



NATIONAL BOARD FOR TECHNICAL EDUCATION

PLOT B BIDA ROAD, P.M.B. 2239, KADUNA, NIGERIA

HIGHER NATIONAL DIPLOMA

IN

HORTICULTURAL TECHNOLOGY

CURRICULUM AND COURSE SPECIFICATIONS

JUNE 2026

PREFACE

The transformation of Nigeria's agricultural sector remains central to the nation's aspirations for sustainable economic growth, food security, job creation, industrial development, and poverty reduction. As agriculture continues to evolve in response to technological advancements, climate change, emerging global market demands, and the need for increased productivity across agricultural value chains, it has become imperative to ensure that curricula in Nigerian tertiary institutions remain relevant, responsive, and aligned with contemporary industry requirements. It is against this backdrop that we embarked on the comprehensive review and modernization of Agricultural curricula for Nigerian tertiary institutions. The review process was designed to address identified skills gaps, integrate emerging technologies and innovations, strengthen entrepreneurship and employability competencies, promote climate-smart agriculture, and align training programmes with the industry expectations and global best practices. The successful execution of this important project was made possible through the invaluable support and commitment of key stakeholders. I wish to express profound appreciation to the Honourable Minister of Education for providing the policy direction and leadership that facilitated this initiative. I also extend sincere gratitude to the Honourable Minister of Agriculture and Food Security and the Honourable Minister of Livestock Development for their unwavering support, technical contributions, and commitment to strengthening agricultural education and workforce development in Nigeria. Special appreciation goes to the Tertiary Education Trust Fund (TETFund) for providing the special intervention grant that enabled the conduct of nationwide skills gap analyses and supported the series of national curriculum review and development workshops. The findings from the skills gap studies provided critical evidence and industry insights that guided the review process and ensured that the curricula reflect current and future workforce requirements within the agricultural sector.

I also acknowledge with gratitude the immense contributions of the Sector Skills Council for Agriculture, whose expertise and industry perspectives greatly enriched the curriculum development process. Equally commendable are the efforts of members of the Implementation Committee, resource persons, industry experts, professional bodies, French Embassy in Nigeria, regulatory agencies, academic institutions, employers, development partners, and other stakeholders who devoted their time, knowledge, and experience to the various workshops and technical sessions. The revised curricula represent a collective national effort to produce graduates equipped with relevant knowledge, practical skills, digital competencies, entrepreneurial capabilities, and professional attitudes required to drive innovation and productivity across Nigeria's agronomy, forestry, fisheries and livestock sectors. It is my expectation that Institutions offering these programmes will faithfully implement the curricula and continue to collaborate with industry to ensure sustained relevance and quality. I commend all stakeholders for their dedication and contributions to this landmark achievement and look forward to the successful implementation of these curricula for the benefit of our dear nation.

Professor Idris M. Bugaje, FNSE
Chairman, Implementation Committee
EXECUTIVE SECRETARY
National Board for Technical Education (NBTE), Kaduna

ACKNOWLEDGEMENT

The National Board for Technical Education (NBTE) expresses its profound appreciation to all individuals and organizations whose invaluable support, expertise, and commitment made the successful review and modernization of the Agricultural Education curricula for Nigerian tertiary institutions possible. Our sincere gratitude goes to the Honourable Minister of Education for providing the policy direction and leadership that made this national initiative possible. We also appreciate the Honourable Minister of Agriculture and Food Security and the Honourable Minister of Livestock Development for their technical guidance, collaboration, and unwavering commitment to strengthening agricultural education and workforce development in Nigeria. The Board is particularly grateful to the Tertiary Education Trust Fund (TETFund) for providing the special intervention grant that funded the nationwide skills gap analyses, stakeholder engagements, curriculum review exercises, validation meetings, and development workshops. The evidence generated through these studies provided a solid foundation for developing curricula that are relevant, industry-driven, and responsive to national and global agricultural priorities.

Special appreciation is extended to the curriculum specialists, resource persons, academic experts, professional bodies, regulatory agencies, employers, industry practitioners, development partners, and representatives of public and private sector organizations who participated actively in the skills gap studies, technical sessions, validation exercises, and curriculum development workshops. Their diverse expertise and practical insights greatly enriched the quality and relevance of the curricula. We further appreciate the support of the French Embassy in Nigeria and other development partners for their collaboration in promoting excellence and innovation in technical and vocational education within the agricultural sector. Finally, NBTE expresses its gratitude to all tertiary institutions, researchers, facilitators, rapporteurs, technical staff, and administrative personnel whose commitment and hard work contributed to the successful completion of this important national assignment. The Board acknowledges that this achievement is the result of a collective effort and remains confident that the effective implementation of these curricula will contribute significantly to producing competent, innovative, and entrepreneurial graduates capable of advancing sustainable agricultural development, food security, and economic prosperity in Nigeria.

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GENERAL INFORMATION

1.0 PROGRAMME NOMENCLATURE

Higher National Diploma (HND) in Horticultural Technology

2.0 PROGRAMME GOAL

The programme is designed to produce highly skilled horticultural technologists capable of applying modern and sustainable technologies in the production, management, processing, marketing and commercialization of horticultural crops including fruits, vegetables, ornamentals, nursery crops and protected cultivation systems for enhanced productivity, food security, climate resilience, export competitiveness and agribusiness development.

3.0 OBJECTIVES OF THE PROGRAMME

At the end of the Programme, the diplomates should be able to:

- i. Plan, establish and manage commercial horticultural enterprises involving fruits, vegetables, ornamentals and nursery crops;
- ii. Apply propagation, nursery and crop management technologies in horticultural production systems;
- iii. Design, establish and manage protected cultivation systems including greenhouse and soilless production technologies;
- iv. Apply climate-smart, precision and resource-efficient horticultural production practices;
- v. Apply integrated nutrient, pest and disease management systems for sustainable horticultural productivity;
- vi. Apply post-harvest handling, cold chain, quality assurance and value addition systems in horticultural enterprises;
- vii. Apply phytosanitary standards, food safety systems and export certification procedures in horticultural production;
- viii. Utilize digital and precision horticultural tools for crop monitoring, decision-making and productivity improvement;
- ix. Design, establish and maintain landscapes, parks, urban and commercial horticultural systems;
- x. Conduct research, data analysis and solve technical problems in horticultural enterprises;
- xi. Establish and manage horticultural agribusinesses, value chains and entrepreneurial ventures;
- xii. Demonstrate communication, leadership and professional ethics in horticultural practice

4.0 ENTRY REQUIREMENTS

The minimum entry requirements into the HND Horticultural Technology Programme are:

- i) National Diploma (ND) in Horticultural Technology, Agricultural Technology, Crop Production Technology, Forestry Technology, Agricultural and Bio-Environmental Engineering Technology, or related disciplines with at least Lower Credit
- ii) Must have undergone one (1) year post-ND industrial training experience;
- iii) Candidates must satisfy institutional and NBTE admission requirements.
- iv) Candidates with a **Pass** at the ND Level with two (2) or more years post-ND cognate work experience may be considered for admission.

5.0 STRUCTURE/DURATION OF THE PROGRAMME

The Programme is structured to last for **two (2) academic years (four semesters)** of classroom instruction, laboratory work and field practical's.

Each semester shall consist of:

- i) 15 contact weeks of teaching (lectures, practicals, fieldwork);
- ii) 2 weeks for tests, registration, and examinations.

6.0 CURRICULUM:

The syllabus of the HND Horticultural Technology programme consists of four (4) main components. These are:

- i. **General Studies Courses:** Courses that develop students' general knowledge, communication skills, values, and personal development outside their main field of study.
- ii. **Foundation Courses:** Basic introductory courses that provide the fundamental knowledge and principles needed for advanced learning in a Programme.
- iii. **Professional Courses:** Specialized courses that equip students with practical and technical skills related to their chosen profession or career field.

7.0 STAFFING REQUIREMENTS

7.1 Core Teaching Staff

A minimum of four (4) Core Lecturers who should be Lecturer II and above, with minimum qualification HND/B.Sc./M.Sc./Ph.D. holders in Horticultural Technology or related fields.

Head of Department (HOD)

The Head of Department shall have at least a Master's degree in Horticultural Technology or related fields. He or she shall not be below the rank of a Senior Lecturer, must be registered with the relevant professional body and must have a minimum of (12 years) experience in both academic and industry.

7.3 Technical Staff

There should be technical staff;

i. Technologist

A technologist is a highly skilled professional trained at the Higher National Diploma (HND) level. They possess advanced technical and practical knowledge in their field and are capable of supervising operations, managing projects, operating modern equipment, and applying technology to solve practical problems. In agriculture, technologists help in farm management, research support, and the application of improved technologies.

ii. Technician

A technician is a middle-level manpower trained at the National Diploma (ND) level. Technicians are responsible for carrying out technical tasks, operating tools and equipment, and assisting technologists and professionals in practical activities. In agriculture, they assist in crop production, livestock management, farm maintenance, and data collection.

iii. Farm Assistants

Farm assistants are support workers who help in daily farm operations under supervision. They perform basic practical activities such as planting, weeding, feeding animals, harvesting, cleaning farm tools, and maintaining farm records. They contribute to the smooth running of farm activities and help improve productivity.

8.0 CERTIFICATION

A diplomate of this Programme shall be awarded the Higher National Diploma (HND) in Horticultural Technology.

9.0 AWARD OF HIGHER NATIONAL DIPLOMA (HND)

The Higher National Diploma certificate in Horticultural Technology shall be awarded by the authority of the Academic Board of the institution under the following conditions:

- i) Satisfactory performance in all prescribed course work/assignments, tests/quizzes, workshop practice, laboratory work, field trips, etc.;
- ii) Satisfactory performance in all semester examinations;
- iii) Satisfactory completion of written project/seminar papers;

9.1 Conditions for the Award of HND:

Institutions offering accredited programmes will award the Higher National Diploma to candidates who successfully completed the programme after passing the prescribed course-work, examinations, diploma project etc. Courses shall be graded as follows:

MARK RANGE	LETTER GRADE	WEIGHTING
75% and above	A	4.00
70% – 74%	AB	3.50
65% – 69%	B	3.25
60% – 64%	BC	3.00
55% – 59%	C	2.75
50% – 54%	CD	2.50
45% – 49%	D	2.25
40% – 44%	E	2.00
Below 40%	F	0.00

9.2 Classification of Diplomas:

Diploma Certificates shall be awarded based on the following classifications:

CGPA	CLASS OF DIPLOMA
CGPA 3.50 and above	Distinction
CGPA 3.00-3.49	Upper Credit
CGPA 2.50-2.99	Lower Credit
CGPA 2.00-2.49	Pass

10.0 ACCREDITATION OF PROGRAMME

The Horticultural Technology shall be accredited by the NBTE before the diplomates are awarded the certificates. Details about the process of accrediting a programme for the award of HND are available from the Board's website www.nbte.gov.ng or through correspondence to: The Executive Secretary, NBTE, Plot 'B' Bida Road, P.M.B 2239, Kaduna, Nigeria.

11.0 LOGBOOK

A personal logbook for each course is to be kept by the students. It shall contain all the recordings of the day-to-day, weekly and semester practical works/activities from day one to the end of the programme. This is to be checked, marked appropriately and endorsed by all lecturers concerned at the end of every week.

12.0 FINAL YEAR PROJECTS

Final year students are expected to carry out project work, either on individual or group basis (not more than 2 per group). The project topics should as much as possible be related to the programme and serve as useful tools for further Research and /or Development. Projects should be properly supervised, and their reports well presented. The Institution should develop formats for presenting and grading projects. The formats should be adopted as applied to each stakeholder.

13.0 Guidance Notes for Teachers of the Programme:

13.1 The new curriculum is drawn in unit courses. This is in keeping with the provisions of the National Policy on Education which stress the need to introduce the semester credit units which will enable a student, who so wishes, to transfer the units already completed in an institution of similar standard from which he/she is transferring.

13.2 In designing the units, the principle of the modular system by product has been adopted, thus making each of the professional modules, when completed provides the student with technician operative skills, which can be used for employment purposes.

13.3 As the success of the credit unit system depends on the articulation of programmes between the institution and industry, the Curriculum content has been written in behavioral objectives, so that the expected performance of the student is clear to all students who successfully completed some of the courses or the diplomates of the programme. There is a slight departure in the presentation of the performance-based curriculum which requires the conditions under which the performance is expected to be carried out and the criteria for the acceptable levels of performance. It is a deliberate attempt to further involve the staff of the department teaching the programme to write their own curriculum stating the conditions existing in their institution under which the performance can take place and follow that with the criteria for determining an acceptable level of performance. Departmental submission on the final curriculum may be vetted by the Academic Board of the institution. Our aim is to continue to see to it that a solid internal Evaluation system exists in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the polytechnic system.

13.4 The teaching of theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice in the ratio of 50:50 or 60:40 or the reverse.

14.0 GUIDELINES ON MANDATORY SKILLS QUALIFICATIONS (MSQ)

Please, refer to NBTE guidelines for implementation of MSQ in Polytechnics. This can be downloaded from NBTE website (web.nbte.gov.ng)



CURRICULUM TABLE**Year I Semester I**

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 301	Use of English III	2	0	0	2	2
2.	MSQ 311	Principles of Quality Assurance Assessment	1	0	1	2	2
3.	CPT 313	Agro-Climatology and Climate Smart Agriculture	1	0	2	3	3
4.	SST 312	Soil Fertility and Plant Nutrition	1	0	3	4	4
5.	HOT 311	Fruit and Vegetable Production Systems	1	0	3	4	4
6.	HOT 312	Nursery and Propagation Technologies	1	0	3	4	4
7.	HOT 313	Apiculture in Horticultural Production Systems	1	0	2	3	3
8.	HOT 314	Horticultural Crop Physiology and Productivity	1	0	3	4	4
9.	HOT 315	Plant Taxonomy	1	0	2	3	3
10.	HOT 316	Artificial Intelligence and Automation in Horticultural Production	1	0	2	3	3
11.	HOT 317	Greenhouse and Controlled Environment Horticultural Systems	1	0	3	4	4
TOTAL			12	0	24	36	36

Year I Semester II

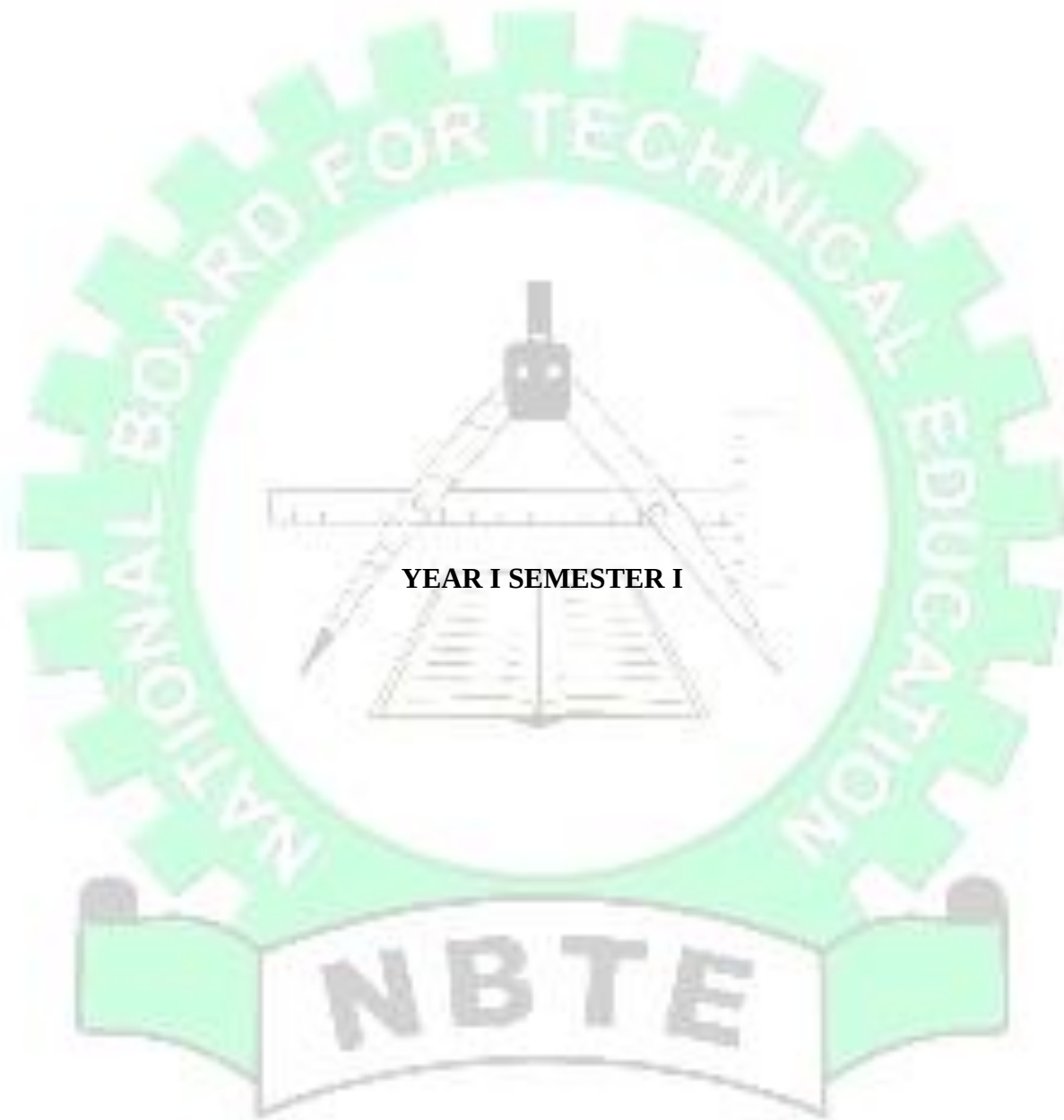
S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 302	Communication in English III	2	0	0	2	2
2.	ENT 326	Practice of Entrepreneurship I	2	0	2	4	4
3.	MSQ 321	Practice of Quality Assurance Assessment	1	0	1	2	2
4.	CPT 321	Principles of Genetics and Molecular Biotechnology	1	0	1	2	2
5.	HOT 321	Pest and Disease Management in Horticulture	1	0	3	4	4
6.	HOT 322	Smart Irrigation System and Design	1	0	3	4	4
7.	HOT 323	Landscape Design and Construction	1	0	3	4	4
8.	HOT 324	Soilless Cultivation and Hydroponics	1	0	3	4	4
9.	HOT 325	Spices and Herbs	1	0	2	3	3
10.	HOT 326	Post-Harvest Handling and Value Chain Systems	1	0	3	4	4
TOTAL			12	0	21	33	33

