

**UNIVERSITY OF NIGERIA
DEPARTMENT OF CROP SCIENCE**

POSTGRADUATE PROGRAMME

1.0 INTRODUCTION

The postgraduate programme of the Department of Crop Science focuses on the training of high level crop scientists who are able to tackle all aspects of crop production with its challenges, and move the frontiers of knowledge in this area of agriculture.

The post graduate training is provided at three levels, namely; The post graduate Diploma; the professional/academic Master degree and the professional/academic Ph.D degree in the following options: Crop Production; Crop Physiology; Horticulture; Plant Breeding and Genetics; Weed Science; Seed Science, Technology; Phytopathology; Entomology and General Crop Protection.

2.0 SCOPE OF POSTGRADUATE PROGRAMMES

The following programmes are offered in Crop Science.

- 2.1 Postgraduate Diploma (PGD) in Crop Science
- 2.2 Professional Masters' Degree (MCP) in Crop Science
- 2.3 Academic Masters' Degree (MSc) in Crop Science
- 2.4 Doctor of Philosophy Degree (Ph.D) in Crop Science

2.1 POSTGRADUATE DIPLOMA (PGD) IN CROP SCIENCE / CROP PRODUCTION/ CROP PROTECTION/ HORTICULTURE

2.1.1 PHILOSOPHY

The philosophy of postgraduate diploma programme in Crop Science/Crop Production/Crop Protection/Horticulture is to provide postgraduate training in these (fields) for Higher National Diploma graduate of agriculture. Professionals wishing to convert to agriculture and recent graduates of agriculture who otherwise would not qualify for admission into the Masters Degree Programmes in these fields.

2.1.2 AIMS AND OBJECTIVES

The Postgraduate Diploma Programme Crop Science/Crop production/ crop Protection/Horticulture is aimed at:

- a) Producing persons with advanced knowledge and skills in these fields.
- b) Exposing professionals in related fields to knowledge, skills and practice of the above disciplines.
- c) Provide training in specific aspects of these disciplines.

2.1.3 ADMISSION REQUIREMENTS

Candidates seeking admission for post graduate diploma in Crop Science/Crop Protection/Horticulture must have of the following qualifications from recognized institutions:

- a) Higher National Diploma in Agriculture with minimum of lower credit. (b) Holders of 3rd Class Honours Degree in Agriculture, Vocational Education (Agric), Biology or any other related discipline.
- b) Minimum of pass Degree at Bachelor's level in Agriculture plus a minimum of five years cognate experience.
- c) Minimum of pass in Higher National Diploma plus ten (10) years cognate experience.

2.1.4 DURATION OF POSTGRADUATE DIPLOMA PROGRAMMES

- a) The full time Postgraduate Diploma Programme shall run for a minimum duration of two (2) semesters and a maximum of four (4) semesters.
- b) The Part-time Postgraduate Diploma programme shall run for a minimum duration of four (4) semesters and maximum of six (6) semesters.

2.1.5 COURSE STRUCTURE

Core Courses	Units
Computer Application in Agriculture I	2
Statistical Methods and Experimental Design	2
Principles and Practices of Crop Production	2
Introduction to Cropping Systems	2
Mineral Nutrition of Plants	2
Insect pest Management	2
Disease Management	2
Weed Management	2

ELECTIVES	2
Project	6
Seminar	2
Maximum unit required	26

ELECTIVES	
Crop classification and physiological bases of classification	2
Crop genetics and improvement	2
Indigenous tree crops	2
Vegetable crops	2
Post harvest handling of produce	2
Plant health	2

2.1.6 REQUIREMENT FOR GRADUATION

The programme consists of course work, project work and seminars on special topics. To be awarded the Postgraduate Diploma in Crop Science/Crop Production/ Crop Protection/Horticulture a candidate must have:

- a) Passed a minimum of 26 credit units in each of the fields as follows:

Courses	Units
Core Courses	10
Electives	8
Seminar	2
Project	6
Total	26

- b) Carried out a research project relevant to the area of specialization submitted an acceptable project report.

2.2 PROFESSIONAL MASTERS IN CROP SCIENCE/CROP PRODUCTION/CROP PROTECTION/HORTICULTURE

2.2.1 PHILOSOPHY

The philosophy of Professional Master of Crop Production/Crop Protection/Horticulture is to provide advanced professional training for upgrading knowledge and skilled for candidates employed in industry; the Public Service or those on self employment.

2.2.2 AIMS AND OBJECTIVES

The Professional Master of Crop Production/Crop Protection/Horticulture is aimed at:

- a) Providing advanced professional training for graduate employed in the public service or in self employment
- b) Providing Advanced training in specific aspects of the mentioned area.

2.2.3a ADMISSION REQUIREMENTS FOR CROP PRODUCTION/HORTICULTURE

Candidates seeking admission for any of the above Master Degrees must have the following qualifications from recognized institutions:

- a) Higher National Diploma with a Postgraduate Diploma in Agric related disciplines.
- b) Bachelor's Degree in Agriculture

2.2.3a ADMISSION REQUIREMENTS FOR CROP PROTECTION OPTION

Candidates seeking admission for the Professional Degree in Crop Protection must have any of the following qualifications from recognized institutions in addition to satisfying the University Matriculation requirements.

