; other examples. Weedy relatives of cultivated plants; Species of *Manihot, Oryza, Sorghum, Dioscorea* etc. Prospects for genetic control of weeds. Pattern of adaptation and genetic variation in insects.The problems of heritable resistance to insecticides. Genetic control of pests: chemosterilization and male -sterile techniques. Speciation in tropical environments.

25. BOT 824: Evolutionary Mechanisms (3 Credit units)

The synthetic theory of evolution and its development.The sources of variability.The nature of mutation, its causes and adaptiveness. The organization of genetic variability.The differentiation of population. Reproductive isolation and the origin of species.The role of hybridization and polyploidy in evolution. Major trends of evolution.

26. BOT 825: Advanced Plant Anatomy (3 Credit units)

The structure of the cell wall. Cambium and its activities. Types, characteristics and structure of wood fibre, wood pulping and Bullressing and its use in the industry.

27. BOT 826: Secondary Growth in Plants (3 Credit units)

Origin and distribution of xylem. Components of xylem vessels in secondary growth of dicotyledonous plants should be treated. The activities of cambium, origin and activity, cork cambium, secondary cortex should be emphasized in respect of wood formation and annual rings in plants. Emphasis should be laid on the origin of cambium, structure and cell types. Ray initials: size, variation, cell arrangement (stored and non-stored). The uniseriate and multiseriate concepts of cambium structure. Importance of cambium. The dimensions of wood, groups of wood (soft and hard wood). Apotracheal and paratracheal wood nature – Rays in hard and soft woods. General studies on the nature and structure of pits as found in hard and soft woods, fibre and vessels. Significance of pit and pit membranes. Cambia and cambial activity in both angiosperm and gymnosperms. Physiology of cambial activity, metabolism of cambium (enzymes activity, temperature, soil nutrient, light intensity and photoperiodism effect on cambial activity). Uses in wood structure and utilization.

28. BOT 827: Advanced Plant Systematics (3 Credit units)

A survey of floral morphology in relation to classification and evolution, chromosome numbers, polyploidy and their role in taxonomy. Flow cytometry as a taxonomic tool and Chemotaxonomy.

29. BOT 828: Palynology (3 Credit units)

Pollen diagrams and their interpretations. Fossil vegetation maps. Palynology and mineral oil exploitation. Pollen load of the atmosphere. Pollen grains and allergy.

30. BOT 829: Biogeography (3 Credit units)

Importance of Biogeography; Distribution of species, genera and families: Endemic species and genera. Pan tropical species and genera. Discontinuous species and genera; Factors of distribution (climatic, edaphic, geographic and dispersal effects).Theory of tolerance. Floristic regions of the world.Vegetation mapping.

31. BOT 830: Plant Biotechnology (3 Credit units)

Plant tissue culture and applications. Micropropagations, somatic embryogenesis, soma clonal variations;

Chemicals and plants interactions. Application of genetic engineering in crop improvement, herbicide resistance, insect resistance, environmental tolerance and virus resistance and Agricultural food production.

32. BOT 831: Experimental Methods in Cytogenetics (3 Credit units)

Collection of samples for chromosome studies: define a sample for chromosome studies in populations; specify how karyotyping is done for variable and uniform populations; prefixation and staining techniques and their specifications: Clarke's Fluid, Carnoy's Fluid, Orcein, Carmine, Giemsa, Feulgen, etc. Techniques of chromosome examination: squash technique, banding techniques (Q-bands, R-bands, T-bands, C-bands, NORs); leucocyte culture; Bone Marrow Aspirates; Fine Needle Aspirate Method in solid tumors; Polytene Chromosomes from salivary glands of *Drosophila*. Molecular methods: Fluorescence *in-situ* hybridization; Virtual karyotyping; Prophase/Metaphase *in-situ* Hybridization (ish), Interphase/Nuclear *in-situ* Hybridization (nucish); Microarray and Multiple Ligation-dependent Probe Amplification (MPLA). Kayotyping: Definition of terms; general principles as in ISCN*; Karyotyping solid state chromosomes; Karyotyping banded chromosomes. Full leukocyte cultures of man, the role of cytogenetic diagnosis in cancer.