Year II Semester I

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	ENT 416	Practice of Entrepreneurship II	2	0	2	4	4
2.	CPT 416	Soil Fertility, Crop Nutrition and Organic Farming	1	0	3	4	4
3.	HOT 411	Horticultural Biotechnology and Seed Systems	1	0	3	4	4
4.	HOT 412	Horticultural Business Management and Agri-Finance	1	0	2	3	3
5.	HOT 413	Field Practical (Export-Oriented Production Systems)	0	0	4	4	4
6.	HOT 414	Fruit and Vegetable Processing and Storage	1	0	2	3	3
7.	HOT 415	Phytosanitary Standards and Export Certification Systems	1	0	2	3	3
8.	HOT 416	Ornamental Horticulture	1	0	2	3	3
9.	HOT 417	Horticultural Machinery and Utilization	1	0	3	4	4
10.	AGR 401	Research Methodology and Scientific Writing	1	0	1	2	2
TOTAL			10	0	24	34	34

Year II Semester II

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	CPT 424	Seed Production and Pathology and Quality Control	1	0	2	3	3
2.	CPT 425	Weed Science and Integrated Weed Management	1	0	2	3	3
3.	AED 424	Rural Sociology	1	0	1	2	2
4.	HOT 421	Horticultural Entrepreneurship and Startup Innovation	1	0	2	3	3
5.	HOT 422	Horticultural Product Branding, Packaging and Export Marketing	1	0	2	3	3
6.	HOT 423	Landscaping, Urban and Commercial Horticulture Systems	1	0	3	4	4
7.	HOT 424	Micro-Gardening and Compost Making	1	0	3	4	4
8.	HOT 425	Parks and Gardens Management	1	0	3	4	4
9.	HOT 426	Project	0	0	4	4	4
TOTAL			9	0	21	30	30



HOT 311: FRUIT AND VEGETABLE PRODUCTION SYSTEMS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: FRUIT AND VEGETABLE PRODUCTION SYSTEMS	COURSE CODE: HOT 311	CONTACT HOURS: 4 hours/week
	CREDIT UNITS: 4	THEORETICAL: 1 hour/week
YEAR: I SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 3 hours/week
GOAL: This course is designed to equip students with knowledge and skills in commercial fruit and vegetable production systems, high-value crops, protected production and management.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand commercial vegetable production systems 2.0 Understand fruit crop production and orchard management 3.0 Know the precision nutrients and irrigation management in fruit and vegetable production 4.0 Understand integrated pest and disease management in commercial production of fruits and vegetables 5.0 Know the quality management and post-harvest handling for market and export for fruits and vegetables 6.0 Understand enterprise planning for commercial fruit and vegetable production		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: FRUIT AND VEGETABLE PRODUCTION SYSTEMS			COURSE CODE: HOT 311	CONTACT HOURS: 4 HOURS/WEEK		
			CREDIT UNITS: 4	THEORETICAL: 1 HOUR/WEEK		
YEAR: I SEMESTER: I			PRE-REQUISITE: Nil	PRACTICAL: 3 HOURS/WEEK		
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills in commercial fruit and vegetable production systems, high-value crops, protected production and management.						
GENERAL OBJECTIVE 1.0: Understand commercial vegetable production systems						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1– 2	1.1 Explain commercial production systems for high-value vegetables 1.2 Describe variety selection criteria for commercial vegetable production 1.3 Describe a complete commercial nutrient management programme for tomato and pepper 1.4 Describe season extension and off-	- Explain commercial production systems for high-value vegetables such as: i. Staked tomato ii. Sweet pepper iii. Cucumber iv. Baby carrots. - Explain variety selection criteria for commercial vegetable production such as: i. Yield potential ii. Disease resistance iii. Market preference - Explain a complete	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Commercial production photographs, variety list, nutrients programme, export quality standards.	- Establish a commercial staked tomato plot - Record variety, date, spacing and plant population - Apply a complete fertiliser programme to the tomato plot - Record type, rate, date and method for each	Guide students to: - Establish a commercial staked tomato plot - Record variety, date, spacing and plant population - Apply a complete fertiliser programme to the tomato plot - Record type, rate, date and method for	Tomato Seedlings/seed s, Stakes, Fertiliser, Farm records, harvesting containers, Weighing scale, Gross margin template, Field notebooks.

	season production strategies for high-value vegetables 1.5 Describe yield targets and commercial quality standards for export vegetables	commercial nutrient management programme for tomato and pepper • Explain season extension and off-season production strategies for high-value vegetables • Explain yield targets and commercial quality standards for export vegetables		application • Inspect the crop weekly for pests and diseases • Record problem found, percentage affected and action taken • Harvest at correct maturity • Record date, total yield and percentage meeting commercial grade • Calculate gross margin for the plot • Record all income and variable costs •	each application • Inspect the crop weekly for pests and diseases • Record problem found, percentage affected and action taken • Harvest at correct maturity • Record date, total yield and percentage meeting commercial grade • Calculate gross margin for the plot • Record all income and variable costs	
GENERAL OBJECTIVE 2.0: Understand fruit crop production and orchard management						
2 – 4	2.1 Describe orchard management	• Explain orchard management practices, canopy management,	Laptop Computers, smart board	• Carry out patch budding on five fruit	Guide students to: • Carry out patch	Rootstocks, scion wood, budding tools,

	practices canopy management, cover cropping and floor management 2.2 Describe propagation techniques for fruit crops 2.3 Describe a complete annual fertiliser and irrigation programme for mango and citrus orchards 2.4 Describe commercial harvest scheduling and maturity testing for mango and citrus 2.5 Describe post-harvest treatments for export fruit: hot water treatment,	cover cropping and floor management • Explain propagation techniques for fruit crops such as: i. Patch budding ii. Tongue grafting iii. Approach grafting • Explain a complete annual fertiliser and irrigation programme for mango and citrus orchards • Explain commercial harvest scheduling and maturity testing for mango and citrus • Explain post-harvest treatments for export fruit: hot water treatment, waxing and fungicide dip	Projector Writing Materials White board Markers Internet Orchard management photographs, budding and grafting tools, annual programme calendar, refractometer, waxing materials, projector.	tree rootstocks • Record date, scion variety and union condition at 10 days • Carry out maintenance pruning on three orchard trees • Record cuts made and canopy condition after pruning • Apply fertiliser to three orchard trees by ring method • Record type, rate, date and method • Determine harvest readiness of mango or citrus using refractometer and float test • Record all	budding on five fruit tree rootstocks • Record date, scion variety and union condition at 10 days • Carry out maintenance pruning on three orchard trees • Record cuts made and canopy condition after pruning • Apply fertiliser to three orchard trees by ring method • Record type, rate, date and method • Determine harvest readiness of mango or citrus using	budding tape, pruning shears, fertiliser, refractometer, waxing materials, field notebooks.
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	waxing and fungicide dip			readings • Apply wax treatment to a batch of harvested fruit • Compare shelf life with untreated fruit at 5 days	refractometer and float test • Record all readings • Apply wax treatment to a batch of harvested fruit • Compare shelf life with untreated fruit at 5 days	
GENERAL OBJECTIVE 3.0: Know precision nutrients and irrigation management						
5 – 6	3.1 Explain fertiliser development programme from soil and leaf analysis data 3.2 Explain fertigation scheduling and nutrient solution management for commercial crops 3.3 Describe precision	• Describe fertiliser development programme from soil and leaf analysis data • Describe fertigation scheduling and nutrient solution management for commercial crops • Explain precision irrigation scheduling such as: - ET-based - Soil moisture-based - crop-based methods • Explain drip irrigation design and installation for commercial fruit and vegetable farms	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Soil and leaf analysis reports, nutrient solution chemicals, EC meter, pH meter, drip system	• Take soil sample, • Analyse soil sample • Interpret the result for the appropriate fertilizer application • Prepare a fertigation solution at the correct EC and pH • Record all steps and measured values	Guide students to: • Take soil sample, • Analyse soil sample • Interpret the result for the appropriate fertilizer application • Prepare a fertigation solution at the correct EC and pH • Record all steps and measured	Soil auger, Soil analysis report, Nutrient chemicals, EC meter, pH meter, Drip system components, Measuring tape, Field notebooks, Sprinklers, tubes, Digital weather stations, Automated

	irrigation scheduling 3.4 Explain drip irrigation design and installation for commercial fruit and vegetable farms 3.5 Describe monitoring and evaluation of nutrient and irrigation management outcomes	• Explain monitoring and evaluation of nutrient and irrigation management outcomes	design guide, monitoring form.	• Design a drip irrigation layout for a 0.5 ha vegetable farm • Sketch layout and specify pipe sizes • Install a drip system on a college farm plot • Record installation steps and operating pressure • Monitor EC and pH of fertigation solution daily for one week; • Record readings and adjustments made	values • Design a drip irrigation layout for a 0.5 ha vegetable farm • Sketch layout and specify pipe sizes • Install a drip system on a college farm plot • Record installation steps and operating pressure • Monitor EC and pH of fertigation solution daily for one week • Record readings and adjustments made	irrigation systems, Planimeter.
GENERAL OBJECTIVE 4.0: Understand integrated pest and disease management in commercial production of fruits and vegetables						
6 – 8	4.1 Describe pest and disease identification	• Explain pest and disease identification using diagnostic keys and online	Laptop Computers, smart board	• Use a diagnostic key to	Guide students to: • Use a	Diagnostic keys, Pest

	using diagnostic keys and online tools 4.2 Describe (Integrated Pests Management) IPM programme design for commercial tomato, pepper and mango production 4.3 Describe biological control options available for commercial horticultural production in Nigeria 4.4 Describe resistance management: Insecticide Resistance Action Committee (IRAC) classification and	tools • Explain (Integrated Pests Management) IPM programme design for commercial tomato, pepper and mango production • Explain biological control options available for commercial horticultural production in Nigeria • Explain resistance management: Insecticide Resistance Action Committee (IRAC) classification and pesticide rotation principles • Explain pesticide safety, environmental protection and food safety compliance in commercial production	Projector Writing Materials White board Markers Internet Diagnostic keys, online diagnostic tool, IPM programme examples, IRAC chart, MRL reference table, PPE set, projector.	identify three pest or disease specimens • Record identification steps and result • Design an IPM programme for one commercial crop on the college farm - Specify all control components and thresholds • Apply a biopesticide to a pest-affected crop • Record product, rate, date and pest count before and after • Classify five pesticides	diagnostic key to identify three pest or disease specimens • Record identification steps and result • Design an IPM programme for one commercial crop on the college farm - Specify all control components and thresholds • Apply a biopesticide to a pest-affected crop • Record product, rate, date and pest count before and after	specimens, Biopesticide, IRAC chart, Pesticide application Record form, MRL table, Field notebooks, PPE, Sweep nets, Trap nets, Insect box, Insect album, Rodents trap etc.
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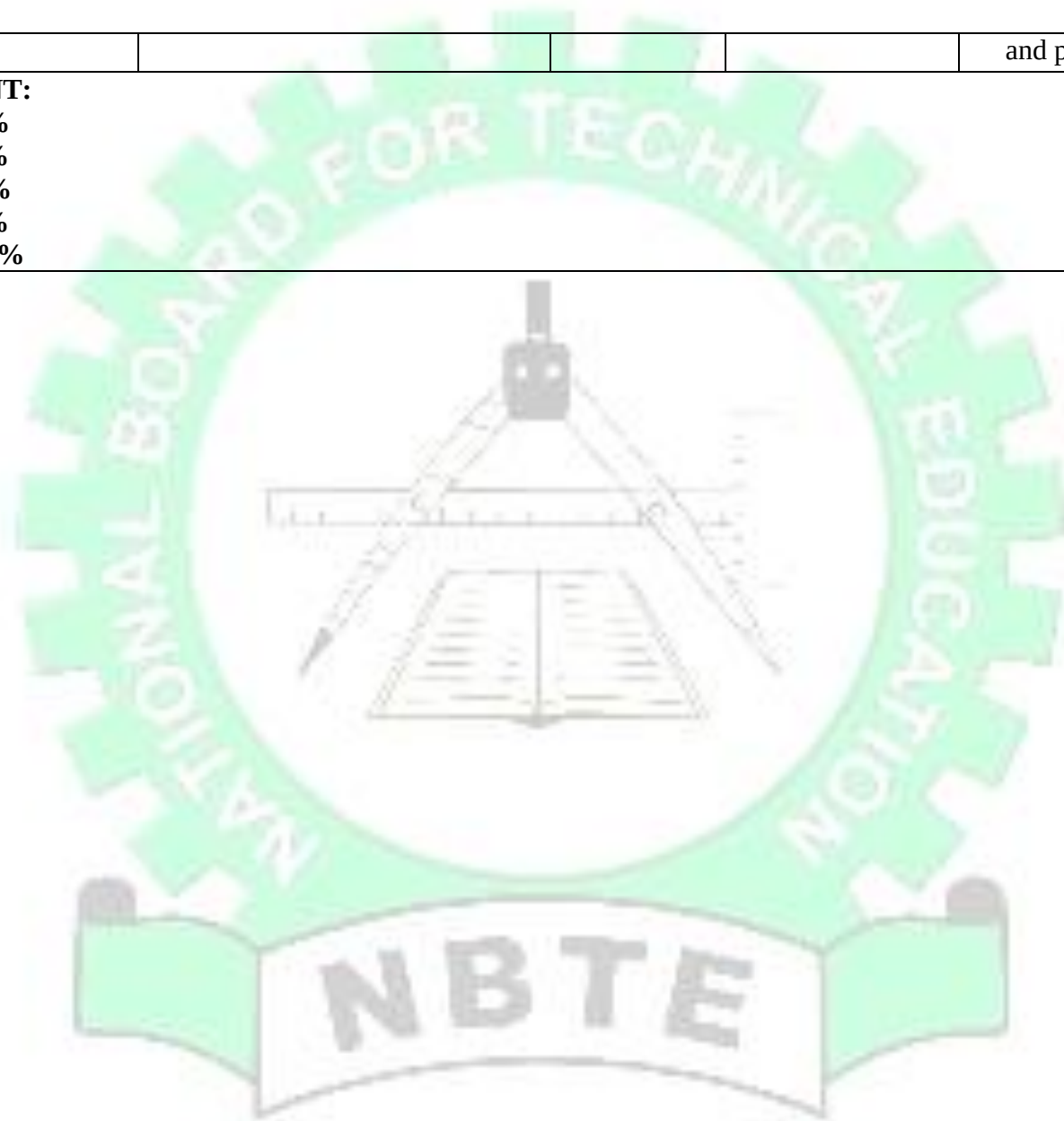
	pesticide rotation principles 4.5 Describe pesticide safety, environmental protection and food safety compliance in commercial production			used on the farm by IRAC mode of action group • Design a rotation sequence Complete a pesticide application record and MRL compliance check for one spray application	• Classify five pesticides used on the farm by IRAC mode of action group • Design a rotation sequence Complete a pesticide application record and MRL compliance check for one spray application	
GENERAL OBJECTIVE 5.0: Know the quality management and post-harvest handling for market and export for fruits and vegetables						
7 – 10	5.1 Discuss export quality standards and requirements for fresh vegetables and fruit for international markets. 5.2 Describe grading, packaging and labelling	• Explain export quality standards and requirements for fresh vegetables and fruit for international markets. • Explain grading, packaging and labelling requirements for export horticultural produce • Explain Good Agricultural Practices	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Export specification	• Grade a batch of vegetables to international export specifications • Pack a batch of vegetables	Guide students to: • Grade a batch of vegetables to international export specifications • Pack a	International export specification, Packaging materials, Export labels, GAP checklist, QR code generator, Cold chain Record form,

	requirements for export horticultural produce 5.3 Outline Good Agricultural Practices applicable to commercial fruit and vegetable farms 5.4 Explain traceability systems for fresh produce: lot numbering, QR codes and documentation 5.5 Describe cold chain requirements from farm to export market	applicable to commercial fruit and vegetable farms • Explain traceability systems for fresh produce: lot numbering, QR codes and documentation • Explain cold chain requirements from farm to export market	sheets, export-packed samples, GAP checklist, QR code generator, cold chain diagram, projector.	to international export specifications • Prepare a complete export label for one produce • record all required label elements Complete a GAP field audit checklist for the college farm • Identify non-compliant points and recommend corrections • Generate a QR code for one produce lot • link to a	batch of vegetables to international export specifications • Prepare a complete export label for one produce • record all required label elements Complete a GAP field audit checklist for the college farm • Identify non-compliant points and recommend corrections • Generate a QR code for one	Field Notebooks.
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				traceability record and verify by scanning • Prepare a cold chain management record for one consignment from harvest to dispatch	produce lot • link to a traceability record and verify by scanning • Prepare a cold chain management record for one consignment from harvest to dispatch	
GENERAL OBJECTIVE 6.0: Understand enterprise planning for commercial fruit and vegetable production						
11– 15	6.1 Explain enterprise budgeting for a commercial fruit or vegetable farm per hectare 6.2 Explain production planning: crop calendar, input procurement and labour scheduling 6.3 Explain risk	• Explain enterprise budgeting for a commercial fruit or vegetable farm per hectare • Explain production planning: crop calendar, input procurement and labour scheduling • Explain risk management in commercial horticultural production • Explain access to export markets for Nigerian fruit and vegetable produce	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Enterprise budget template, crop calendar, risk	• Prepare a one-hectare enterprise budget for one commercial crop Record all costs, yield and gross margin • Prepare a production plan for the college farm for one semester	Guide students to: • Prepare a one-hectare enterprise budget for one commercial crop Record all costs, yield and gross margin • Prepare a production plan for the college farm for one	Enterprise budget template, Production plan template, Risk management template, Export requirements guide, Smartphone, Field notebooks.