- a) Bachelor's degree in Agriculture/Crop protection or related discipline with a minimum of 2nd class lower, with CGPA of 3.00 or above; or
- b) HND Upper Credit plus PGD with Distinction.

2.2.4 DURATION OF THE PROFESSIONAL MASTER OF ANY OF THE PROGRAMMES IN CROP SCIENCE; CROP PRODUCTION/CROP PROTECTION/HORTICULTURE

- a) The full time Master of above fields shall run for a minimum of 2 semesters and maximum of four (4) semesters.
- b) The Part-time Masters programme in any field shall run for a four (4) semesters and maximum of six (6) semesters.

2.2.5 REQUIREMENTS FOR GRADUATION

The programme consists of course work, project work and seminar. To be awarded the Professional Master of agriculture in any of the field, one must have passed a minimum of 32 credits units as follows:

Course	Units
Core course	12
Electives	12
Project	6
Special topic or seminar	2
Total	32

COURSE STRUCTURE

CORE COURSE	UNITS
Computer Application in Agriculture II	3
Statistical Methods, Design and Analysis of Experiments	3
Advanced Crop Production	3
Soil Fertility and Plant Nutrition	3
Elective course	12

ELECTIVE FOR PROFESSIONAL (MASTER) IN CROP PRODUCTION/ HORTICULTURE

Crop physiology	3
Crop Ecology	3
Biometrical genetics	3
Post harvest physiology of fruits and vegetables	3
Plantation crops	3
Plant Breeding	3

GENERAL CROP PROTECTION OPTION CORE COURSES

A. CORE/COMPULSORY COURSES	UNITS
Computer Application in Agriculture II	3
Statistical Methods, design and analysis of Experiments	3
Techniques in Agricultural Research	3
Ecological principles and methods	3
Total	12

ELECTIVES

Project	6
Seminar	2
Total	32

B. ELECTIVE

Plant pathology	3
Economic entomology	3
Weed management	3
Crop physiology	3
Mineral nutrition of plants	3
Plant Biotechnology	3
Plant Nematatology	3
Virus disease of plant	3
Bacterial diseases	3
Pesticide science and Toxicology	3

3.0. ACADEMIC MASTER (M.SC) IN AGRONOMY / CROP SCIENCE / CROP PROTECTION / CROP PRODUCTION / PLANT SCIENCE WITH SPECIALIZATION IN AGRONOMY, CROP PHYSIOLOGY, HORTICULTURE, PLANT BREEDING, WEED SCIENCE, SEED SCIENCE AND TECHNOLOGY. PHYTOPATHOLOGY, ECONOMIC ENTOMOLOGY AND GENERAL CROP PROTECTION

3.1 PHILOSOPHY

The philosophy of Academic Master Degree Programme in Agronomy/Plant Science/Crop Science /Crop production is to develop high level manpower to pursue careers in academics and research.

3.2 AIMS AND OBJECTIVES

- a) The Academic Masters Degree programme in these disciplines are aimed at exposing students to advanced courses in the relevant areas or fields and other academic disciplines
- b) Equipping students with research skills through the conduct of supervised research, seminar presentations and theses preparation.

3.3 ADMISSION REQUIREMENTS

Candidates seeking admission for the Academic Masters Degree in any of these fields must have any of the following qualifications from recognized institutions.

- a) Bachelors degree in Agriculture or related discipline with a minimum of second class lower division.
- b) HND Upper Credit plus PGD at Distinction in addition to satisfying university matriculation requirements.
- c) Candidates seeking admission for the Academic Masters Degree in any of these fields must have any of the following qualifications from recognized institutions.

4.0 DURATION OF ACADEMIC MASTERS DEGREE PROGRAMMES

- a) The full time Academic Masters Degree programme shall run for a minimum duration of four (4) semesters and maximum of six (6) semesters.
- b) The part-time Academic Masters Degree programmes shall run for a minimum duration of six (6) semester and maximum of eight (8) semesters.

4.1 REQUIRMENT FOR GRADUATION

Candidates must have fulfilled the following conditions to be awarded the Academic Maters Degree in Agriculture:

The candidate must pass a minimum pf 36 credit units made up the following:

A. COURSES	UNITS
Core Courses	12
Electives	12
Thesis/Dissertation	10
Seminars	2
PGC	3
Total:	39

CROP PRODUCTION/ AGRONOMY

A. CORE/COMPULSORY COURSES	UNITS
CSC 603 – Crop physiology	3
CSC 605 – Crop Ecology	3
CSC 611 – Design of Experiment	3
CSC 613 – Mineral Nutrition of Plant	3
PGC 601– Research Methodology and Application of ICT in Research	3
Electives	12
Project	6

Seminar	2
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Total

B. ELECTIVES

CSC 631 – Principle of Pest and Plant Disease control	3
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CSC 602 – Economic Entomology	3
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CSC 623 – Plant Breeding	3
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CSC 652 – Crop Growth Analysis	3
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CSC 628 – Weed Management	3
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CSC 665 – Plant Biotechnology	3
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CSC 644 – Organic Agriculture	3
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FORAGE AND FODDER CROPS