*An International System for Human Cytogenetic Nomenclature.

33. BOT 832: Gametogenesis and Embryogenesis in Plants (3 Credit units)

The reproductive process in plants: A review of the processes of mitosis and meiosis; mitosis as an integral part of meiosis; microsporogensis and megasporogenesis; microgametogenesis and megagametogenesis; Ovule development and variations in gametophyte development; double fertilization. Definition of embryogenesis; the process of embryogenesis; pattern formation, morphogenesis, differentiation; dormancy; cytology of the embryo; morphogenesis and the role of programmed cell death; somatic embryogenesis in *Arabidopsis thaliana*. The role of Reverse Genetics in the understanding of the process of embryogenesis. Apomixis in plants and animals: apomixis in angiosperms, haploid (reduced) parthenogenesis, diploid (unreduced) parthenogenesis; adventitious embryonic. Parthenogenesis in animals: explain all the mechanisms of automictic and apomictic parthenogenesis. Mosaics and chimeras: definition and exploration of the forms and mechanisms in plants and animals.

34. BOT 833: Phytoremediation **(3 Credit units)**

Overview of Phytoremediation- Metal bioavailablilty and hyperaccumulation, phytoextraction and phytovolatilization. Rhizofiltration, phytodegradation and phytostabilzation. Soil improvement with organic/plant residues. Phytodegradation of oil, herbicides, pesticides and other organic compounds by plants, bacteria and fungi. Genetic improvement of plants for phytoremediation.Techniques (e.g. EDXRF, TXRF, micro-PIXE, INAA, and AAS) in phytoremediation studies; Phytoremediation System Selection and Design Considerations; Remedial Objectives, Treatability, and Evaluation; Case Studies.

35. BOT 834: Ecosystems Pollution and Plant Degradation (3 Credit units)

The study of pollution and major pollutants: Air pollution, oil and petrochemical, heavy metals, solid wastes of aerial, terrestrial and aquatic environment and their effects on other components of the ecosystems. The study of radiation and plant life. Types of pollutants. Tissue degradation. Effects of pollution – impacts of air pollutants on crops, semi – and natural vegetation. Impacts of ozone pollution on vegetation and atmospheric deposition of heavy metals to vegetation. Impact of pollutant mixtures (e.g., ozone and nitrogen) and Acid rain. Consequences of air pollution for biodiversity, modifying influence of climate change and impact of air pollutants on vegetation.

36. BOT: 835 - Landscape Restoration Ecology (3 Credit units)

Causes and effects of land degradation; deforestation, overgrazing, over cultivation, fire/bush burning, soil erosion, contamination by oil, pesticides and other polyaromatic hydrocarbons (PAHs). Forest decline and soil acidification. Land restoration and reclamation. Plant species selection and planting materials. Nursery and field practices for reforestation/re-vegetation.Watershed management. Ecological succession. Energy and nutrient dynamics of climax communities. Landscape horticulture.

37. BOT 836: Advanced Algology (3 Credit units)

Algal classification. Habitats and distributions of algae. Diversity, collection and taxonomy of algae. Algae in the phytoplankton Cyanophyceae, Chlorophyceae, Euglenophyceae, Phaeophyceae and Rhodophyceae. Economic importance of classes of algae. Role of algae in lichens and soil fertility.

38. BOT 837: Advanced Pteridology (3 Credit units)

Place of Pteridophytes in plant Kingdom. Review of distribution, collection and taxonomy of pteridophytes in tropical West Africa. Comparative studies of pteridophytes in other zones of the world. The life forms, reproduction, growth and climatic influence on pteridophytes. Economic importance of pteridophytes in remediation of polluted soils.