	management in commercial horticultural production 6.4 Describe access to export markets for Nigerian fruit and vegetable produce 6.5 Describe the use of digital tools and platforms to manage and market commercial horticultural produce	• Explain the use of digital tools and platforms to manage and market commercial horticultural produce	management guide, export access guide, digital tool examples, projector, computer systems.	• Specify crops, calendar, inputs and labour • Develop a risk management plan • Identify three risks and one mitigation strategy for each Research on export requirements for one Nigerian horticultural crop • Record destination, standards and certification • Create a digital product listing for one college farm crop • Include photograph, description and price	semester • Specify crops, calendar, inputs and labour • Develop a risk management plan • Identify three risks and one mitigation strategy for each Research on export requirements for one Nigerian horticultural crop • Record destination, standards and certification • Create a digital product listing for one college farm crop • Include photograph, description	
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					and price	
COURSE ASSESSMENT:						
Course work:	10%					
Test/Assignments:	10%					
Practical:	40%					
Examination:	40%					
Total:	100%					



HOT 312: NURSERY AND PROPAGATION TECHNOLOGIES

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: NURSERY AND PROPAGATION TECHNOLOGIES	COURSE CODE: HOT 312	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in commercial nursery management and modern propagation technologies.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Know commercial nursery enterprise planning and management 2.0 Understand vegetative propagation techniques in horticultural plants. 3.0 Understand budding and grafting for commercial production 4.0 Know tissue culture and micro-propagation principles 5.0 Know nursery growing systems and substrate management 6.0 Understand quality assurance and certification in nursery production		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: NURSERY AND PROPAGATION TECHNOLOGIES			COURSE CODE: HOT 312	CONTACT HOURS: 4 HOURS/WEEK		
			CREDIT UNITS: 4	THEORETICAL: 1 HOUR/WEEK		
YEAR: I SEMESTER: I			PRE-REQUISITE: Nil	PRACTICAL: 3 HOURS/WEEK		
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills in commercial nursery management and modern propagation technologies.						
GENERAL OBJECTIVE 1.0: Know commercial nursery enterprise planning and management of horticultural plants						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1 – 2	1.1 Explain the design and layout of a commercial nursery 1.2 Explain the following: i. Commercial nursery production, ii. Plant scheduling iii. Capacity planning iv. Record systems 1.3 Explain management practices in a commercial nursery: grading, labelling and inspection standards 1.4 Explain marketing	- Explain the design and layout of a commercial nursery such as: i. Production zones, ii. Irrigation, iii. Shade iv. Access - Explain commercial nursery production, plant scheduling, capacity planning and record systems - Explain management practices in a commercial nursery: grading, labelling and inspection standards - Explain marketing	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Commercial nursery plan diagram, production schedule template, quality inspection checklist, marketing	- Prepare a layout plan for a 0.25 ha commercial nursery - Sketch zones, structures and irrigation to scale - Prepare a production schedule for one month in the college nursery - Record crops, quantities and target dates - Conduct a	Guide students to: - Prepare a layout plan for a 0.25 ha commercial nursery - Sketch zones, structures and irrigation to scale - Prepare a production schedule for one month in the college nursery - Record crops, quantities and	Layout plan template, Production schedule Template, quality inspection checklist, Pricing worksheet, Business plan template, Field notebooks.

	channels and pricing strategies for a commercial nursery enterprise 1.5 Describe preparation of commercial nursery, business plan and access financing	channels and pricing strategies for a commercial nursery enterprise Describe preparation of commercial nursery, business plan and access financing	guide, business plan template, projector.	quality inspection of the college nursery - Record varieties, grade, labelling status and any defects - Prepare a pricing structure for five nursery products - Record cost of production, margin and selling price - Prepare a one-page business plan summary for a small commercial nursery	target dates - Conduct a quality inspection of the college nursery - Record varieties, grade, labelling status and any defects - Prepare a pricing structure for five nursery products - Record cost of production, margin and selling price - Prepare a one-page business plan summary for a small commercial nursery	
GENERAL OBJECTIVE 2.0: Understand vegetative propagation techniques in horticultural plants.						
2– 4	1.6 Explain cutting propagation such as:	Explain cutting propagation such as:	Laptop Computers,	Prepare single node cuttings	Guide students to: Prepare single	Budding knife,

	i. Single node cuttings, ii. Leaf-bud cuttings iii. Mist propagation systems etc. 1.7 Explain the various layering techniques for commercial production. 1.8 Explain division and separation for commercial production such as: i. Mechanical separation ii. Post-division management 1.9 Describe rooting environment management such as: i. Humidity tents ii. Mist systems iii. Bottom heat 1.10 Explain rooting evaluation using percentage take and time to rooting	i. Single node cuttings, ii. Leaf-bud cuttings iii. Mist propagation systems etc. • Explain the various layering techniques for commercial production. • Explain division and separation for commercial production such as: i. Mechanical separation ii. Post-division management • Describe rooting environment management such as: i. Humidity tents ii. Mist systems iii. Bottom heat • Explain rooting evaluation using percentage take and time to rooting	smart board Projector Writing Materials White board Markers Internet Cutting guide, stool Trench layering diagrams, Mechanical separation tools, Humidity tent materials, Rooting evaluation Form, projector.	of one ornamental species • Record number prepared • check rooting at 14 days • Carry out stool layering on one shrub species on the college farm • Record date, technique • Check rooting at 21 days • Carry out division of ten clump-forming ornamentals • Record time taken, number of divisions and survival at 7 days • Set up a humidity tent propagation system for fifty cuttings • Record	node cuttings of one ornamental species • Record number prepared • check rooting at 14 days • Carry out stool layering on one shrub species on the college farm • Record date, technique • Check rooting at 21 days • Carry out division of ten clump-forming ornamentals • Record time taken, number of divisions and survival at 7 days • Set up a humidity tent propagation	garden saw, pruning shears, rooting medium, rooting hormone, humidity tent materials, thermometer, hygrometer, rooting success form, field notebooks
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				temperature and humidity daily for 7 days • Calculate rooting percentage for each propagation method practiced • Compare methods • State which gave the best result	system for fifty cuttings • Record temperature and humidity daily for 7 days • Calculate rooting percentage for each propagation method practiced • Compare methods • State which gave the best result	
GENERAL OBJECTIVE 3.0: Understand budding and grafting of horticultural plants for commercial production						
5– 6	3.1 Explain commercial budding operations such as: - T-budding, - Patch budding - Chip budding at production scale 3.2 Explain commercial grafting operations such as: - Cleft	• Explain commercial budding operations such as: - T-budding, - Patch budding - Chip budding at production scale • Explain commercial grafting operations such as: - Cleft	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Budding and grafting tools	• Carry out commercial-scale T-budding on fifteen citrus rootstocks • Record date, scion variety and union condition at 10 days	Guide students to: • Carry out commercial-scale T-budding on fifteen citrus rootstocks • Record date, scion variety and union condition at	Budding and grafting tools and materials; budding tape, budding knife, grafting tape,

	ii. Tongue iii. Whip-and-tongue iv. Approach grafting 3.3 Explain rootstock selection and management for commercial fruit tree production 3.4 Explain quality standards for certified budded and grafted planting material 3.5 Describe sprouting rates in commercial budding and grafting operations	ii. Tongue iii. Whip-and-tongue iv. Approach grafting • Explain rootstock selection and management for commercial fruit tree production • Explain quality standards for certified budded and grafted planting material • Explain sprouting rates in commercial budding and grafting operations	and materials; budding tape, budding knife, citrus and mango rootstocks, desired scion wood, quality standard checklist, take rate calculation guide, projector.	• Carry out tongue grafting on ten mango rootstocks • Record date, scion length and union condition at 14 days • Grade twenty budded seedlings against quality standard criteria • Record success, failure and reason for each • Calculate sprouting rate for all budding and grafting operations performed • Record method, numbers and percentage	10 days • Carry out tongue grafting on ten mango rootstocks • Record date, scion length and union condition at 14 days • Grade twenty budded seedlings against quality standard criteria • Record success, failure and reason for each • Calculate sprouting rate for all budding and grafting operations performed • Record	rootstocks, scion wood, quality standard checklist, production record form, field notebooks.
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				• Collate a commercial propagation production • Record for one week covering all varieties, methods and quantities	method, numbers and percentage • Collate a commercial propagation production • Record for one week covering all varieties, methods and quantities	
GENERAL OBJECTIVE 4.0: Understand tissue culture and micro-propagation principles of horticultural plants.						
6- 9	4.1 Explain the principles of plant tissue culture such as: - Totipotency, - Explant selection - Sterile technique 4.2 Explain the stages of micro-propagation such as: - Initiation - Multiplication, - Rooting - Acclimatization 4.3 Explain the preparation of	• Explain the principles of plant tissue culture such as: - Totipotency, - Explant selection - Sterile technique • Explain the stages of micro-propagation such as: - Initiation - Multiplication, - Rooting - Acclimatization • Explain the preparation of tissue culture media such as:	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Tissue culture principles diagram, micropropagation stage photographs, MS medium	• Prepare MS medium from stock solutions • Record all components, concentrations and sterilization steps • Carryout aseptic transfer technique by	• Prepare MS medium from stock solutions • Record all components, concentrations and sterilization steps • Carryout aseptic transfer technique by	MS medium chemicals , laminar flow cabinet, autoclave, sterilants, TC plantlets, humidity tent, test tubes, conical flask, cotton wool,

	tissue culture media such as: - Murashige and Skoog (MS) medium, - Growth regulators - Sterilization 4.4 Explain commercial applications of tissue culture in Nigeria on banana, onions, tomato and ornamental plants. 4.5 Explain the acclimatization of tissue culture plantlets and their management in the nursery	- Murashige and Skoog (MS) medium, - Growth regulators - Sterilization - Explain commercial applications of tissue culture in Nigeria on banana, onions, tomato and ornamental plants. - Explain the acclimatization of tissue culture plantlets and their management in the nursery	recipe, autoclave guide, acclimatization guide, projector.	transferring agar blocks between containers using a laminar flow cabinet - Carryout surface sterilization of one plant explant type, sterilant, concentration, duration and contamination result - Acclimatize ten tissue culture plantlets in the college nursery - Record humidity reduction	transferring agar blocks between containers using a laminar flow cabinet - Carryout surface sterilization of one plant explant type, sterilant, concentration, duration and contamination result - Acclimatize ten tissue culture plantlets in the college nursery - Record	production record form, field notebooks .
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				schedule, date and survival at 14 days • Prepare a tissue culture production record for one species • Record explant, medium, growth regulators and stage reached	humidity reduction schedule, date and survival at 14 days • Prepare a tissue culture production record for one species • Record explant, medium, growth regulators and stage reached	
GENERAL OBJECTIVE 5.0: Know nursery growing systems and substrate management						
10– 11	5.1 Explain container nursery systems such as: - Open ground - Container - Raised bench production 5.2 Explain substrate formulation for commercial nursery production	• Explain container nursery systems such as: - Open ground - Container - Raised bench production • Explain substrate formulation for commercial nursery	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Production	• Prepare three substrates for commercial nursery production • Record components, ratios	Guide students to: • Prepare three substrates for commercial nursery production • Record	Substrate components, transparent polythene, thermometer, fertigation injector,

	5.3 Explain substrate sterilization methods and their commercial application 5.4 Explain fertigation systems for container nursery production 5.5 Explain substrate and nutrition problem diagnosis with photographs	production • Explain substrate sterilization methods and their commercial application • Explain fertigation systems for container nursery production • Explain substrate and nutrition problem diagnosis with photographs	system photographs, substrate formulation guide, sterilization guide, fertigation system diagram, problem diagnosis photographs, projector.	and target properties • Carry out substrate sterilization by solarization • Record temperature daily for 5 days and final microbial status • Set up a fertigation system, record components, Exchangeable Cations (EC) and Potential of Hydrogen (Ph) settings • Diagnose	components, ratios and target properties • Carry out substrate sterilization by solarization • Record temperature daily for 5 days and final microbial status • Set up a fertigation system, record components, Exchangeable Cations (EC) and Potential of Hydrogen (Ph) settings	EC meter, Ph meter, substrate management record form, field notebooks .
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				one substrate or nutrition problem in the college nursery - Record symptom, probable cause and corrective action - Prepare a substrate management record for the college nursery for one month - Record all inputs and changes	- Diagnose one substrate or nutrition problem in the college nursery - Record symptom, probable cause and corrective action - Prepare a substrate management record for the college nursery for one month - Record all inputs and changes	
GENERAL OBJECTIVE 6.0: Understand quality assurance and certification in nursery production						
12 – 15	4.6 Discuss quality assurance systems for nursery production	Explain quality assurance systems for nursery production	Laptop Computers, smart board	Complete a quality inspection	Guide students to: Complete a quality	Quality inspection form,

	such as: - Inspections - Grading - labelling 4.7 Explain plant health certification requirements for nursery stock in Nigeria 4.8 Explain traceability systems in nursery production, mother block records and batch tracking 4.9 Discuss nursery certification inspection 4.10 Explain the market advantages of producing certified nursery stock	such as: - Inspections - Grading - labelling - Explain plant health certification requirements for nursery stock in Nigeria - Explain traceability systems in nursery production, mother block records and batch tracking - Explain nursery certification inspection - Explain the market advantages of producing certified nursery stock	Projector Writing Materials White board Markers Internet Quality assurance guide, plant health certification guide, mother block record template, inspection preparation checklist, market price premium data, projector.	of twenty nursery plants - Record species, grade, health status and labelling for each - Prepare a mother block record for one species in the college nursery - Record all required fields - Prepare a traceability record linking propagation batch to current stock for one species	inspection of twenty nursery plants - Record species, grade, health status and labelling for each - Prepare a mother block record for one species in the college nursery - Record all required fields - Prepare a traceability record linking propagation batch to current stock for	mother block record template, traceability record template, pre-inspection checklist, QA manual template, field notebooks .
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				• Complete a pre-inspection checklist for the college nursery • Identify gaps and recommend corrective actions • Prepare a quality assurance manual for the college nursery • Record forms	one species • Complete a pre-inspection checklist for the college nursery • Identify gaps and recommend corrective actions • Prepare a quality assurance manual for the college nursery • Record forms	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 313: APICULTURE IN HORTICULTURAL PRODUCTION SYSTEMS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: APICULTURE IN HORTICULTURAL PRODUCTION SYSTEMS	COURSE CODE: HOT 313	CONTACT HOURS: 3HOURS/WEEK
	CREDIT UNITS: 3	THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 2HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills required for sustainable beekeeping in horticultural production systems.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the ecology, biology, and behavior of honey bees. 2.0 Understand the relationship between honey bees and horticultural crops. 3.0 Understand the types and management of bee hives and equipment. 4.0 Understand the handling and management of honey bee colonies. 5.0 Understand the processing and utilization of honey and beeswax 6.0 Understand the economics and marketing of beekeeping enterprises.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: APICULTURE IN HORTICULTURAL PRODUCTION SYSTEMS			COURSE CODE: HOT 313		CONTACT HOURS: 3HOURS/WEEK	
YEAR: I SEMESTER: I			CREDIT UNITS: 3		THEORETICAL: 1HOUR/WEEK	
			PRE-REQUISITE: Nil		PRACTICAL: 2HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and skills required for sustainable beekeeping in horticultural production systems.						
GENERAL OBJECTIVE 1.0: Understand the ecology, biology, and behavior of honey bees.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-2	1.1 Describe the ecological importance of honey bees. 1.2 State the species and races of honey bees used in beekeeping. 1.3 Explain the anatomy and physiology of honey bees. 1.4 Differentiate between the queen, worker, and drone bees. 1.5 Explain the life cycle of honey	- Explain the ecological importance of honey bees. - Explain the species and races of honey bees used in beekeeping. - Explain the anatomy and physiology of honey bees. - Differentiate between the queen, worker, and drone bees. - Explain the life	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Honey bee charts Insect anatomy models Multimedia presentations Reference textbooks Videos on bee	- Identify the queen, worker, and drone bees in a colony. - Examine the external parts of honey bee specimens. - Label the external parts of honey bee specimens. - Observe honey bee activities around a hive - Record honey bee activities around a hive.	Guide students to: - Identify the queen, worker, and drone bees in a colony. - Examine the external parts of honey bee specimens. - Label the external parts of honey bee specimens. - Observe honey bee activities around a hive	Preserved bee specimens Hand lenses Observation sheets Protective clothing Apiary

	bees. 1.6 Describe the behavior and communication systems of honey bees.	cycle of honey bees. • Explain the behavior and communication systems of honey bees.	behavior	• Monitor behavioral patterns of honey bees • Report behavioral patterns of honey bees.	• Record honey bee activities around a hive. • Monitor behavioral patterns of honey bees • Report behavioral patterns of honey bees.	
GENERAL OBJECTIVE 2.0: Understand the relationship between honey bees and horticultural crops.						
3-4	2.1 Explain pollination and fertilization in horticultural crops. 2.2 Explain major bee forage plants and flowering crops. 2.3 Describe the role of honey bees in crop pollination. 2.4 Explain factors affecting bee visitation to flowers.	• Explain pollination and fertilization in horticultural crops. • Explain major bee forage plants and flowering crops. • Describe the role of honey bees in crop pollination. • Explain factors affecting bee visitation to flowers. • Explain the effect of pollination on crop yield and quality.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Pollination charts Crop specimens Multimedia resources Pollination case studies	• Identify bee forage plants in horticultural production systems. • Examine the floral structures of horticultural crops. • Conduct pollinator counts on flowering crops. • Assess honey bee visitation on selected horticultural crops. • Record pollination observations.	Guide students to: • Identify bee forage plants in horticultural production systems. • Examine the floral structures of horticultural crops. • Conduct pollinator counts on flowering crops. • Assess honey bee visitation on selected	Flowering horticultural crops Field guides Hand lenses Data collection sheets Apiary

	2.5 Explain the effect of pollination on crop yield and quality.			Report pollination observations.	horticultural crops. - Record pollination observations. - Report pollination observations.	
GENERAL OBJECTIVE 3.0: Understand the types and management of bee hives and equipment.						
5-6	3.1 List common types of bee hives. 3.2 Describe the components of bee hives. 3.3 Explain the functions of beekeeping equipment. 3.4 Explain suitable sites for apiary establishment. 3.5 Explain hive installation and maintenance procedures	- Explain common types of bee hives. - Explain the components of bee hives. - Explain the functions of beekeeping equipment. - Explain suitable sites for apiary establishment. - Explain hive installation and maintenance procedures	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Hive diagrams Equipment catalogues Videos Models of hive components	- Identify common bee hives and beekeeping equipment. - Assemble a standard bee hive. - Operate beekeeping tools and equipment safely. - Select a suitable site for apiary establishment. - Install a bee hive in an apiary.	Guide students to: - Identify common bee hives and beekeeping equipment. - Assemble a standard bee hive. - Operate beekeeping tools and equipment safely. - Select a suitable site for apiary establishment - Install a bee hive in an apiary.	Kenyan Top Bar Hive Langstroth Hive Traditional Hive Hive tools Smokers Protective suits Apiary site
GENERAL OBJECTIVE 4.0: Understand the handling and management of honey bee colonies.						