A. CORE/COMPULSORY COURSES

UNITS

CSC 603 – Crop physiology	
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CSC 611 – Experimental design	
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CSC 613 – Mineral nutrition of plant	
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CSC 606 – Grass land productivity	
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PGC 601– Research Methodology and Application of ICT in Research	3
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B. ELECTIVES

CSC 605 – Crop ecology	
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CSC 623 – Plant breeding	
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CSC 602 – Economic entomology	
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CROP PHYSIOLOGY OPTION

A. CORE/COMPULSORY COURSES

UNITS

CSC 603 – Crop physiology	3
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CSC 605 – Crop Ecology	3
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CSC 652 – Crop Growth Analysis	3
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CSC 611 – Design of Experiment	3
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PGC 601– Research Methodology and Application of ICT in Research	3
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Electives	12
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Project	6
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Seminar	2
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Total

B. ELECTIVES

CSC 651 – Soil and Plant Analysis	3
CSC 604 – Research technique in Crop Physiology	3
CSC 623 – Plant Breeding	3
CSC 601 – Plant Pathology	3
CSC 610 – Post Harvest Physiology of Fruits and vegetable	3
CSC 644 – Organ agriculture	3
CSC 665 – Plant Biotechnology	3

HORTICULTURE OPTION

A. CORE/COMPULSORY COURSES	UNITS
CSC 640 – Plant Propagation Techniques	3
CSC 642 – Fruits and Vegetable Crop Production	3
CSC 603 – Crop Physiology	3
CSC 611 – Design of Experiment	3
PGC 601– Research Methodology and Application of ICT in Research	3
Electives	12
Project	6
Seminar	2
Total	

B. ELECTIVE

CSC 643 – Horticultural methods	3
CSC 650 – Post Harvest Physiology	3
CSC 665 – Plant Biotechnology	3
CSC 613 – Principle of Pest and Plant Disease control	3
CSC 625 – Tropical Fruits	3
CSC 613 – Mineral Nutrition of Plant	3
CSC 626 – Plantation Crops	3
CSC 609 – Tropical Ornamental Horticulture and Land Scope	
CSC 624 – Advanced Vegetable Crops	

PLANT BREEDING AND GENETICS

A. CORE/COMPULSORY COURSES	UNITS
CSC 600 – Biometrical Genetics	3
CSC – Plant Breeding and Genetics	3

CSC – Biotechnology in Crop Improvement	3
CSC – Cytogenetics	3
CSC 603 – Crop Physiology	3
CSC 613 – Mineral Nutrition of Plants	3
CSC 623 – Plant Breeding	3
PGC 601– Research Methodology and Application of ICT in Research	3
Electives	12
Project	6
Seminar	2
Total	
B. ELECTIVE	
CSC 630 – Research Methods in Weed Science	3
CSC 631 – Physiology and Biochemistry of Herbicide action	3
CSC 613 – Mineral Nutrition of Plant	3
CSC 665 – Plant Biotechnology	3
CSC 632 – General Biochemistry	3
CSC – Crop Physiology	3

SEED SCIENCE AND TECHNOLOGY

A. CORE/COMPULSORY COURSES	UNITS
CSC 661 – Seed Biology	3
CSC 662 – Seed Production and Certification	3
CSC 611 – Design of Experiment	3
CSC 623 – Plant Breeding	3
PGC 601– Research Methodology and Application of ICT in Research	3
Electives	12
Project	6
Seminar	2
Total	
B. ELECTIVE	
CSC 663 – Seed Analysis, Testing and Certification	3
CSC 610 – Post Harvest Physiology of Vegetable and Fruits	3
CSC 665 – Plant Biotechnology	3
CSC 664 – Seed Technology	3
CSC 640 – Stored Product Entomology and Pathology	3
CSC 604 – Techniques in Crop Physiology	3

PHYTO PATHOLOGY

A. CORE/COMPULSORY COURSES	UNITS
CSC 601 – Plant pathology	3
CSC 603 – Crop physiology	3
CSC 611 – Design of Experiment	3
CSC 605 – Crop Ecology	3
PGC 601– Research Methodology and Application of ICT in Research	3
Electives	12
Project	6
Seminar	2
Total	
B. ELECTIVE	
CSC 620 – Plant Nematology	3
CSC 621 – Virus diseases of plants	3
CSC 613 – Mineral nutrition	3
CSC 622 – Bacterial diseases	3
CSC 60s – Entomology	3
CSC 665 – Plant Biotechnology	3
CSC 607 – Weed Biology	3
CSC 608 – Physiology of Herbicidal Action	3

ECONOMIC ENTOMOLOGY

A. CORE/COMPULSORY COURSES	UNITS
CSC 601 – Plant pathology	3
CSC 602 – Economic entomology	3
CSC 611 – Design of Experiment	3
CSC 603 – Crop ecology	3
PGC 601– Research Methodology and Application of ICT in Research	3
Electives	12
Project	6
CSC 627 – Seminar	2
Total	

B. ELECTIVE

CSC – Pesticide science and Toxicology	3
CSC 612 – Chemistry and Toxicology of Insecticides	3
CSC 640 – Mineral Nutrition of plants	3
Plant Biotechnology	3
Plant Breeding	3