7-8	4.1 Describe safe handling of honey bees. 4.2 Explain colony establishment techniques. 4.3 Explain colony strength and health. 4.4 Explain common bee pests, diseases, and predators. 4.5 Explain colony management practices. 4.6 Explain colony management records.	• Explain safe handling of honey bees. • Explain colony establishment techniques. • Explain colony strength and health. • Explain common bee pests, diseases, and predators. • Explain colony management practices. • Explain colony management records.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Colony management manuals Pest and disease charts Videos Record templates	• Use protective clothing correctly. • Conduct hive inspection using recommended procedures. • Transfer or bait honey bee colonies into hives. • Identify common pests and diseases affecting honey bee colonies. • Assess colony health and strength. • Prepare colony management records.	Guide students to: • Use protective clothing correctly. • Conduct hive inspection using recommended procedures. • Transfer or bait honey bee colonies into hives. • Identify common pests and diseases affecting honey bee colonies. • Assess colony health and strength. • Prepare colony management records.	Active bee colonies Protective clothing Hive tools Smoker Inspection record sheets
GENERAL OBJECTIVE 5.0: Understand the processing and utilization of honey and beeswax						
9-11	5.1 Explain mature honey combs for	• Describe mature honey combs for	Laptop Computers,	• Identify mature honey combs for	Guide students to: • Identify mature	Honey extractor Uncapping knife

	harvesting. 5.2 Explain honey harvesting procedures. 5.3 Explain honey extraction and processing techniques. 5.4 Describe beeswax extraction and processing. 5.5 Explain the quality of honey and beeswax products. 5.6 Explain the uses of honey and beeswax.	harvesting. • Discuss honey harvesting procedures. • Describe honey extraction and processing techniques. • Explain beeswax extraction and processing. • Describe the quality of honey and beeswax products. • Discuss the uses of honey and beeswax.	smart board Projector Writing Materials White board Markers Internet Honey quality standards Packaging samples Processing manuals Videos	harvesting. • Harvest honey using recommended procedures. • Extract and filter honey. • Process beeswax into marketable products. • Package and label honey and beeswax products. • Assess the quality of honey and beeswax products.	honey combs for harvesting. • Harvest honey using recommended procedures. • Extract and filter honey. • Process beeswax into marketable products. • Package and label honey and beeswax products. • Assess the quality of honey and beeswax products.	Honey sieve, Wax melting equipment Packaging materials Refractometer.
GENERAL OBJECTIVE 6.0: Understand the economics and marketing of beekeeping enterprises.						
12-15	6.1 Explain costs and returns in beekeeping enterprises. 6.2 Explain the preparation of enterprise budgets for beekeeping operations. 6.3 Determine market	• Discuss costs and returns in beekeeping enterprises. • Discuss the preparation of enterprise budgets for beekeeping operations. • Determine market opportunities for bee products.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Enterprise budget templates	• Prepare a beekeeping enterprise budget. • Conduct a market survey for bee products. • Grade bee products for sale. • Package bee products for sale. • Label bee products for sale	Guide students to: • Prepare a beekeeping enterprise budget. • Conduct a market survey for bee products. • Grade bee products for sale. • Package bee	Calculator/computer Market survey instruments Budget worksheets Business plan templates Honey and beeswax samples

	opportunities for bee products. 6.4 Explain value addition in honey and beeswax production.	Discuss value addition in honey and beeswax production.	Market reports Business plan formats Financial records	- Prepare a business plan for a beekeeping enterprise. - Evaluate the costs and returns of a beekeeping enterprise.	products for sale. - Label bee products for sale - Prepare a business plan for a beekeeping enterprise. Evaluate the costs and returns of a beekeeping enterprise.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 314: HORTICULTURAL CROP PHYSIOLOGY AND PRODUCTIVITY

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: HORTICULTURAL CROP PHYSIOLOGY AND PRODUCTIVITY	COURSE CODE: HOT 314	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills of the physiological processes governing growth, productivity and quality in commercial horticultural crops.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand plant growth and development physiology 2.0 Understand photosynthesis, respiration and dry matter production 3.0 Understand water relations and stomatal physiology 4.0 Understand hormones as related to horticultural plants and their applications 5.0 Understand flowering, fruiting and ripening physiology in horticultural crops 6.0 Understand physiological knowledge to improve horticultural production		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: HORTICULTURAL CROP PHYSIOLOGY AND PRODUCTIVITY				COURSE CODE: HOT 314		CONTACT HOURS: 4 HOURS/WEEK
				CREDIT UNITS: 4		THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I				PRE-REQUISITE: Nil		PRACTICAL: 3 HOURS/WEEK
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of the physiological processes governing growth, productivity and quality in commercial horticultural crops.						
GENERAL OBJECTIVE 1.0: Understand plant growth and development physiology						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1– 2	1.1 Describe the growth analysis parameters used to measure crop productivity.	- Describe the growth analysis parameters used to measure crop productivity: i. Leaf Area Index (LAI), Net Assimilation Rate (NAR), ii. Crop Growth Rate (CGR) iii. Relative Growth Rate (RGR) - Explain the source-sink relationship and	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Growth analysis calculation guide, source-sink diagram, phenological stage charts, projector Computer	- Measure LA of one crop on the college farm using the planimeter to determine LA; - Record all measurements and - Calculate LAI - Measure plant height, leaf count and fruit count of five tagged plants weekly for four weeks; - Calculate CGR - Record daily maximum and minimum	Guide students to: - Measure LA of one crop on the college farm using the planimeter to determine LA; - Record all measurements and - Calculate LAI - Measure plant height, leaf count and fruit count of five tagged plants weekly for four weeks;	Planimeter, ruler, weighing scale, temperature recording form, phenological stage chart, growth analysis report template, field notebooks, weighing scale, oven.
	1.2 Explain the source-sink relationship and its role in assimilate partitioning in fruit crops					
	1.3 Describe how temperature, photoperiod and vernalisation regulate crop development					

	1.4 Explain the concept of phenological stages and their use in crop management decisions 1.5 Describe how growth analysis data is used to optimize commercial horticultural production	its role in assimilate partitioning in fruit crops - Describe how temperature, photoperiod and vernalisation regulate crop development - Explain the concept of phenological stages and their use in crop management decisions - Describe how growth analysis data is used to optimize commercial horticultural production	system.	temperature for two weeks; - Calculate heat units accumulated - Identify the phenological stage of five horticultural crops on the college farm and - Record observations - Prepare a growth analysis report for one crop - Record all parameters and - State one management recommendation	- Calculate CGR - Record daily maximum and minimum temperature for two weeks; - Calculate heat units accumulated - Identify the phenological stage of five horticultural crops on the college farm and - Record observations - Prepare a growth analysis report for one crop - Record all parameters and - State one management recommendation	
GENERAL OBJECTIVE 2.0: Understand photosynthesis, respiration and dry matter production						
3-5	2.1 Describe the light response curve of photosynthesis 2.2 Explain its	- Explain the light response curve of photosynthesis - Explain its implications for	Laptop Computers, smart board Projector Writing	- Measure light intensity at five canopy positions in one crop - Record readings	Guide students to: Measure light intensity at five canopy positions in one crop	Lux meter, CO ₂ meter, tomato samples, weighing scale, drying oven or

	implications for canopy management 2.3 Explain effects of CO₂ concentration photosynthetic rate in greenhouse crops 2.4 Describe the relationship between photosynthesis, dry matter accumulation and economic yield 2.5 Explain the role of respiration in post-harvest quality loss and how temperature affects it 2.6 Describe management of canopy light interception to maximise photosynthesis in commercial crops	canopy management • Explain effects of CO₂ concentration photosynthetic rate in greenhouse crops • Explain the relationship between photosynthesis, dry matter accumulation and economic yield • Explain the role of respiration in post-harvest quality loss and how temperature affects it • Explain management of canopy light interception to maximise photosynthesis in commercial crops	Materials White board Markers Internet Light response curve diagram, CO₂ enrichment data, dry matter model, Q10 diagram, canopy management guide, projector.	and identify shaded zones • Set up a CO₂ monitoring experiment in the college greenhouse • Record CO₂ levels at different times of day • Measure daily weight loss of harvested tomato at two temperatures over 5 days • Calculate respiration rate at each • Compare dry matter content of fruits at three maturity stages • Record fresh and dry weight for each stage • Prepare a canopy management plan for one commercial crop • Carryout pruning and training to improve light interception	• Record readings and identify shaded zones • Set up a CO₂ monitoring experiment in the college greenhouse • Record CO₂ levels at different times of day • Measure daily weight loss of harvested tomato at two temperatures over 5 days • Calculate respiration rate at each • Compare dry matter content of fruits at three maturity stages • Record fresh and dry weight for each stage • Prepare a canopy management plan for one commercial crop • Carryout pruning	sun drying area, canopy management plan template, field notebooks.
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					and training to improve light interception	
GENERAL OBJECTIVE 3.0: Understand water relations and stomatal physiology						
6-8	3.1 Describe the Soil-Plant-Atmosphere Continuum (SPAC) 3.2 Explain stomatal regulation 3.3 Explain deficit irrigation strategies 3.4 Explain the effect of water deficit on yield and quality of commercial horticultural crops 3.5 Explain measurement of crop water status using pressure pump and Leaf Water Potential (LWP)	• Explain the Soil-Plant-Atmosphere Continuum (SPAC) and how water moves from soil to atmosphere • Explain stomatal regulation: how Absciscic Acid (ABA), light and CO₂ control stomatal aperture • Explain deficit irrigation strategies regulated deficit irrigation and partial rootzone drying • Explain the effect of water deficit on yield and quality of commercial horticultural crops • Explain measurement of crop water status	Laptop Computers, smart board Projector Writing Materials White board Markers Internet SPAC diagram, stomatal regulation diagram, deficit irrigation guide, water deficit yield data, pressure bomb diagram, projector.	• Observe stomatal closure response of a potted plant subjected to water stress over 3 days • Record stomatal closure response of a potted plant subjected to water stress over 3 days • Set up a regulated deficit irrigation experiment on two plots • Record irrigation volumes and plant response • Measure soil moisture at 15 and 30 cm depth on three college farm plots • Record readings and irrigation decisions • Compare fruit quality of deficit-	Guide students to: • Observe stomatal closure response of a potted plant subjected to water stress over 3 days • Record stomatal closure response of a potted plant subjected to water stress over 3 days • Set up a regulated deficit irrigation experiment on two plots • Record irrigation volumes and plant response • Measure soil moisture at 15 and 30 cm depth on three college	Potted plants, soil moisture meter, deficit irrigation guide, refractometer, firmness tester, schedule template, field notebooks.

		using pressure pump and Leaf Water Potential (LWP)		irrigated and fully-irrigated crops - Record size, soluble solids and firmness - Prepare a deficit irrigation schedule for one commercial crop - Record stages, soil moisture targets and expected water savings	farm plots - Record readings and irrigation decisions - Compare fruit quality of deficit-irrigated and fully-irrigated crops - Record size, soluble solids and firmness - Prepare a deficit irrigation schedule for one commercial crop - Record stages, soil moisture targets and expected water savings	
GENERAL OBJECTIVE 4.0: Understand hormones as related to horticultural plants and their applications						
9-11	4.1 Explain the role of auxins in rooting, fruit set and apical dominance management 4.2 Explain the use of gibberellins in fruit enlargement,	- Explain the role of auxins in rooting, fruit set and apical dominance management - Explain the use of gibberellins in fruit enlargement,	Laptop Computers, smart board Projector Writing Materials White board Markers	- Apply auxin at three concentrations to cuttings - Compare rooting percentage at 14 days for each treatment	Guide students to: - Apply auxin at three concentrations to cuttings - Compare rooting percentage at 14 days for each	Rooting hormone at three concentrations, gibberellin solution, ripe apple and banana, cytokinin

	seedlessness and flowering 4.3 Explain the role of ethylene in post-harvest storage ethylene scrubbers and 1-Methylcyclopropane (1-MCP) 4.4 Explain cytokinin applications in tissue culture and shelf-life extension 4.5 Explain the regulation of growth regulators in Nigerian horticulture: approved products and safety	seedlessness and flowering • Explain the role of ethylene in post-harvest storage ethylene scrubbers and 1-Methylcyclopropane (1-MCP) • Explain cytokinin applications in tissue culture and shelf-life extension • Explain the regulation of growth regulators in Nigerian horticulture: approved products and safety	Internet Plant hormone application guide, growth regulator product labels, 1-MCP information, cytokinin application guide, Nigerian regulatory guide, projector, Computer system.	• Apply gibberellin to developing fruit on one plant • Compare fruit size with untreated fruit at 14 days • Expose ripe banana to ethylene from a ripe apply • Compare ripening rate with control; record colour change daily • Set up a cytokinin shelf-life experiment on harvested leafy vegetable, record colour and freshness at 3 and 5 days • Prepare a growth regulator use record for one application • Record product, rate, crop, date and safety precautions	treatment • Apply gibberellin to developing fruit on one plant • Compare fruit size with untreated fruit at 14 days • Expose ripe banana to ethylene from a ripe apply • Compare ripening rate with control; record colour change daily • Set up a cytokinin shelf-life experiment on harvested leafy vegetable, record colour and freshness at 3 and 5 days • Prepare a growth regulator use record for one application • Record product, rate, crop, date	solution, leafy vegetables, growth regulator, record form, field notebooks.
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					and safety precautions	
GENERAL OBJECTIVE 5.0: Understand flowering, fruiting and ripening physiology in horticultural crops						
12-13	5.1 Explain floral induction and the role of photoperiod and temperature in horticultural crops 5.2 Discuss fruit set, fruit development and the physiological factors affecting fruit size and number 5.3 Explain the biochemistry of fruit ripening pigment development, softening and aroma 5.4 Explain alternate bearing in mango and citrus management strategies. 5.5 Discuss manipulation of flowering and fruiting using	• Explain floral induction with photoperiod and temperature response charts • Explain fruit set and development with a tomato fruit growth curve • Explain ripening biochemistry: anthocyanin, pectin degradation and volatile production • Explain alternate bearing in mango; describe management practices to reduce it • Explain cultural and chemical manipulation of flowering and fruiting	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Photoperiod response chart, fruit growth curve, ripening biochemistry diagram, alternate bearing management guide, projector, Computer system.	• Record flowering date and fruit set percentage on five tagged plants of one crop • Record over 4 weeks • Monitor fruit development on one crop from fruit set to harvest • Record size and colour at each visit - Record ripening of mango or tomato • Record colour, firmness and aroma at 2-day intervals • Compare fruit set percentage on gibberellin-sprayed flowers with unsprayed control • Record result • Prepare a flowering and fruiting management calendar for one fruit crop on the college	Guide students to: • Record flowering date and fruit set percentage on five tagged plants of one crop • Record over 4 weeks • Monitor fruit development on one crop from fruit set to harvest • Record size and colour at each visit - Record ripening of mango or tomato • Record colour, firmness and aroma at 2-day intervals • Compare fruit set percentage on gibberellin-sprayed flowers with unsprayed control • Record result • Prepare a flowering and	Tagged plants, ruler, Twine, colour chart, firmness tester, gibberellin solution, flowering calendar template, field notebooks.

	cultural and chemical practices			farm	fruiting management calendar for one fruit crop on the college farm	
GENERAL OBJECTIVE 6.0: Understand physiological knowledge to improve horticultural production						
14– 15	6.1 Explain growth analysis guides on fertilizer timing in horticultural crop production and management 6.2 Explain irrigation guides, scheduling and deficit as it relates to plant development 6.3 Describe hormone application in crop propagation, management and post-harvest 6.4 Explain how ripening physiology guides harvest timing and post-harvest storage decisions 6.5 Describe how to prepare a physiology-based	• Explain growth analysis guides on fertilizer timing in horticultural crop production and management • Explain irrigation guides, scheduling and deficit as it relates to plant development • Explain hormone application in crop propagation, management and post-harvest • Explain how ripening physiology guides harvest timing and post-harvest storage decisions • Explain how to prepare a	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Growth analysis data, irrigation guide, hormone application examples, ripening physiology data, crop management guide template, projector, Computer system.	• Use growth analysis data from the college farm to write two crop management recommendations • Use transpiration and soil moisture data to adjust irrigation scheduling for horticultural crops • Record outcome • Apply hormone product on the college farm for horticultural crop and record the result • Determine the optimum harvest stage for one crop using physiological maturity indices and record all	Guide students to: • Use growth analysis data from the college farm to write two crop management recommendations • Use transpiration and soil moisture data to adjust irrigation scheduling for horticultural crops • Record outcome • Apply hormone product on the college farm for horticultural crop and record the result • Determine the optimum harvest	Growth analysis data, transpiration data, hormone product, auxanometer, AI powered cameras, spectral sensors, wireless data loggers, transpirometer, analytical scale, softwares for analysis, a maturity index reference, crop management guide template, field notebooks.