**B. POSSIBLE ELECTIVES IN AREAS OF SPECIALIZATION
GENERAL AGRONOMY OPTION**

COURSES	UNITS
CSC 603 – Crop Physiology	3
CSC 652 – Crop Growth analysis	3
CSC 665 – Plant Biotechnology	3
CSC 628 – Weed Management	3
CSC 627 – Principles of Pest and Disease Control	3
CSC 626 – Plantation Crops	3

A. CROP PHYSIOLOGY OPTION

COURSES	UNITS
CSC 603 – Crop Physiology	3
CSC 605 – Crop Ecology	3
CSC 665 – Plant Biotechnology	3
CSC 628 – Weed Management	3
CSC 626 – Plantation Crops	3
CSC 652 – Crop Growth Analysis	3
CSC 610 – Post Harvest Physiology of Fruits & Vegetable	3
CSC 623 – Plant Breeding	3
CSC 629 – Stored Products Entomology and Pathology	3

5.0 DOCTOR OF PHILOSOPHY (Ph.D) IN CROP SCIENCE/CROP PRODUCTION/CROP PROTECTION/HORTICULTURE

The Ph.D programme in Crop Science/Crop Production/Crop Protection/Horticulture will be offered with specialization in either of these:

Agronomy
 Crop Physiology
 Horticulture
 Plant Breeding and Genetics
 Weed Science
 Seed Science and Technology
 Entomology
 Phytopathology
 General Crop Protection

5.1 PHILOSOPHY

The philosophy of the Doctor of Philosophy (Ph.D) Degree programmes in Crop Science / Crop Production / Crop Protection / Horticulture is to develop high level manpower to pursue courses in academic and research. It is to provide the highest degree of specialization in a particular field in the context of expanding knowledge globally and solving real life problems.

5.2 AIM AND OBJECTIVES

The Doctor of philosophy Degree programmes in these fields is aimed at:

- (a) Equipping students with research skills through the conduct of supervised research, seminar presentations and thesis preparation.
- (b) Provide training for those whose future course lie in teaching and research at the tertiary level and in research and development in the public and private sector.

5.3 ADMISSION REQUIREMENT

Candidate seeking admission for Doctor of philosophy Degree in any of these fields must have academic Masters Degree in any of these fields Agriculture of related discipline with a minimum CGPA 3.5 from recognized institutions.

5.4 DURATION OF DOCTOR OF PHILOSOPHY PROGRAMMES:

- (a) The full-time Doctor of philosophy Degree programmes shall run for a minimum duration of four (4) semesters and maximum of six (6) semesters.
- (b) The part-time Doctor of Philosophy Degree programmes shall run for a minimum duration of six (6) semesters and maximum of eight (8) semesters.

5.5 REQUIREMENTS FOR GRADUATION

A candidate must have passed a minimum of 47 credit units made in the following to be awarded the Ph.D Degree in Agriculture and related fields.

Course

units

Course transferred from M.Sc	21
PGC	3
Electives	9
Thesis /Dissertation	12
Seminar	2
Total	47

6.0 SPECIALIZATIONS

Specializations are offered at Ph.D degree programmes as follows:

- a) Plant Breeding and Genetics
- b) Agronomy
- c) Horticulture
- d) Weed Science
- e) Seed Science
- f) Phyto Pathology (Bacteriology, Mycology, Netuatology and Virology)
- g) Economic Entomology
- h) General Crop Protection Option
- i) Forage and Fodder Crops

PLANT BREEDING AND GENETICS

COURSE	UNITS
CSC 724 – Molecular genetics	3
CSC 725 – Plant cytology	3
CSC 700 – Biometrical genetics II	3
CSC 723 – Advanced plant breeding and Genetics	3
CSC 765 – Advanced Biotechnology II	3
PGC 701– Synopsis and Grant Writing	3

AGRONOMY

COURSE	UNITS
CSC 705 – Advanced plant ecology	3
CSC 704 – Research Techniques in crop physiology	3
CSC 752 – Advanced in crop growth analysis	3
CSC 703 – Crop physiology	3
CSC 765 – Advanced Biotechnology II	3
PGC 701– Synopsis and Grant Writing	3

HORTICULTURE

COURSE	UNITS
CSC 713 – Advanced plant nutrition	3
Research Techniques in plant propagation	3
CSC 704 – Research Techniques in crop physiology	3
CSC 705 – Advanced plant ecology	3
CSC 765 – Advanced Biotechnology II	3
PGC 701– Synopsis and Grant Writing	3

WEED SCIENCE

COURSE	UNITS
CSC 728 – Advanced Weed Management	3
CSC 705 – Advanced plant ecology	3
CSC 708 – Physiology and biochemistry of Herbicide action II	3
CSC 765 – Advanced Biotechnology II	3
PGC 701– Synopsis and Grant Writing	3

SEED SCIENCES

COURSE	UNITS
CSC 762 – Advanced seed production and certification	3
CSC 763 – Recent techniques in seed analysis testing and certification	3
CSC 723 – Advanced plant breeding	3
CSC 765 – Advanced Biotechnology II	3
PGC 701– Synopsis and Grant Writing	3