	crop management guide.	physiology-based crop management guide.		indices assessed • Prepare a physiology-based crop management guide for horticultural crop • Specify key management actions using growth and /or yield stage	stage for one crop using physiological maturity indices and record all indices assessed • Prepare a physiology-based crop management guide for horticultural crop • Specify key management actions using growth and /or yield stage	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 315: PLANT TAXONOMY

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: PLANT TAXONOMY	COURSE CODE: HOT 315	CONTACT HOURS: 3HOURS/WEEK
	CREDIT UNITS: 3	THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 2HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and practical skills in the classification, identification, nomenclature, and documentation of horticultural plants.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the scope of plant taxonomy and its application in horticulture. 2.0 Understand the principles of plant taxonomy and methods of plant classification. 3.0 Understand the classification of horticultural plants into species, varieties, clones, and strains. 4.0 Understand the identification of plants using vegetative, floral, and anatomical characteristics. 5.0 Understand the use of taxonomic keys, standard floras, and digital identification tools for plant identification. 6.0 Understand herbarium techniques and plant documentation for horticultural practice.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: PLANT TAXONOMY			COURSE CODE: HOT 315	CONTACT HOURS: 3HOURS/WEEK		
			CREDIT UNITS: 3	THEORETICAL: 1HOUR/WEEK		
YEAR: I SEMESTER: I			PRE-REQUISITE: Nil	PRACTICAL: 2HOURS/WEEK		
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and practical skills in the classification, identification, nomenclature, and documentation of horticultural plants.						
GENERAL OBJECTIVE 1.0: Understand the scope of plant taxonomy and its application in horticulture.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define plant taxonomy and related concepts. 1.2 Explain the scope and importance of plant taxonomy. 1.3 Describe the relationship between taxonomy and horticulture. 1.4 Explain the roles of taxonomy in plant conservation and improvement. 1.5 Describe current trends in plant taxonomy.	• Explain plant taxonomy and related concepts. • Explain the scope and importance of plant taxonomy. • Explain the relationship between taxonomy and horticulture. • Explain the roles of taxonomy in plant conservation and improvement.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Taxonomy textbooks Charts and diagrams Multimedia presentations Scientific publications	• Demonstrate observation of taxonomic features. • Supervise field identification exercises.	Guide students to: • Demonstrate observation of taxonomic features. • Supervise field identification exercises.	Living plant collections Hand lenses Field notebooks Plant identification manuals

		Explain current trends in plant taxonomy.				
GENERAL OBJECTIVE 2.0: Understand the principles of plant taxonomy and methods of plant classification.						
4-5	2.1 Explain taxonomic hierarchy in plants. 2.2 Describe artificial, natural, and phylogenetic classification systems. 2.3 Explain the principles of plant nomenclature. 2.4 Describe the International Code of Botanical Nomenclature. 2.5 Explain the significance of scientific naming.	- Explain taxonomic hierarchy in plants. - Explain artificial, natural, and phylogenetic classification systems. - Explain the principles of plant nomenclature. - Explain the International Code of Botanical Nomenclature. - Explain the significance of scientific naming.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Taxonomy charts Botanical nomenclature guides Multimedia resources Reference texts .	- Classify selected horticultural plants into taxonomic categories. - Assign scientific names to selected plant specimens. - Prepare taxonomic profiles for selected horticultural plants.	Guide students to: - Classify selected horticultural plants into taxonomic categories. - Assign scientific names to selected plant specimens. - Prepare taxonomic profiles for selected horticultural plants.	Plant specimens Taxonomic keys Classification charts Reference manuals
GENERAL OBJECTIVE 3.0: Understand the classification of horticultural plants into species, varieties, clones, and strains.						
6-7	3.1 Define species, varieties, clones, and strains.	Explain species, varieties, clones, and strains.	Crop Laptop Computers, smart board	Identify species and varieties of selected	Identify species and varieties of selected horticultural crops.	Crop samples Variety catalogues Field

	3.2 Differentiate among species, varieties, clones, and strains. 3.3 Explain the importance of genetic diversity in horticultural crops. 3.4 Describe the classification of selected horticultural crops. 3.5 Explain the relevance of plant classification in crop improvement.	- Differentiate among species, varieties, clones, and strains. - Explain the importance of genetic diversity in horticultural crops. - Explain the classification of selected horticultural crops. - Explain the relevance of plant classification in crop improvement.	Projector Writing Materials White board Markers Internet catalogues Variety descriptions Charts Multimedia presentations	horticultural crops. Prepare classification records for selected crops.	Prepare classification records for selected crops.	records Identification guides
GENERAL OBJECTIVE 4.0: Understand the identification of plants using vegetative, floral, and anatomical characteristics.						
8-9	4.1 Describe vegetative characteristics used in plant identification. 4.2 Explain floral characteristics used in taxonomy. 4.3 Describe anatomical	- Explain vegetative characteristics used in plant identification. - Explain floral characteristics used in taxonomy. - Explain	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Botanical	- Identify horticultural plants using vegetative characteristics. - Identify horticultural plants using floral characteristics. - Examine plant anatomical	Guide students to: - Identify horticultural plants using vegetative characteristics. - Identify horticultural plants using floral characteristics. - Examine plant	Fresh plant specimens Compound microscopes Hand lenses Dissecting kits Identification manuals

	features used in plant identification. 4.4 Explain the importance of diagnostic characteristics. 4.5 Describe methods of plant identification.	anatomical features used in plant identification. - Explain the importance of diagnostic characteristics. - Explain methods of plant identification.	charts Microscopes Plant specimens Multimedia resources	structures for identification. Record diagnostic features of selected plant species.	anatomical structures for identification. Record diagnostic features of selected plant species.	
GENERAL OBJECTIVE 5.0: Understand the use of taxonomic keys, standard floras, and digital identification tools for plant identification.						
10-12	5.1 Explain the principles of taxonomic keys. 5.2 Describe different types of taxonomic keys. 5.3 Explain the use of floras in plant identification. 5.4 Describe digital tools used in plant identification. 5.5 Explain the advantages and limitations of digital identification systems.	- Explain the principles of taxonomic keys. - Explain different types of taxonomic keys. - Explain the use of floras in plant identification. - Explain digital tools used in plant identification. - Explain the advantages and limitations of digital identification	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Floras Taxonomic keys Computers Smartphones Internet facilities	- Identify plants using dichotomous keys. - Identify plants using standard floras. - Use digital applications to identify horticultural plants. - Compare results obtained from different identification methods.	- Identify plants using dichotomous keys. - Identify plants using standard floras. - Use digital applications to identify horticultural plants. - Compare results obtained from different identification methods.	Taxonomic keys Floras Smartphones Computers Internet access Plant identification apps

		systems.				
GENERAL OBJECTIVE 6.0: Understand herbarium techniques and plant documentation for horticultural practice.						
13-15	6.1 Explain the importance of herbarium collections. 6.2 Describe procedures for plant collection and preservation. 6.3 Explain specimen mounting and labeling techniques. 6.4 Describe methods of plant documentation. 6.5 Explain the use of herbarium records in horticulture.	• Explain the importance of herbarium collections. • Explain procedures for plant collection and preservation. • Explain specimen mounting and labeling techniques. • Explain methods of plant documentation. • Explain the use of herbarium records in horticulture.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Herbarium specimens, Herbarium manuals, Mounting materials, Multimedia presentations	• Collect plant specimens for herbarium preparation. • Press and preserve plant specimens. • Mount and label herbarium specimens. • Prepare plant passport data and documentation records. • Develop a herbarium collection of horticultural plants.	Guide students to: • Collect plant specimens for herbarium preparation. • Press and preserve plant specimens. • Mount and label herbarium specimens. • Prepare plant passport data and documentation records. • Develop a herbarium collection of horticultural plants.	Plant press, Newspapers, Herbarium sheets, Mounting adhesive, Labels and tags, GPS device, Digital camera, Plant record sheets
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 31: AI AND AUTOMATION IN HORTICULTURAL PRODUCTION

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: AI AND AUTOMATION IN HORTICULTURAL PRODUCTION	COURSE CODE: HOT 316	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNITS: 316	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 2 HOURS/WEEK
GOAL: To equip students with knowledge and practical skills in the application of artificial intelligence and automation technologies for efficient horticultural production.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the principles and applications of artificial intelligence in horticultural production. 2.0 Understand digital data collection, sensors, and smart monitoring systems in horticulture. 3.0 Understand AI-assisted crop management and decision-support systems. 4.0 Understand automation technologies used in horticultural production systems. 5.0 Understand the application of drones, robotics, and precision agriculture technologies in horticulture. 6.0 Understand the economic, ethical, and sustainability implications of AI and automation in horticulture.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: AI AND AUTOMATION IN HORTICULTURAL PRODUCTION			COURSE CODE: HOT 316		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNITS: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE: Nil		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and practical skills in the application of artificial intelligence and automation technologies for efficient horticultural production.						
GENERAL OBJECTIVE 1.0: Understand the principles and applications of artificial intelligence in horticultural production.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define artificial intelligence and related concepts in horticulture. 1.2 Explain the principles of artificial intelligence in agricultural production systems. 1.3 Explain areas of horticultural production where AI technologies are applied. 1.4 Explain the benefits and limitations of AI applications in	- Define artificial intelligence and related concepts in horticulture. - Explain the principles of artificial intelligence in agricultural production systems. - Explain areas of horticultural production where AI technologies are applied. - Explain the benefits and limitations of AI	Computer systems Multimedia projector AI application videos Journals and publications Internet facilities Case studies	- Identify AI-powered tools used in horticultural production. - Access and operate selected AI applications for crop production. - Use AI tools for basic horticultural decision-making. - Compare outputs generated by different AI platforms.	Guide students to: - Identify AI-powered tools used in horticultural production. - Access and operate selected AI applications for crop production. - Use AI tools for basic horticultural decision-making. - Compare outputs generated by	Computers Smartphones Internet access AI software applications Digital devices

	horticulture. 1.5 Describe emerging trends in AI-driven horticultural production.	applications in horticulture. Describe emerging trends in AI-driven horticultural production.			different AI platforms.	
GENERAL OBJECTIVE 2.0: Understand digital data collection, sensors, and smart monitoring systems in horticulture.						
4-5	2.1 Explain the importance of digital data in horticultural production. 2.2 State types of sensors used in horticulture. 2.3 Explain the principles of smart monitoring systems. 2.4 Describe the operation of Internet of Things (IoT) devices in horticulture. 2.5 Explain data acquisition and transmission systems.	- Explain the importance of digital data in horticultural production. - State types of sensors used in horticulture. - Explain the principles of smart monitoring systems. - Describe the operation of Internet of Things (IoT) devices in horticulture. - Explain data acquisition	Sensor charts IoT diagrams Multimedia presentations Internet facilities Smart farming manuals	- Identify sensors used in horticultural production. - Install simple environmental monitoring devices. - Collect field data using digital sensors. - Monitor environmental parameters using smart devices. - Record sensor-generated data. - Interpret sensor-generated data.	Guide students to: - Identify sensors used in horticultural production. - Install simple environmental monitoring devices. - Collect field data using digital sensors. - Monitor environmental parameters using smart devices. - Record sensor-generated data.	Soil moisture sensors Temperature sensors Humidity sensors Data loggers Smartphones IoT devices

		and transmission systems.			Interpret sensor-generated data.	
GENERAL OBJECTIVE 3.0: Understand AI-assisted crop management and decision-support systems.						
6-7	3.1 Explain AI-assisted decision-making in horticultural production. 3.2 Describe AI applications in irrigation management. 3.3 Explain AI-based pest and disease diagnosis systems. 3.4 Explain AI-assisted nutrient management systems. 3.5 Describe AI-supported yield prediction systems.	- Explain AI-assisted decision-making in horticultural production. - Explain AI applications in irrigation management. - Explain AI-based pest and disease diagnosis systems. - Explain AI-assisted nutrient management systems. - Explain AI-supported yield prediction systems.	Computer systems AI software Case studies Multimedia resources Internet facilities	- Operate AI-assisted crop management applications. - Diagnose crop problems using AI platforms. - Generate irrigation recommendations using AI tools. - Interpret AI-generated crop management reports. - Evaluate AI recommendations for selected horticultural crops.	- Operate AI-assisted crop management applications. - Diagnose crop problems using AI platforms. - Generate irrigation recommendations using AI tools. - Interpret AI-generated crop management reports. - Evaluate AI recommendations for selected horticultural crops.	Computers Smartphones AI crop management applications Internet facilities Sample crop datasets
GENERAL OBJECTIVE 4.0: Understand automation technologies used in horticultural production systems.						
8-9	4.1 Explain the concept of	Explain automation	Automation manuals	Identify automated production	Guide students to: Identify	Automated irrigation kits

	automation in horticulture. 4.2 Identify automated systems used in horticultural production. 4.3 Explain automated irrigation and fertigation systems. 4.4 Describe greenhouse automation systems. 4.5 Explain the advantages and limitations of automation technologies.	principles. • Discuss automated production systems. • Illustrate automated greenhouse technologies. • Explain automated irrigation systems.	Multimedia presentations Videos System diagrams	systems. • Operate automated irrigation equipment. • Operate automated fertigation systems. • Monitor automated greenhouse control systems. • Evaluate the performance of automation technologies.	automated production systems. • Operate automated irrigation equipment. • Operate automated fertigation systems. • Monitor automated greenhouse control systems. • Evaluate the performance of automation technologies.	Fertigation units Greenhouse controllers Sensors Monitoring devices
GENERAL OBJECTIVE 5.0: Understand the application of drones, robotics, and precision agriculture technologies in horticulture.						
10-12	5.1 Explain the principles of precision agriculture. 5.2 Describe drone applications in horticulture. 5.3 Explain the use of robotics in crop production. 5.4 Explain GPS and	• Explain precision agriculture concepts. • Discuss drone and robotics technologies. • Illustrate GPS and GIS applications. • Explain remote sensing systems.	Drone manuals GIS maps Remote sensing images Multimedia resources Precision agriculture guides	Identify drones and precision agriculture equipment. Operate GPS-enabled devices for field mapping. Interpret drone and satellite imagery. Collect field data using precision agriculture	• Demonstrate drone operations. • Demonstrate GPS field mapping. • Guide students in image interpretation. • Supervise precision agriculture field	Agricultural drones GPS devices GIS software Satellite images Computers

	GIS technologies in horticulture. 5.5 Describe remote sensing technologies used in crop monitoring.			tools. Prepare simple field maps using GPS data.	exercises.	
GENERAL OBJECTIVE 6.0: Understand the economic, ethical, and sustainability implications of AI and automation in horticulture.						
13-15	6.1 Explain the economic benefits of AI and automation technologies. 6.2 Explain ethical issues associated with AI adoption. 6.3 Describe sustainability considerations in digital horticulture. 6.4 Explain challenges affecting AI adoption in horticulture. 6.5 Assess the future prospects of AI in horticultural production.	• Discuss economic implications of AI technologies. • Explain ethical and regulatory issues. • Discuss sustainability concepts. • Present case studies on AI adoption.	Case studies Policy documents Journals Multimedia resources Internet facilities	Conduct a cost-benefit analysis of selected AI technologies. Assess the suitability of AI technologies for horticultural enterprises. Evaluate the sustainability of automated production systems. Prepare a proposal for AI adoption in a horticultural enterprise.	• Guide students in enterprise analysis. • Demonstrate cost-benefit evaluation techniques. • Supervise sustainability assessment exercises. • Guide preparation of AI adoption proposals.	Enterprise records Computers Spreadsheet software Case studies Business planning templates

COURSE ASSESSMENT:

Course work: 10% |

Test/Assignments: 10% |

Practical: 40% |

Examination: 40% |

Total: 100%



HOT 317: GREENHOUSE AND CONTROLLED ENVIRONMENT HORTICULTURAL SYSTEMS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: GREENHOUSE AND CONTROLLED ENVIRONMENT HORTICULTURAL SYSTEMS	COURSE CODE: HOT 317	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 3 HOURS/WEEK
GOAL: To equip students with knowledge and skills to design, construct, manage and operate protected cultivation systems for commercial horticultural production.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand greenhouse design and construction principles 2.0 Know climate management in protected structures 3.0 Understand crop production in greenhouse and shade net house 4.0 Understand soilless and substrate production in protected structures 5.0 Know pest and disease management specific to protected cultivation 6.0 Understand the economics and enterprise management of protected cultivation		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: GREENHOUSE AND CONTROLLED ENVIRONMENT HORTICULTURAL SYSTEMS				COURSE CODE: HOT 317		CONTACT HOURS: 4 HOURS/WEEK
				CREDIT UNITS: 4		THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I				PRE-REQUISITE: Nil		PRACTICAL: 3 HOURS/WEEK
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and skills to design, construct, manage and operate protected cultivation systems for commercial horticultural production.						
GENERAL OBJECTIVE 1.0: Understand greenhouse design and construction principles						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1 – 2	1.1 Describe greenhouse types and their suitability for Nigerian conditions: Venlo, tunnel and gothic arch 1.2 Describe covering materials: polyethylene film, polycarbonate and shade netting; compare light transmission and cost 1.3 Describe the structural components of a	- Describe greenhouse types with photographs and cost comparison - Compare covering materials using a light transmission and cost table - Explain structural components with a labelled greenhouse diagram - Describe construction sequence with step-by-step	Greenhouse type photographs, covering material comparison table, labelled greenhouse diagram, construction photographs, maintenance schedule, projector.	Sketch and dimension a greenhouse design for a 100 m ² production area; include orientation, vents and gutters - Measure the college greenhouse structure; calculate floor area, volume and covering material area - Inspect the college structure for maintenance needs; record findings and recommended corrective actions - Install or repair one structural component	- Guide students to: - Provide design template; guide preparation; review accuracy - Supervise measurements; guide calculations - Guide inspection; review maintenance records - Supervise installation or repair; review records - Provide schedule template; guide preparation;	College greenhouse, measuring tape, design template, maintenance schedule template, tools and repair materials, field notebooks.

	commercial greenhouse: frame, gutters, vents and foundation 1.4 Describe the construction sequence for a tunnel greenhouse: site preparation to commissioning 1.5 Describe the maintenance schedule for greenhouse structures and covering materials	photographs • Explain maintenance schedule for structure and covering		of the college greenhouse; record work done and materials used • Prepare a five-year maintenance schedule for the college greenhouse	review schedules	
GENERAL OBJECTIVE 2.0: Know climate management in protected structures						
3 – 5	2.1 Describe climate parameters in protected structures: temperature, humidity, CO₂ and light 2.2 Describe ventilation and evaporative cooling systems: natural ventilation, pad-and-fan and fogging	• Explain climate parameters and their effect on crop growth • Explain ventilation and cooling systems; demonstrate vent operation • Explain LED grow lights; compare spectrum and energy	Climate parameter guide, ventilation system, LED grow lights, CO ₂ enrichment guide, automated control system diagram, projector.	Monitor temperature, humidity and CO₂ inside the college greenhouse at 3-hour intervals for 3 days; record all readings • Adjust ventilation to reduce inside temperature; record temperature before and 30 minutes after adjustment • Measure light	Guide students to: • Provide climate monitoring form; guide recording • Supervise ventilation adjustment; guide before-and-after recording • Demonstrate lux meter use; supervise measurement	Thermometer, hygrometer, CO ₂ meter, lux meter, climate monitoring form, schedule template, field notebooks.

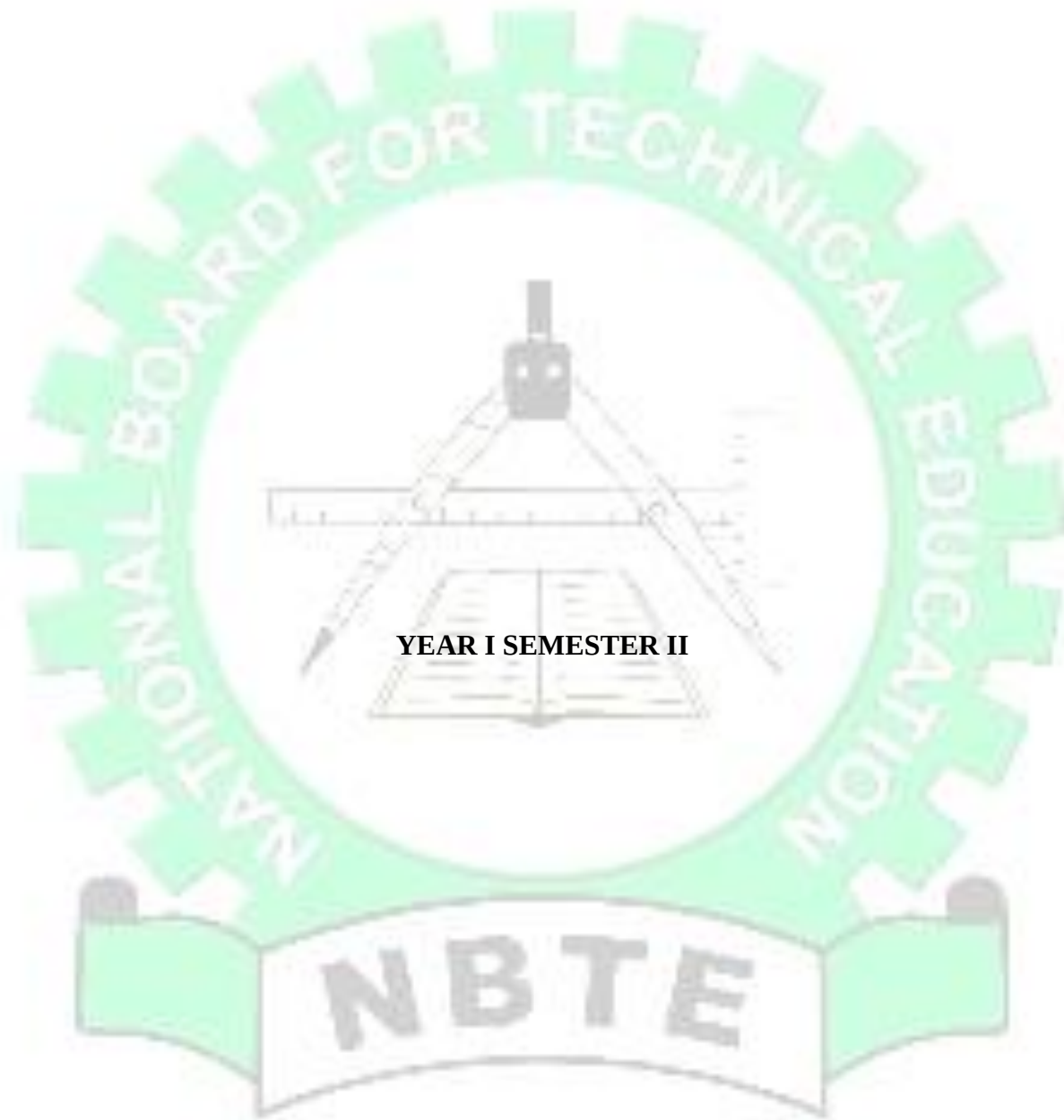
	2.3 Describe supplemental lighting systems: Light Emitting Diode (LED) grow lights, spectrum requirements and energy use 2.4 Describe CO₂ enrichment systems and their benefits for greenhouse crops 2.5 Describe automated climate control systems and their components	consumption • Explain CO₂ enrichment; describe delivery systems and concentration targets • Explain automated climate control; describe sensors, controllers and actuators		intensity at five points inside the structure; record readings and identify low-light zones • Design a climate management schedule for one greenhouse crop; specify daily ventilation, irrigation and lighting times • Calibrate a thermostat or sensor in the college greenhouse; record set point, reading and adjustment made	• Provide schedule template; guide preparation; review schedules • Demonstrate calibration; supervise student practice	
GENERAL OBJECTIVE 3.0: Understand Crop Production in Greenhouse and Shade Net House						
6 – 8	3.1 Describe substrate selection for protected production: coco peat, perlite, rock wool and growing bags 3.2 Describe transplanting, spacing and training systems	• Explain substrate samples and properties and suitability for each crop • Explain spacing, training systems, string and clip training • Discuss fertigation	Substrate samples, growing bags, string and clip training system, fertigation programme, yield recording form, crop rotation guide,	Transplant one vegetable species into growing bags in the college greenhouse; record date, substrate and spacing	• Guide students to: • Supervise transplanting; check substrate and spacing • Demonstrate training; supervise student practice • Supervise fertigation; review daily EC and pH	Growing bags, substrate, crop seedlings, string, clips, EC meter, pH meter, yield recording form, production record form, field notebooks.

	for greenhouse vegetable crops 3.3 Describe fertigation programmes for greenhouse tomato and cucumber 3.4 Describe harvest management and yield recording for protected crops 3.5 Describe crop rotation and sanitation practices in protected structures	programme for greenhouse tomato and cucumber • Explain harvest management and yield recording for protected crops • Explain crop rotation and sanitation in protected structures	projector.	• Apply fertigation at the correct EC and pH for the crop stage; record all values daily for one week • Harvest the greenhouse crop at correct maturity; record date, yield per plant and visual quality grade • Prepare a crop production record covering all operations from transplanting to final harvest	records • Supervise harvest; guide yield and quality recording • Provide production record form; review completeness	
GENERAL OBJECTIVE 4.0: Understand soilless and substrate production in protected structures						
9 – 10	4.1 Describe soilless production systems: Nutrient Film Technique (NFT), Deep Water Culture (DWC), drip-to-waste and substrate bag systems 4.2 Describe nutrient solution preparation and management for	• Describe soilless systems with diagrams; compare suitability for Nigeria • Discuss nutrient solution preparation from stock solutions • Explain EC and pH management in recirculating	Soilless system diagrams, stock solution chemicals, EC meter, pH meter, problem photographs, yield calculation guide, projector.	Set up a simple DWC or drip soilless system for one crop; record components, setup steps and date • Prepare a nutrient solution at the correct EC and pH; record all components and measured values • Monitor EC and pH of the nutrient solution daily for one week;	Guide students to: • Demonstrate system setup; supervise student practice • Demonstrate solution preparation; supervise student practice • Supervise daily monitoring; review adjustment	Soilless system components, nutrient chemicals, EC meter, pH meter, growing medium, crop seedlings, field notebooks.

	soilless production 4.3 4.3 Describe EC and pH management in recirculating and open systems 4.4 Describe common soilless system problems: clogging, root disease and nutrient imbalance 4.5 Describe how to calculate yield per square metre in soilless production systems	and open systems - Describe soilless system problems with photographs; explain solutions - Demonstrate yield per square metre calculation for NFT lettuce		record readings and adjustments - Diagnose one soilless system problem in the college structure; record problem and corrective action taken - Calculate yield per square metre for one soilless crop; compare with the open field yield for the same crop	records - Carryout diagnosis; review corrective action records - Conduct yield calculation; review comparison with open field	
GENERAL OBJECTIVE 5.0: Know pest and disease management specific to protected cultivation						
11 – 12	5.1 Describe the pest and disease risks specific to protected cultivation: whitefly, spider mite, botrytis and powdery mildew 5.2 Describe biological control methods used inside protected structures	- Describe protected structure pests and diseases with photographs - Explain biological control agents used in greenhouse production - Explain monitoring traps and exclusion netting;	Protected structure pest and disease photographs, biological control agent guide, monitoring traps, exclusion netting, sanitation guide,	Set up yellow sticky traps inside the college greenhouse; record trap positions and insects caught at 7 days - Scout the greenhouse crop weekly for two weeks; record pest or disease, crop part affected and management action - Apply one biological control agent to a pest-	- Guide students to: - Demonstrate trap installation; supervise student practice - Provide scouting form; accompany students; review forms - Supervise biological control application; guide recording - Supervise	Yellow sticky traps, scouting form, biological control agent, cleaning equipment, IPM plan template, field notebooks.

	5.3 Describe the use of yellow sticky traps, pheromone traps and exclusion netting in protected structures 5.4 Describe pesticide application inside protected structures: safety requirements and residue management 5.5 Describe sanitation and crop hygiene practices to prevent pest and disease buildup in greenhouses	demonstrate trap installation • Explain pesticide application safety inside structures; describe PPE requirements • Explain sanitation practices: crop removal, structure washing and fumigation	projector.	affected greenhouse crop; record product, rate and pest counts before and after • Carry out a full structure sanitation between crops: remove plant debris, wash surfaces and record all steps • Prepare a greenhouse Integrated Pest Management (IPM) plan for one crop cycle; specify monitoring, biological control and chemical thresholds	sanitation exercise; check thoroughness; review records • Provide IPM plan template; guide preparation; review plans	
GENERAL OBJECTIVE 6.0: Understand the economics and enterprise management of protected cultivation						
13 – 15	6.1 Describe the capital investment required for different protected structure types in Nigeria 6.2 Describe operating costs of a protected	• Discuss investment cost data for three protected structure types • List and explain operating cost categories for protected	Investment cost data, operating cost categories, gross margin calculation guide, marketing channel guide,	Prepare an investment cost estimate for a 100 m² greenhouse; list all materials and labour costs • Prepare a one-month operating cost record for the college greenhouse; record all	Guide students to: • Provide estimate template; guide preparation; review accuracy • Provide operating cost record form; guide data entry; review accuracy	Investment cost template, operating cost record form, gross margin calculation worksheet, business plan template, field

	cultivation enterprise: water, nutrients, labour and structure 6.3 Explain how to calculate cost of production per kilogram and gross margin for a greenhouse crop 6.4 Describe marketing channels and premium pricing for protected cultivation produce in Nigeria 6.5 Describe how to prepare a bankable business plan for a protected cultivation enterprise	cultivation • Demonstrate cost per kilogram and gross margin calculation • Describe marketing channels and premium pricing for protected produce • Demonstrate bankable business plan preparation	business plan template, projector.	inputs and costs • Calculate gross margin and ROI for one greenhouse crop cycle; record all calculations • Identify two premium marketing channels for college greenhouse produce; record buyer requirements and prices • Prepare a one-page bankable business plan for a 200 m² greenhouse enterprise	• Carryout gross margin and ROI calculation; review accuracy • Identify channel; review records • Provide business plan template; guide preparation; review plans	notebooks.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



HOT 321: PEST AND DISEASE MANAGEMENT IN HORTICULTURE

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: PEST AND DISEASE MANAGEMENT IN HORTICULTURE	COURSE CODE: HOT 321	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 3HOURS/WEEK
GOAL: To equip students with advanced competencies in pest and disease diagnosis, monitoring, integrated management, pesticide stewardship, and regulatory compliance in horticultural production.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Apply advanced pest identification and diagnostic methods. 2.0 Apply advanced disease identification and epidemiology. 3.0 Apply biological control in commercial horticultural IPM. 4.0 Apply resistance management and pesticide stewardship. 5.0 Design and evaluate IPM programmes for commercial horticultural crops. 6.0 Apply pesticide safety, food safety, and regulatory compliance.		

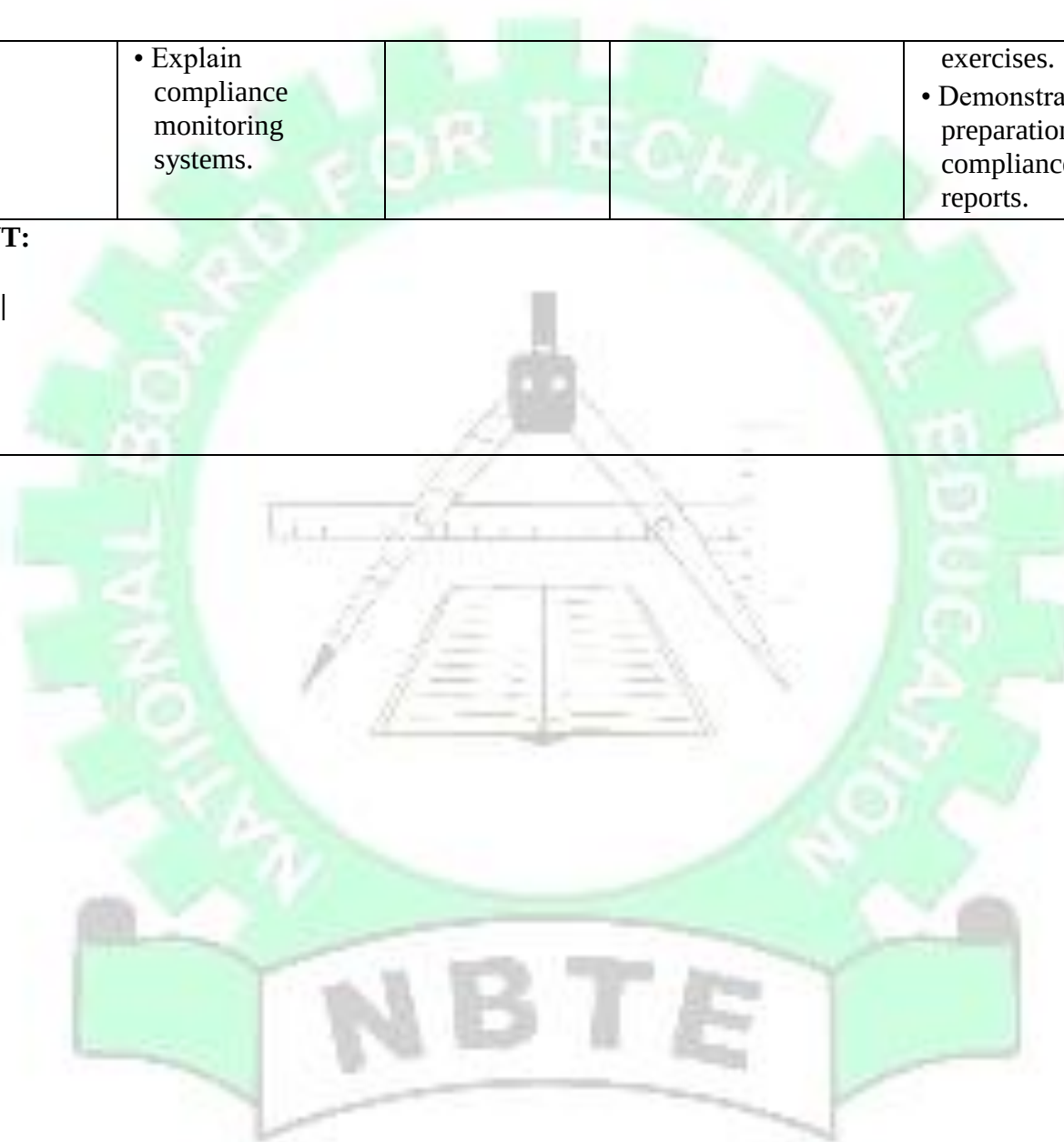
PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: PEST AND DISEASE MANAGEMENT IN HORTICULTURE				COURSE CODE: HOT 321		CONTACT HOURS: 4HOURS/WEEK
				CREDIT UNITS: 4		THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: II				PRE-REQUISITE: Nil		PRACTICAL: 3HOURS/WEEK
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with advanced competencies in pest and disease diagnosis, monitoring, integrated management, pesticide stewardship, and regulatory compliance in horticultural production.						
GENERAL OBJECTIVE 1.0: Apply advanced pest identification and diagnostic methods.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain pest classification systems. 1.2 Describe economically important horticultural pests. 1.3 Explain pest diagnostic techniques. 1.4 Describe pest surveillance systems. 1.5 1.5 Explain economic thresholds.	• Explain pest taxonomy. • Discuss pest identification techniques. • Explain economic threshold concepts.	Pest identification manuals Specimens Digital diagnostic guides	Identify major horticultural pests. Collect pest samples. Diagnose pest infestations. Conduct field scouting. Prepare pest monitoring reports.	• Demonstrate pest scouting. • Guide diagnostic exercises. • Supervise monitoring activities.	Hand lenses Insect collection kits Monitoring sheets
GENERAL OBJECTIVE 2.0: Apply advanced disease identification and epidemiology.						
4-5	2.1 Explain plant disease	• Explain disease cycles.	Disease manuals Specimens	Diagnose plant diseases.	• Demonstrate disease diagnosis.	Microscopes Diagnostic kits