PHYTO PATHOLOGY

COURSE	UNITS
CSC 721 – Advanced virus diseases of plant	3
CSC 722 – Advanced Bacterial diseases	3
CSC 720 – Advanced Nematology	3
CSC 702 – Advanced Economic entomology	3
CSC 701 – Advanced mycology	3
CSC 705 – Advanced crop ecology	3
CSC 765 – Advanced Biotechnology II	3
PGC 701– Synopsis and Grant Writing	3

ECONOMIC ENTOMOLOGY

COURSE	UNITS
CSC 702 – Advanced Economic Entomology	3
CSC 712 – Chemistry and Toxicology of Insecticide II	3
CSC 705 – Advanced crop ecology	3
CSC 713 – Advanced Mineral nutrition	3
CSC 765 – Advanced Biotechnology II	3
PGC 701– Synopsis and Grant Writing	3

GENERAL CROP PROTECTION OPTION

COURSE	UNITS
CSC 702 – Advanced Economic Entomology	3
CSC 721 – Advanced Virus diseases of plant	3
CSC 722 – Advanced Bacterial diseases	3
CSC 720 – Advanced Nematology	3
CSC 701 – Advanced mycology	3
CSC 765 – Advanced Biotechnology II	3
PGC 701– Synopsis and Grant Writing	3

COURSES SYNOPSIS FOR CROP SCIENCE / CROP PRODUCTION / CROP PROTECTION / HORTICULTURE PROGRAMMES

A. Postgraduate Diploma In Crop Science / Crop Production / Crop Protection / Horticulture

Statistical Methods and Experimental Design CSD 611 2 credit

Definition and scope of statistics, collections, tabulation and graphical presentation statistical data. Measurement of central tendency and dispersion, frequency distribution, probability distribution, t-test, hypothesis testing, simple correlation and regression analysis principles of experimentation, factors influencing plant size, plot shape, number replications, experimental layout, analysis of data and interpretation of results.

Introduction to Cropping Systems CSD 0624 2 credit

Discussion of the concept, principles and modalities of different cropping system monocropping, mixed cropping, relay cropping, alley cropping, agro-forestry, crop rotation ratoon cropping and other systems sustainability of crop production in relation to cropping system.

Principles and practices of Crop Production CSD 0626 2 credit

Climate, soil, economic and social conditions affecting crop production and growth, crop culture, propagation, soil and climate requirement, fertilizers, handling, distribution for economic analysis of specific crops cropping patterns and land use system.

Mineral Nutrition of Plants CSD 0613 2 credit

Historical aspects of plant nutrition. The soil as a source of plant nutrients, physical chemical processes involved in uptake and movement of ions in plants. Ion interactions and essential elements and their functions. Importance of mineral elements in plants for purposes other than satisfying plant growth requirements.

B. PROFESSIONAL AND/OR ACADEMIC MASTERS/PH.D PROGRAMMES

Advanced Crop Production CSP 640 3 credit

Physiological origins of crop yield, Potential versus harvest yield and the role of environmental factors. Management practices employed in crop production, farming

systems traditional and modern concepts, the eco-physiological consideration of multiple cropping, contemporary models in cropping systems and research methods.

Crop Production/Plant Fertility and Plant Nutrition CSP 641 3 credit

Fertility in relation to physical and chemical characteristics of soils, Nutrient absorption credit distribution in plants, effects of fertilizer and line, C.E.C. organic matter and pH on graphical presentation availability and uptake, fertilizer use and technology.

Methods, Design and Analysis of Experiments CSP 611 3 credit

Plot shape, number statistical rotation, averages and standard deviations, normal distributions, t-distribution and confidence limits, statistical hypothesis and tests of significance, discrete data, principles of experimental design.

Fertility and Plant Nutrition CSP 613 3 credit

Different cropping system in relation to physical and chemical characteristics of soils. Nutrient absorption Pro-forestry, crop rotation

COURSE SYNOPSES

Computer Application in Agriculture I CSP 642 2 Units

Introduction to computers. History of computers. Functional components of computers. Hardware, software, operation systems. Use computers data analysis and production of reports.

Computer Application in Agriculture II CSP 643 3 Units

Introduction to computer hardware, software and operating systems. Microsoft office data management and analysis packages. Internet connectivity, browsing, virtual libraries. Computer-based modeling packages in agricultural science.

Insect Pest management CSP 633 2 Units

Importance of disease in crop production. Factors influencing disease incidence and reverent. Disease control and reduction of crop loss by chemical and non-chemical methods.

Weed Management CSP 628 2 Units

Important of weeds in the ecosystem. Principles and practice of weed management in field horticultural and plantation crops.

Advanced Pest Management**CSP 632****3 Units**

Ecological principles and methods with reference to the study of insect population. The effect of farming practices on pest incidence and crop loss. Insect control and reduction of crop loss by chemical and non chemical methods in the field and in storage. Evaluation of insect control programme.

Plant Disease Control Principles**CSP 631****3 Units**

Natural defence mechanisms. Factors influencing disease incidence and severity. Biotechnology and genetic engineering in disease control. Evaluation of disease control programme.