	development. 2.2 Describe major horticultural diseases. 2.3 Explain disease diagnosis. 2.4 Describe epidemiological factors. 2.5 Explain disease forecasting systems.	• Discuss disease diagnosis. • Explain epidemiological concepts.	Disease charts	Collect disease samples. Identify disease symptoms. Monitor disease outbreaks. Prepare disease reports.	• Guide disease monitoring. • Supervise report preparation.	Sample containers
GENERAL OBJECTIVE 3.0: Apply biological control in commercial horticultural IPM.						
6-8	3.1 Explain biological control principles. 3.2 Describe biological control agents. 3.3 Explain conservation biological control. 3.4 Describe augmentative biological control. 3.5 Explain biological control	• Explain biological control systems. • Discuss natural enemies. • Explain IPM integration.	Biological control manuals Videos Specimens	Identify beneficial organisms. Release biological control agents. Monitor biological control effectiveness. Maintain biological control records. Evaluate IPM performance.	• Demonstrate release procedures. • Guide monitoring exercises. • Supervise evaluations.	Beneficial insects Monitoring sheets Field plots

		integration.					
GENERAL OBJECTIVE 4.0: Apply resistance management and pesticide stewardship.							
9-10	4.1	Explain pesticide resistance.	• Explain the concept and causes of pesticide resistance.	Pesticide resistance manuals FAO pesticide stewardship guidelines Multimedia projector Pest management textbooks Charts and diagrams Internet resources	Select appropriate pesticides. Calibrate spraying equipment. Apply pesticides safely. Maintain pesticide records. Evaluate pesticide performance.	• Demonstrate pesticide selection using label information. • Demonstrate sprayer calibration procedures. • Guide students in safe pesticide application. • Supervise pesticide record-keeping exercises. • Demonstrate pesticide efficacy evaluation methods.	Sprayers PPE Calibration equipment Pesticide labels
	4.2	Describe resistance management strategies.	• Discuss mechanisms of resistance development in pests and pathogens.				
	4.3	Explain pesticide stewardship.	• Explain resistance management strategies and pesticide rotation.				
	4.4	Describe pesticide selection criteria.	• Discuss pesticide stewardship principles.				
	4.5	Explain environmental implications.	• Explain environmental and health implications of pesticide misuse.				
GENERAL OBJECTIVE 5.0: Design and evaluate IPM programmes for commercial horticultural crops.							
11-13	5.1	Explain IPM principles.	• Explain principles and components of IPM.	IPM manuals Pest identification guides Multimedia	Develop IPM plans. Conduct pest monitoring. Implement IPM	• Demonstrate pest scouting procedures. • Guide students in preparing IPM	Monitoring traps Hand lenses Field notebooks Pest scouting forms Demonstration
	5.2	Describe IPM components.	• Discuss pest monitoring and				
	5.3	Explain					

	monitoring systems. 5.4 Describe decision-making tools. 5.5 Explain IPM evaluation.	surveillance systems. • Explain economic thresholds and decision-making tools. • Discuss integration of biological, cultural, physical, and chemical controls. • Explain methods of IPM programme evaluation.	projector Field monitoring charts Case studies Scientific publications	programmes. Evaluate programme effectiveness. Prepare IPM reports.	plans. • Supervise pest monitoring exercises. • Demonstrate implementation of IPM strategies. • Guide students in programme evaluation and report writing.	plots Computers IPM planning templates
GENERAL OBJECTIVE 6.0: Apply pesticide safety, food safety, and regulatory compliance.						
14-15	6.1 Explain pesticide regulations. 6.2 Describe residue management. 6.3 Explain MRL requirements. 6.4 Describe food safety regulations. 6.5 Explain compliance systems.	• Explain pesticide legislation and regulations. • Discuss Maximum Residue Limits (MRLs). • Explain food safety standards and certification requirements. • Discuss residue management practices.	National pesticide regulations Food safety manuals MRL guidelines GLOBALG.A.P. standards Multimedia projector Regulatory publications	Conduct pesticide safety inspections. Implement PPE requirements. Maintain pesticide records. Conduct compliance audits. Prepare compliance reports.	• Demonstrate pesticide safety inspections. • Demonstrate proper use of PPE. • Guide students in maintaining pesticide application records. • Supervise compliance audit	PPE kits Inspection checklists Audit templates Pesticide application records Regulatory forms Demonstration farm

		• Explain compliance monitoring systems.		- exercises. • Demonstrate preparation of compliance reports.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%					



HOT 322: SMART IRRIGATION SYSTEM AND DESIGN

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: SMART IRRIGATION SYSTEM AND DESIGN	COURSE CODE: HOT 322	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1HOUR
YEAR: I SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 3HOURS/WEEK
GOAL: To equip students with practical skills in irrigation design, installation, operation, water conservation, and irrigation enterprise management for commercial horticultural production.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Apply principles of irrigation design for horticultural production systems. 2.0 Apply irrigation system installation, operation, and maintenance procedures. 3.0 Apply smart irrigation and irrigation scheduling technologies. 4.0 Apply water-use efficiency and conservation strategies. 5.0 Apply irrigation water quality assessment and management practices. 6.0 Apply irrigation enterprise management and economics.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: SMART IRRIGATION SYSTEM AND DESIGN			COURSE CODE: HOT 322		CONTACT HOURS: 4HOURS/WEEK	
			CREDIT UNITS: 4		THEORETICAL: 1HOUR	
YEAR: I SEMESTER: II			PRE-REQUISITE: Nil		PRACTICAL: 3HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with practical skills in irrigation design, installation, operation, water conservation, and irrigation enterprise management for commercial horticultural production.						
GENERAL OBJECTIVE 1.0: Apply principles of irrigation design for horticultural production systems.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain irrigation principles. 1.2 Describe irrigation methods. 1.3 Explain irrigation design requirements. 1.4 Describe hydraulic principles. 1.5 1.5 Explain crop water requirements.	• Explain basic principles of irrigation. • Discuss various irrigation methods used in horticultural production. • Explain irrigation system design requirements. • Illustrate hydraulic principles affecting irrigation systems. • Demonstrate crop water requirement	Irrigation engineering textbooks Irrigation design manuals Multimedia projector Hydraulic charts and diagrams Soil maps Crop coefficient tables Whiteboard and markers	• Measure field parameters. • Calculate crop water requirements. • Design irrigation layouts. • Select irrigation components. • Prepare irrigation plans.	Guide Students to: • Measure field parameters. • Calculate crop water requirements. • Design irrigation layouts. • Select irrigation components. Prepare irrigation plans.	Measuring tapes Surveying equipment GPS device Field maps Irrigation catalogues Design software Drawing sheets Calculators

		calculations using examples. • Discuss factors influencing irrigation efficiency.				
GENERAL OBJECTIVE 2.0: Apply irrigation system installation, operation, and maintenance procedures.						
4-5	2.1 Explain irrigation components. 2.2 Describe installation procedures. 2.3 Explain operation requirements. 2.4 Describe maintenance procedures. 2.5 Explain troubleshooting techniques.	• Explain irrigation system components and functions. • Discuss installation procedures for different irrigation systems. • Explain operational requirements of irrigation systems. • Discuss preventive maintenance procedures. • Explain troubleshooting techniques and fault diagnosis.	Irrigation installation manuals Component catalogues Multimedia projector Technical drawings Maintenance guides	Install irrigation systems. Operate irrigation systems. Conduct maintenance activities. Diagnose system faults. Repair irrigation components.	• Demonstrate installation of drip and sprinkler systems. • Guide students in operating irrigation systems. • Supervise routine maintenance exercises. • Demonstrate fault diagnosis procedures. • Guide students in repairing damaged irrigation components.	Drip irrigation kits Sprinkler systems Water pumps Pipes and fittings Valves Hand tools Maintenance kits Workshop facilities
GENERAL OBJECTIVE 3.0: Apply smart irrigation and irrigation scheduling technologies.						
6-8	3.1 Explain irrigation scheduling principles.	• Explain irrigation scheduling	Smart irrigation manuals	Install sensors. Schedule irrigation	• Demonstrate installation of soil	Soil moisture sensors Weather stations

	3.2 Describe smart irrigation technologies. 3.3 Explain sensor applications. 3.4 Describe automation systems. 3.5 Explain decision-support tools.	principles. • Discuss smart irrigation technologies. • Explain the use of sensors in irrigation management. • Discuss automated irrigation systems. • Explain decision-support tools for irrigation scheduling.	Sensor catalogues Multimedia projector Technical publications Internet resources	operations. Operate automated systems. Analyze irrigation data. Generate irrigation schedules.	moisture sensors. • Guide students in programming irrigation schedules. • Demonstrate operation of automated irrigation systems. • Supervise irrigation data collection and analysis. • Guide students in generating irrigation schedules.	Controllers and timers Computers Irrigation management software Internet facilities Automated irrigation systems
GENERAL OBJECTIVE 4.0: Apply water-use efficiency and conservation strategies.						
9-10	4.1 Explain water-use efficiency concepts. 4.2 Describe conservation techniques. 4.3 Explain deficit irrigation. 4.4 Describe water harvesting systems. 4.5 Explain climate-smart irrigation.	• Explain concepts of water-use efficiency. • Discuss water conservation techniques. • Explain deficit irrigation practices. • Discuss water harvesting technologies.	Water management manuals Climate-smart agriculture publications Multimedia projector Technical bulletins Charts and diagrams	Assess water-use efficiency. Implement conservation practices. Install water harvesting systems. Evaluate irrigation performance. Recommend efficiency improvements.	• Demonstrate water-use efficiency assessment methods. • Guide students in implementing conservation practices. • Demonstrate installation of rainwater harvesting	Water meters Irrigation systems Rainwater harvesting tanks Measuring devices Demonstration plots Monitoring sheets

		• Explain climate-smart irrigation strategies.			systems. • Supervise irrigation performance evaluation exercises. • Guide students in developing water-saving recommendations.	
GENERAL OBJECTIVE 5.0: Apply irrigation water quality assessment and management practices.						
11-13	5.1 Explain water quality parameters. 5.2 Describe irrigation water testing. 5.3 Explain water quality effects on crops. 5.4 Describe treatment methods. 5.5 Explain monitoring procedures.	• Explain irrigation water quality parameters. • Discuss procedures for irrigation water testing. • Explain effects of poor-quality irrigation water on crops and soils. • Discuss water treatment methods. • Explain water quality monitoring procedures.	Water quality manuals Laboratory guides Multimedia projector Water analysis reports Technical publications Water quality standards	Collect water samples. Conduct water quality tests. Interpret laboratory results. Recommend corrective measures. Maintain water quality records.	• Demonstrate water sample collection procedures. • Guide students in water quality testing. • Supervise laboratory analyses. • Demonstrate interpretation of laboratory results. • Guide students in preparing water quality reports.	Water sampling bottles pH meter EC meter Water testing kits Laboratory equipment Record sheets Water quality laboratory
GENERAL OBJECTIVE 6.0: Apply irrigation enterprise management and economics.						
14-15	6.1 Explain irrigation	• Explain irrigation	Enterprise	Prepare irrigation	• Guide students in	Computers

	economics. 6.2 Describe irrigation enterprise planning. 6.3 Explain cost-benefit analysis. 6.4 Describe irrigation project management. 6.5 Explain sustainability considerations.	enterprise economics. • Discuss enterprise planning procedures. • Explain cost-benefit analysis techniques. • Discuss irrigation project management principles. • Explain sustainability considerations in irrigation enterprises.	management manuals Budget templates Market reports Multimedia projector Computers Financial management guides Business planning manuals	budgets. Conduct economic analyses. Develop irrigation business plans. Evaluate project performance. Present irrigation project proposals.	preparing irrigation budgets. • Demonstrate economic analysis techniques. • Supervise business plan preparation. • Guide project evaluation exercises. • Assess irrigation project proposals and presentations.	Spreadsheet software Calculators Budget templates Financial records Business plan templates Project evaluation forms Enterprise planning software
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 323: LANDSCAPE DESIGN AND CONSTRUCTION

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: LANDSCAPE DESIGN AND CONSTRUCTION	COURSE CODE: HOT 323	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 3HOURS/WEEK
GOAL: This course is designed to equip the students with the understanding and knowledge of landscape concepts in landscape design		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Know the history, skill and scope of landscape design and construction 2.0 Know the rules and design processes of drawing site plan. 3.0 Understand the principles and economy in landscape design. 4.0 Understand landscape design processes. 5.0 Know the type of materials involved in landscape design. 6.0 Understand the methods of costing landscape design materials. 7.0 Know the practical skills involved in landscape design.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: LANDSCAPE DESIGN AND CONSTRUCTION				COURSE CODE: HOT 323		CONTACT HOURS: 4HOURS/WEEK
				CREDIT UNITS: 4		THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: II				PRE-REQUISITE: Nil		PRACTICAL: 3HOURS/WEEK
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip the students with the understanding and knowledge of landscape concepts in landscape design						
GENERAL OBJECTIVE 1.0: Know the history, skill and scope of landscape design and construction						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-2	1.1 Explain the history and evolution of garden forms in Babylon, Egypt, Persia, the European Countries and Colonial America (California and Mexico). 1.2 Discuss the form of the Landscape to the Culture of the people 1.3 Explain Landscape Design and construction 1.4 Explain the skills	• Discuss the history and evolution of garden forms in Babylon, Egypt, Persia, the European Countries and Colonial America (California and Mexico). • Explain the form of the Landscape to the Culture of the people Explain the meaning of Landscape Design and construction Explain the	Lecture notes, whiteboard and Marker, laptop computer and LCD projector, landscape design materials, tools and equipment construction materials; tools and materials soft wares and app etc	Students should comprehend the meaning of landscape design and construction Identify different types of soft and hard landscape materials, tools and equipment Identify the different types of materials, tools and equipment used in construction Itemize the areas that soft and hard landscape cover.	• Guide students to: Identify the different soft and hard materials, tools and equipment necessary for landscape design and construction • Construct a Landscape design (soft and hard) and record the observed components Lay their hands on soft and hard landscape	Soil samples, Plant, flowers, measuring Tapes, Kerbs stones, Cement, Block, Soft and hard landscape materials, tools and equipment.

	involved in Landscape Design and construction 1.5 Explain the relationship between Soft and Hard Landscape Design and construction	importance of skills in Landscape design and construction Discuss the relationship between soft and hard Landscape Design and construction; give relevant examples			construction.	
GENERAL OBJECTIVE 2.0: Know the rules and design processes of drawing site plan.						
3-4	2.1 Explain the rules and principles involved in designing or drawing of site plan 2.2 Discuss design processes in drawing a site plan 2.3 Outline the materials, tools and equipment used in drawing a site plan	• Discuss the rules and principles involved in designing or drawing of site plan • Discuss design processes in drawing a site plan • State the materials, tools and equipment used in drawing a site plan	Lecture notes, Marker board, laptop computer, videos and LCD projector.	Show photographs of different gardens of the named locations Draw the garden forms as applied in the different civilizations as indicated in 2.1. Assist students to draw a site plan	• Guide students to: Draw the garden forms as applied in the different civilizations • Sketch gardens suitable for the College	Books and referral materials on history of landscape design, LCD projector, laptop computer, videos, Relevant tools and equipment
GENERAL OBJECTIVE 3.0: Understand the principles and economy in landscape design						
5-6	3.1 Explain the topography and associated	• Enumerate the components of topography and	Lecture note, Marker, whiteboard,	Display simple Survey Maps of Estates and building in order to	• Guide student to: Identify various materials of a	Books on landscape, LCD projector, laptop

	problems encountered in the landscape e.g. terrain soil types Soil profiles rocky ground eroded sites 3.2 3.2 Explain simple Survey Maps of Estates and building in order to indicate positions of Landscape materials. 3.3 3.3 Discuss lay-out with emphasis on present and projected structures of landscape importance 3.4 3.4 Explain how to draw with free hand a sketch design on the spot for a proposed landscape working site.	associated problems encountered in the landscape as a result of unsuitable topography Discuss simple Survey Maps of Estates and building marking clearly the positions of Landscape materials. • Explain layout lamenting on all present and projected structures of landscape importance Explain how to sketch a proposed landscape working site. • Explain the considerations for positioning plant and non-plant materials in a	laptop computer and LCD projector, Pictures, Calculators, videos, Landscape materials, tools and equipments.	show students positions of Landscape materials. Sketch a lay-out to indicate all present and projected structures of landscape importance and develop same into reality. Draw a landscape and indicate all its components Position the various plant and non-plant materials to be used in the landscape. Carryout the position of Landscape in the College premises Prepare estimates using drawing plans for landscape projects e.g. Parks and gardens, Housing estates, Amenity developments, High ways Carryout survey of the Terrain of the area to be landscape and note its features	Landscaped area and • Take record • Prepare simple • Survey Maps of Estates and buildings • Sketch a layout and indicate the right position for all the components Differentiate between plants and non-plant materials • Monitor the positioning of the Landscape components and take record • Calculate the expenses of landscaping an area in the college premises and take record • Monitor the terrain of two locations in the college premises and take	computer, video, pictures, landscape materials, tools and equipment Pencil, eraser, drawing tools Printer soft ware (Auto CAD, Corel Draw)
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	3.5	Explain how to position various plant materials in a landscape.	landscape. • Explain the estimates using drawing plans for landscape projects e.g.			record and compare the differences	
	3.6	Discuss how to raise estimates to be incurred in obtaining the materials needed when designing a landscape	• Parks and gardens, Housing estates Amenity developments and High ways				
	3.7	3.7 Explain the importance of Terrain in Landscape Design	Discuss the importance of terrain in the landscape				
GENERAL OBJECTIVE 4.0: Understand landscape design processes							
7-8	4.1	Explain the processes involved in landscape design.	• Explain the principles, elements, accents and economy in landscaping.	Lecture notes, Marker, whiteboard, laptop	Soft and hard design landscape to show the principles, elements and the accents Visit a landscape area to teach and assess the space allocation and position of soft and hard landscape materials or components.	• Guide students to: Design landscape beautification, shade windbreak, with emphasis on diversity economy and conservation n and how to apply ecological adaptation to the landscape.	Books and referral materials on landscape and horticultural designs, materials
	4.2	Explain the rules and principles of landscape design.	• Explain the relationship between principles, elements and accents and their effective use in landscape environment.	computer and LCD projector, videos and pictures, tools materials and equipment.	Monitor and evaluate the relationship between the soft and hard landscape and	and how to apply ecological adaptation to the landscape.	LCD laptop computer, Pencil, eraser, field utility vehicle
	4.3	List the materials, tools and equipment involved in landscape processes.				• Record the differences between	Printer soft ware (Auto CAD, software and hard materials Corel Draw)
	4.4	Explain the processes					

	involved in landscape beautification, placement of soft and hard landscape materials, its maintenance and management.	• Explain the uses of principles, elements and accents in a landscaped area Explain the similarity and difference between formalism and naturalism in different ecological environments. • Explain the term adaptation and how it affects plants performance in a landscape Explain how to Design landscape beautification, shade windbreak, diversity economy and conservation		naturalization of landscape area, take record. Take a field trip to standard parks, gardens and beautified areas.	formalism and naturalism and asses the record taken Visit a Landscape area and monitor the design	
GENERAL OBJECTIVE 5.0: Know the type of materials involved in landscape design.						
9-10	5.1 Explain the meaning of pre-landscape design process	• Explain the pre-landscape design process. • Outline the contact	Lecture notes, Marker board, laptop computer and	Outsource consultants and professionals in landscape design for training Exposure to	• Guide students to: Meet professionals and consultants in the	Field notebook, Field utility vehicle Materials, tools and