Techniques in Agricultural Research**CSP 644****3 Units**

Specimen preparation. Stain technology. Theory and use of microscope and microstomes. Photograph and photomicrography. Greenhouse experimentation. Sampling and population assessment for pathogens.

Ecological Principles and Methods**CSP 645****3 Units**

Ecological principles and methods with particular reference to the study of insect population. Physical and biotic factors affecting abundance and distribution of insects and their interrelationships. Insect survey and assessment of damage.

Biometrical Genetics**CSP 646****1 Unit**

Non-Parametric methods in plant breeding and selection- in stratified ranking and consistency performance, multivariate techniques-pattern analysis, cluster, and principal components (PCA), analyses, dendrogram and factor analysis. The environment-Comstock and Moll (1963), micro-environment, macro-environment (different years, locations, fertilizer levels, planting dates, irrigation schedules, etc), Allard and Bradshaw (1964), predictable variation (soil types, day length, planting dates and other agronomic practices, etc.), unpredictable Variation-fluctuating features of the environment, weather (rainfall and temperature).

Plant Breeding II**CSP 647****1 Unit**

Biotechnology in crop improvement molecular markers and marker-assisted selection, autopoloidy in plant breeding:- 'allopoloidy and aneuploidy, mutation breeding, interspecific hybridization, genetics and breeding for resistance to disease and insects

(biotic stresses), and mineral stresses (salinity, mineral deficiency and mineral toxicity), and heat and cold stress (abiotic stresses), quality seed:- classes, production practices and maintenance, release and maintenance of breeding materials, field plot techniques and experimental designs.

Statistical Methods, Design and Analysis of Experiments II CSP 648 1 Unit

Simple linear, partial and multiple regression and correlation and path coefficients analyses, analysis of covariance (ANCOVA), design and analysis of rotation experiments, combining experiments-locations and/years/seasons, time of planting and plant population/density design experiments, fixed and random treatment models in analysis of variance, determination of expected mean squares (EMS), in analysis of variance, analysis of intercrop experiments.

COURSE DESCRIPTIONS OF M.SC

Biometrical Genetics

CSC 600

3 Units

Elementary Statistics. Elements of Matrix Algebra. Variance and Covariance Analysis. Path Analysis. Scaling Test and Components of Generation Means. Dialysis. Analysis of Partial Dialled. Three-way Cross Analysis. Analysis of North Caroline Designs. Classificatory Analysis-Metroglyph and Index Score method D2 statistics stability method. Simultaneous Selection Models.

Plant Pathology

CSC 601

3 Units

Concept and definitions of diseases in agricultural crops. Classification and identification of mycopathogens in various crops. Ecology of plant diseases as well as its economic significance. History of plant pathology. The phenomena of infection and disease development. The physiology of parasitism and resistance of Hosts. Abiotic disease, storage waste, seed testing and quarantine regulations. Control methods as well as integrated pest management.

Economic Entomology

CSC 602

3 Units

A survey of insects that are of agricultural importance in crop production in the tropics, principles of insect control in field and storage by chemical; biological and integrated methods; techniques for survey of insect pest infestation and evaluation of insect damage and losses in the field.

Crop Physiology

CSC 603

3 Units

Crop growth as a resultant of all physiological processes, inherent patterns of growth and development. Plant metabolic processes; Quantitative analysis of crop growth and development; Effects of cultural and environmental factors; Regulation of growth and development; Growth correlations; Developmental physiology of selected leaf, storage organ, fruit and seed crops; potential productivity of (a) existing crops (b) model crops; Methods of study and interpretation of the physical environment of and in filed crops.

Techniques in Crop Physiology

CSC 604

3 Units

Solution culture techniques; Environmental factors – measurements and control in glasshouses, growth room and growth cabinets; plant growth analysis; Measurements and interpretation of the physical environments of crops; Methods in carbondioxide assimilation (photosynthesis) respiration and stomatal movements and their interrelations; Chemical analysis of plant tissues and data interpretation; Chromatographic techniques.

Crop Ecology**CSC 605****3 Units**

Climatic, biotic and adaphic factors which affect adaptation, distribution and productivity of crop plants; Growth and development patterns of crops. Factors of light (intensity and duration), temperature, moisture, soil and nutrition in relation to crop production. Vernalization in crop production, crop adaptation to stress conditions; measurements of yield and productivity; problems of crop production in humid tropics.

Grassland Productivity**CSC 606****3 Units**

Species adaptation and productivity of tropical forage species; pasture establishment and cutting management; grass/legume mixtures and productivity. Nitrogen fixation and N-economy of tropical forage legumes; fertilization and general management practices for increased productivity of natural and sown pastures; grazing management in relation to pasture productivity; forage crop conservation.

Weed Biology**CSC 607****3 Units**

The study of weeds: their biology and ecology interactions. Research methods in the study of weed-crop interactions.

Physiology of Herbicidal Action**CSC 608****3 Units**

Classification and behaviour of herbicides with emphasis on uptake, translocation, metabolism in plants and pollution of the environment. Research methods in the study of herbicide activity in the environment.

Tropical Ornamental Horticulture and Landscape**CSC 609****3 Units**

Concepts and techniques of landscape plant production and utilization with special reference to the tropics. Domestication and improvement of ornamental plants. Floricultural crop production and indoor environment. Protected cultivation, and lawn grass species. Establishment and maintenance of turfgrasses.

Post-harvest Physiology of Fruits and Vegetables

Field cultural treatments in relation to post-harvest physiological disorders. Packing house and transit handling and storage life. Methods of preservation. Major ways of prolonging storage life: mechanical refrigeration, vacuum cooling, liquid nitrogen and gas storage. Measurement of heat, moisture loss, respiration, respiratory Quotient and Climacteric.

Virus Diseases of Plants**CSC 621****3 Units**

The course is designed to explore the nature of plant viruses, the diseases they cause and how plant virus diseases are controlled.

Bacterial Diseases of Plants**CSC 622****3 Units**

Classification and identification of pathogenic bacteria. Symptomatology and serological identification of bacterial diseases of important crops: Root and Tuber crops, vegetables, ornamental and various species of Nursery plant physiology and host-parasite interactions. Host defence systems. Prophylactic and therapeutic methods in seeds and cuttings intended for planting. Integrated Post Management – a viable option to other methods.

Principles of Plant Breeding**CSC 623****3 Units**

Introduction; Reproduction processes in plants; Types of Reproduction; Plant Life Cycles; genomes in autopolyploid and allopolyploid plants; Sex expression in plants and its relationship to self and cross pollinated crops. Types of cultivars in crop plants; Heterosis in plants; Genetic variation in plants; Genetic structure of self-pollinated crops; Breeding methods for crop plants; doubled Haploid; Pedigree method or Bulk Method of Breeding; Multiline cultivars; Backcross method of Breeding; Intrapopulation Breeding methods; Mass selection methods; tissue Culture Application to plant breeding; Application of Restriction Fragment Length to plant breeding; polymorphism (RFLP) to plant Breeding Procedures; Method of Hybrid seed production.

Advanced Vegetable Crop Science**CSC 624****3 Units**

Recent developments in commercial vegetable production technology; Advances in vegetable crop science in relation to field and greenhouse culture; vegetable crops nutrition – major – and trace elements and their interrelationship with vegetable crop production as a commercial venture; vegetable crop planning.

Tropical Fruits**CSC 625****3 Units**

Origin, classification, genetics, breeding and technical aspects of culture of fruit and nut crops commercially important in Nigeria. Rootstock-scion relationship; anatomical aspects of regemoration of roots and shoots in asexual propagation. Recent developments in fruit tree nutrition, irrigation, weed control and pest disease control. Pollination problems leading to self and cross – incompatibility in orchard crops. Growth regulators in horticulture: screening and field testing of chemical substances for growth regulator activity.

Plantation Crops**CSC 626****3 Units**

A study of the general principles and practice of tree-crop culture and their relation to underlying sciences. Topics to be covered include Economics, History, Distribution, Botany, growth, propagation, production, processing and uses of major tropical tree crops and crop products.

Biotechnology in Crop Improvement**CSC 627****3 Units**

Concept of biotechnology, plant protoplast, cell and tissue culture, micro propagation of plants, isolation and characterization of genomic and organelle DNA, electrophoresis, polymerase chain reaction (PCR) and amplification of DNA fragments, gene cloning, DNA hybridization, Gene sequencing, Application of marker Assisted selection in crop improvement.

Cytogenetics**CSC 628****3 Units**

Plant cell, cell division, chromosome, karyotype and genome, breakage fusion bridge cycles, changes in chromosome constitution (Quantitative and qualitative changes). Meiotic irregularities arising consequences, variations in chromosome number: aneuploidy and euploidy, random chromosome and chromatic segregation in autotetraploids mating types, meiotic irregularities in aneuploids and their consequences.

Cytogenetics**CSC 629****2 Units**

Relationships between plant breeding and genetical science, cytogenetic basis of plant breeding-variations in individual chromosome, variations in chromosome number, cytoplasmic inheritance and related phenomena, modes of reproduction in plants-description and identification of various modes, hereditary and environmental factors affecting modes of reproduction, plant breeding problems associated with modes of reproduction, origin of the plant breeders material-indigenous materials and introductions, centres of diversity and/or origin, Vavilov's and Harlam's works, origin of crop species, collections of potential parental materials, interspecific hybridization, barriers to hybridization, cytogenetic basis of hybrid sterility, genetic disability of F₂ and later generations, methods of utilizing interspecific hybrids, analysis and managing of discontinuous variation" patterns of discontinuous variation, testing hypotheses, binomial, χ^2 and other tests, estimation of linkage intensities, development and use of near isogenic lines, mutation breeding: genetic basis of mutation, methods of mutation breeding.

Statistical Methods, Design and Analysis of Experiments I CSC630 2 Units

Basic ideas about statistical inference and test of hypothesis, planning of experiments, collection, presentation and summarization of data, randomization, replication, sub-sampling and unequal-sample size, experimental error, error control, standard deviation and standard error of means, coefficient of variability (C.V.)-define, introduction to statistical computer software's; Statistical Analysis System (SAS), Statistical Package for Social Science (SPSS), GENSTAT, BIPLLOT, Principal Component Analysis (PCA), and other Computer Software programmes/packages, *etc.*, survey of experimental designs, and analysis of variance (ANOVA), assumptions of ANOVA, linear additive model(s), expected mean squares (EMS), Latin Square (LS), and Split-Plot designs, missing data, incomplete block designs, detection of difference between treatment means, application of Fisher's least significant difference (F-LSD = LSD), Duncan's new multiple range test (DNMRT), Honest significant difference (HSD), or Turkey's W-procedure and Dunnett's test, comparison-wise and experiment-wise error rates, factorial experiments, linear model for factorial experiments, single-degree of freedom comparisons, individual degrees of freedom, equally spaced treatments, orthogonal comparisons, and response surface analysis, confounding in factorial experiments. Repeated measures design(s), simple linear, regression and correlation, coefficients analyses, non-linear relations, analysis of covariance (ANCOVA), data transformation and non-parametric techniques, combining of experiments, location and/or years or seasons, Bartlett's test, *etc.*, design and analysis of rotation experiments.

Plant Breeding I

CSC 631

2 Units

Introduction: Perspective in plant breeding, evolution of cultivated plants, plant introductions/Nigerian research institutes for crops/plants, international institutes for crop improvement, modes of reproduction and plant breeding biometrical techniques in plant breeding:- simple measures of variability, components of variance, genetic diversity, aids to selection:- correlation and path coefficients analyses, discriminate function, choice of parents in breeding procedures:- diallel cross analysis, bi-parental cross analysis, varietal adaptation:- component of adaptability, assessment of stability, the environment, genetics in plant breeding: quantitative and qualitative characters, multiple factors in plant breeding:- types of gene action, roles of environment in plant breeding, heritability, breeding and selection of self-pollinated crops. Hybridization and gene combination, pedigree, bulk and backcross methods of breeding, breeding and selection of cross pollination crops, method of cross pollination, clonal selection and hybridization: clonal crops, inbreeding and heterosis, hybrid varieties, recurrent selection methods, synthetic

varieties, quality seed: classes, production practices and maintenance, release and maintenance of breeding materials, field plot techniques and experimental designs.

Biometrical Genetics I

CSC 632

2 Units

Qualitative and quantitative characters in genetics:- genotype and phenotype, qualitative and quantitative characters, inheritance of qualitative characters, inheritance of quantitative characters:- the multiple factor hypothesis, polygenic inheritance and continuous variation, the role of environment in quantitative inheritance, components of genetic variance:- heritability, heterosis, etc., biometrical techniques in plant breeding:- biometry/biometrics-define/explain, biometrical genetics vs quantitative genetics, assessment of variability: simple measures of variability, component of variance, metroglyph analysis, statistical aids to selection:- correlation and path coefficients analyses, choice of parents and breeding procedures:- diallel cross analysis, Hayman's graphical approach, genetic ratios, the $V_e - W_r$ graph, etc., Griffing's numerical approach:- partial diallel, triallel, quadriallel analysis, line x tester analysis, generation mean analysis, bi-parental cross analysis, North Carolina design I, North Carolina design II, North Carolina design III, triple test cross analysis, varietal adaptation:- Eberhart and Russel (1966) model, Perkins and Jinks (1968) model, Freeman and Perkins (1971) model.

PGC 601: Research Methodology and Application of ICT in Research

3 Units

This is in-depth research work aimed at acquiring full knowledge and presentation in scholarly writing of the concepts, issues, trends in the definition and development of the study of the study area from African and Western perspectives; Major steps in research: Selection of problem, Literature review, Design, Data collection, analysis and interpretation, Conclusions, Study of various research designs, Historical, Case Studies, Surveys, Descriptive, Cross sectional, Experimental, as well as Analysis, surveys and synthesis of conceptual and philosophical foundations of different disciplines. Identification of research problems and development of research questions and or hypotheses are discussed. Detailed treatment of methods of collecting relevant research data and the format for presenting research results (from designing the table of contents to referencing, bibliography and appendix) are also part of this course; Data analysis and result presentation in different disciplines using appropriate analytical tools, Methods of project dissertation writing. This course also considers the Application of appropriate advanced ICT tools relevant in various disciplines for data gathering, analysis and result presentation; Essentials of Spreadsheets, internet technology and internet search engines.

PGC 701: Synopsis and Grant Writing**3 Units**

This course identifies types and nature of grant and grant writing as well as meaning of grants application calls on the internet. The course Determines appropriate strategy for grant application; Study of various grant application structures and contents and writing of concept notes, detailed project description, budgeting and budget defense. Study of sample grant writings in various forms and writing of mock research and other grants are part of this course. Students are taught University of Nigeria synopsis structure and requirements, (Introduction, Methodology and Results); determining the content of each sub-unit of the synopsis; Steps in writing of synopsis from the Dissertation/Thesis document, Structural and language issues. Common errors in synopsis writing and strategies for avoiding them are discussed. The roles of the student and the supervisor in the writing of synopsis are discussed as well as writing of mock synopsis.

Seminar**CSC 632****2 Units**