	5.2 Discuss what a reconnaissance survey means in relation to landscape design.	persons/groups necessary for effective landscape design process.	LCD projector, Design materials, equipment tools, videos, pictorials.	critical thinking and team based learning Regular attendance of seminars, workshop, conference both local and international. Visits to various parks and gardens, recreational centers. Carryout identification of landscape ingredients	field Attend seminars, workshops both local and international. • Identify the ingredients of landscape	equipment, pictures, videos, softwares and applications
	5.3 List the materials, tools and equipment involved in landscape designs.	• Discuss the necessary ingredients in landscape design process.				
GENERAL OBJECTIVE 6.0: Understand the methods of costing landscape design materials						
11-12	6.1 Explain drawing plans to scales and apply same into reality to raise cost estimate. 6.2 Explain costing methods in beautification and landscaping. 6.3 Enumerate materials to be costed in beautification and landscaping 6.4 Discuss methods of costing different types of	• Explain drawing plans to scales and apply same into reality to raise cost estimate Classify different plants functional y used in the landscape Explain various hard materials used in landscape design such as those indicated in 6.2 Explain the uses of both different functional plants and hard materials	Lecture notes, Marker board, laptop computer and LCD projector materials, equipment tools, videos, pictorials.	Interpret drawing plans to scales and apply same into reality to raise cost estimate The teacher should expose students to processes involved in practical beautification and landscaping Students should be exposed to raising cost estimate They should be exposed to sourcing of necessary materials for beautification and landscaping. Carryout a team work on beautification and	• Guide students to: Interpret drawing plans to scales and apply same into reality to raise cost estimate Processes involved in practical beautification and landscaping Be exposed to raising cost estimate Be exposed to sourcing of necessary materials for beautification and	Books on landscape design and beautification, LCD laptop computer, Pencil eraser, drawing books Materials, tools and equipment, pictures, videos, softwares and applications

	materials in beautification and landscaping e.g material description, the quantity, units and total prices 6.5 Explain how to source for materials both soft and hard used in beautification and landscaping Models Water fountain Plant containers Lighting of parfio gardens 6.6 Explain the uses of both different functional plants and hard materials in the landscape. 6.7 Explain the spacing of different plants in the landscape design. 6.8 Discuss plant light, canopy shape and	in the landscape. • Outline the spacing of different plants in the landscape design. • Explain plant light, canopy shape and branching characteristic of plants in the landscape.		landscaping	landscaping. • Carryout a team work on beautification and landscaping	
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	branching characteristics of plants in the landscape.					
GENERAL OBJECTIVE 7.0: Know the practical skills involved in landscape design.						
13-15	7.1 Explain the spacing of different plants in the landscape. 7.2 Explain survival rates of different plants in the landscape. 7.3 Explain the principles and practices of horticultural plants management. 7.4 Explain the role of labour management and transportation in the over-all costing of landscape design materials	• Explain the spacing of different plants in the landscape. • Discuss factors that affect the survival rates plants in the landscape. • Explain the principles and practices of farm business management. • Describe how to calculate the quality of each material involved in the landscape design and develop costing of same. • Discuss the role of labour management and transportation in	Lecture notes, Marker board, laptop computer and LCD projector, Sample plants, videos, pictures	Teach the students to carryout measurement and calculations of spacing in landscape Teach students to practically plant flowers or ornamental Maintenance culture as regards each plant in beautification and landscaping Practically Explain survival rates of different plants in the landscape	• Guide students to: Carryout measurement and calculations of spacing in landscape Practically plant flowers or ornamental • Maintain culture as regards each plant in beautification and landscaping Practically • Explain survival rates of different plants in the landscape	Different plants spp, planting medium, plants foods or manure, chemicals, measuring tapes, record books

		the over-all costing of landscape design materials.				
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 324: SOILLESS CULTIVATION AND HYDROPONICS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: SOILLESS CULTIVATION AND HYDROPONICS	COURSE CODE: HOT 324	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 3HOURS/WEEK
GOAL: To equip students with knowledge and practical skills in the design, establishment, operation, and management of soilless cultivation and hydroponic systems for sustainable commercial horticultural production.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand soilless cultivation systems and their principles 2.0 Apply nutrient solution preparation and management 3.0 Apply Nutrient Film Technique (NFT) and Deep-Water Culture (DWC) hydroponic systems 4.0 Apply substrate and bag culture production systems 5.0 Apply crop management in soilless production 6.0 Understand the economics and enterprise management of soilless cultivation		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: SOILLESS CULTIVATION AND HYDROPONICS			COURSE CODE: HOT 324		CONTACT HOURS: 4HOURS/WEEK	
			CREDIT UNITS: 4		THEORETICAL: 1HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE: Nil		PRACTICAL: 3HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and practical skills in the design, establishment, operation, and management of soilless cultivation and hydroponic systems for sustainable commercial horticultural production.						
GENERAL OBJECTIVE 1.0: Understand soilless cultivation systems and their principles						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-2	1.1 Explain the concept of soilless cultivation. 1.2 Describe the principles of hydroponics. 1.3 Differentiate between major soilless cultivation systems. 1.4 Explain the advantages and limitations of soilless cultivation. 1.5 1.5 Describe the components of	• Explain the concept and history of hydroponics. • Discuss principles of soilless cultivation. • Illustrate different hydroponic systems using charts and videos. • Compare hydroponic and conventional production systems. • Discuss	Hydroponics textbooks Charts and diagrams Multimedia projector Hydroponic system models Videos and animations Internet resources	Identify components of hydroponic systems. Assemble simple hydroponic units. Compare different hydroponic systems. Inspect operational hydroponic facilities. Maintain hydroponic structures.	• Demonstrate identification of hydroponic components. • Guide students in assembling hydroponic units. • Demonstrate operation of different systems. • Organize visits to commercial hydroponic facilities. • Supervise maintenance exercises.	NFT units DWC units Pumps Reservoir tanks Pipes and fittings Hydroponic greenhouse

	hydroponic systems.	commercial applications of hydroponics.				
GENERAL OBJECTIVE 2.0: Apply nutrient solution preparation and management						
3-4	2.1 Explain essential plant nutrients. 2.2 Describe nutrient solution formulation. 2.3 Explain EC and pH concepts. 2.4 Describe nutrient deficiencies and toxicities. 2.5 Explain nutrient monitoring procedures.	• Explain plant nutrition requirements. • Discuss nutrient solution preparation. • Explain EC and pH management. • Discuss nutrient imbalance symptoms. • Demonstrate nutrient calculations.	Plant nutrition manuals Fertilizer samples EC charts pH charts Multimedia projector	Prepare nutrient solutions. Measure EC and pH. Adjust nutrient concentrations. Monitor nutrient solution quality. Maintain nutrient management records.	• Demonstrate nutrient solution preparation. • Guide EC and pH measurements. • Demonstrate nutrient adjustments. • Supervise monitoring exercises. • Guide record keeping.	Fertilizer salts Measuring cylinders Digital EC meters Digital pH meters Mixing tanks Water supply
GENERAL OBJECTIVE 3.0: Apply Nutrient Film Technique (NFT) and Deep-Water Culture (DWC) hydroponic systems						
5-7	3.1 Explain the Nutrient Film Technique (NFT). 3.2 Explain Deep Water Culture (DWC). 3.3 Describe system design requirements. 3.4 Explain operation	• Explain NFT principles. • Explain DWC principles. • Discuss design specifications. • Illustrate system layouts. • Discuss maintenance	System diagrams Hydroponic manuals Videos Multimedia projector	Install NFT systems. Install DWC systems. Operate hydroponic systems. Troubleshoot operational faults. Evaluate system performance.	• Demonstrate installation procedures. • Guide students during installation. • Demonstrate operational procedures. • Supervise	NFT channels DWC tanks Water pumps Air pumps Net pots Growing trays

	and maintenance procedures. 3.5 Describe factors affecting system performance	requirements.			troubleshooting exercises. • Assess system performance.	
GENERAL OBJECTIVE 4.0: Apply substrate and bag culture production systems						
8-9	4.1 Explain substrate culture systems. 4.2 Describe common growing media. 4.3 Explain bag culture production. 4.4 Describe media selection criteria. 4.5 Explain media sterilization methods.	• Explain substrate culture principles. • Discuss growing media characteristics. • Explain media sterilization methods. • Discuss crop suitability. • Explain bag culture systems.	Growing media samples Charts Manuals Multimedia projector	Prepare growing media. Sterilize growing media. Establish bag culture systems. Plant crops in substrate systems. Evaluate media performance.	• Demonstrate media preparation. • Demonstrate sterilization procedures. • Guide bag culture establishment. • Supervise planting activities. • Monitor crop growth.	Cocopeat Perlite Vermiculite Rice husk Nursery bags Steam sterilizer
GENERAL OBJECTIVE 5.0: Apply crop management in soilless production						
10-13	5.1 Explain crop establishment procedures. 5.2 Describe environmental management requirements. 5.3 Explain pest and disease management. 5.4 Describe harvesting	• Explain crop establishment methods. • Discuss environmental control systems. • Explain IPM practices. • Discuss harvesting standards. • Explain quality	Crop production manuals Environmental monitoring charts IPM manuals Multimedia projector	Establish crops in hydroponic systems. Monitor crop growth. Implement IPM programmes. Harvest hydroponic crops. Maintain production records.	• Demonstrate transplanting techniques. • Guide crop monitoring. • Demonstrate IPM practices. • Supervise harvesting. • Verify production records.	Seedlings Hydroponic units Monitoring sheets IPM tools Harvesting tools

	5.5	procedures. Explain quality assurance requirements.	management systems.				
GENERAL OBJECTIVE 6.0: Understand the economics and enterprise management of soilless cultivation							
14-15	6.1	Explain hydroponic enterprise economics.	• Explain hydroponic business models. • Discuss enterprise budgeting. • Explain investment appraisal. • Discuss market opportunities. • Explain commercialization strategies.	Business plan templates Enterprise budgets Market reports Computers Multimedia projector	Prepare enterprise budgets. Conduct feasibility studies. Analyze production costs. Develop marketing plans. Prepare business proposals.	• Guide budget preparation. • Supervise feasibility studies. • Demonstrate cost analysis. • Guide marketing plan development. • Assess business proposals.	Computers Calculators Budget templates Market survey forms Business plan templates
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%							

HOT 325: SPICES AND HERBS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: SPICES AND HERBS	COURSE CODE: HOT 325	CONTACT HOURS: 3HOURS/WEEK
	CREDIT UNITS: 3	THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 2HOURS/WEEK
GOAL: To equip students with knowledge and practical skills in the identification, production, processing, utilization, and commercialization of herbs and spices.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the identification, classification, and properties of important spices. 2.0 Understand the identification, classification, and properties of important herbs. 3.0 Understand the origin, distribution, environmental requirements, and production practices of spices. 4.0 Understand the origin, distribution, environmental requirements, and production practices of herbs. 5.0 Understand the maturity indices, processing, storage, and utilization of herbs and spices. 6.0 Understand the economic and industrial importance of herbs and spices		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY							
COURSE TITLE: SPICES AND HERBS				COURSE CODE: HOT 325		CONTACT HOURS: 3HOURS/WEEK	
				CREDIT UNITS: 3		THEORETICAL: 1HOUR/WEEK	
YEAR: I SEMESTER: II				PRE-REQUISITE: Nil		PRACTICAL: 2HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL							
GOAL: To equip students with knowledge and practical skills in the identification, production, processing, utilization, and commercialization of herbs and spices.							
GENERAL OBJECTIVE 1.0: Understand the identification, classification, and properties of important spices.							
THEORETICAL CONTENT				PRACTICAL CONTENT			
Week	Specific Learning Outcome		Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-2	1.1	Classify spices according to plant parts utilized.	• Explain the classification of spices. • Display spice samples and photographs. • Discuss botanical characteristics of important spices. • Explain the properties and uses of spices.	Spice samples Herbarium specimens Charts and posters Multimedia presentations Reference texts	Identify important spice crops and products.	• Demonstrate spice identification. • Guide specimen collection. • Supervise classification exercises. • Guide morphological observations	Fresh spice samples Hand lenses Identification guides Herbarium materials
	1.2	Identify important spice crops cultivated in Nigeria and the tropics.			Classify spice samples according to plant parts utilized.		
	1.3	Describe the botanical characteristics of major spices.			Examine and record morphological characteristics of spices.		
	1.4	Explain the physical and chemical properties of spices.			Prepare a collection of spice specimens.		
	1.5	Differentiate					

	between fresh and processed spice products.					
GENERAL OBJECTIVE 2.0: Understand the identification, classification, and properties of important herbs.						
3-5	.1 Classify herbs according to their uses. .2 Identify important herb crops cultivated in Nigeria and the tropics. .3 Describe the botanical characteristics of major herbs. .4 Explain the physical and aromatic properties of herbs. .5 Differentiate among culinary, medicinal, and aromatic herbs.	• Explain herb classification systems. • Discuss characteristics of important herbs. • Present herb samples and images. • Explain herb properties and applications.	Herb samples Charts Multimedia presentations Reference books	Identify important herb crops. Classify herb samples according to use. Examine and record morphological characteristics of herbs. Prepare a herbarium collection of herbs.	• Demonstrate herb identification. • Guide herbarium preparation. • Supervise classification exercises. • Guide plant observations.	Fresh herb samples Hand lenses Herbarium materials Identification manuals
GENERAL OBJECTIVE 3.0: Understand the origin, distribution, environmental requirements, and production practices of spices.						
6-8	3.1 Describe the origin and distribution of important spices. 3.2 Explain environmental requirements for spice production.	• Explain agroecological requirements. • Discuss propagation techniques.	Maps Production manuals Propagation charts Videos	Propagate selected spice crops. Prepare nursery media for spice production. Establish a spice nursery.	• Demonstrate propagation techniques. • Guide nursery establishment. • Demonstrate	Nursery beds Seed trays Poly pots Planting materials Field tools

	3.3 Describe propagation methods used for spice crops. 3.4 Explain land preparation and planting procedures for spices. 3.5 Explain cultural and maintenance practices in spice production.	• Explain field establishment practices. • Discuss crop management operations.		Plant and maintain spice crops in the field. Maintain production records for spice crops.	planting operations. • Supervise field maintenance activities.	
GENERAL OBJECTIVE 4.0: Understand the origin, distribution, environmental requirements, and production practices of herbs.						
9-11	4.1 Describe the origin and distribution of important herbs. 4.2 Explain environmental requirements for herb production. 4.3 Describe propagation methods used for herbs. 4.4 Explain land preparation and planting procedures for herbs. 4.5 Explain cultural and maintenance	• Explain ecological requirements. • Discuss herb propagation methods. • Explain crop establishment procedures. • Discuss maintenance operations.	Production guides Maps Charts Videos	Propagate selected herb crops. Establish a herb nursery. Transplant herb seedlings into the field. Carry out maintenance operations on herb crops. Maintain production records for herb crops.	• Demonstrate herb propagation. • Guide nursery establishment. • Demonstrate transplanting techniques. • Supervise field management activities	Nursery facilities Seedlings Irrigation equipment Farm tools

	practices in herb production.					
GENERAL OBJECTIVE 5.0: Understand the maturity indices, processing, storage, and utilization of herbs and spices.						
12-13	5.1 Explain maturity indices for herbs and spices. 5.2 Describe harvesting methods for herbs and spices. 5.3 Explain primary processing operations. 5.4 Describe storage requirements for herbs and spices. 5.5 Explain the medicinal and food values of herbs and spices.	• Discuss harvest maturity indicators. • Explain processing methods. • Discuss storage practices. • Explain nutritional and medicinal values.	Quality standards manuals Processing charts Storage guides Product samples	Determine harvest maturity of herbs and spices. Harvest herbs and spices using recommended procedures. Process harvested herbs and spices. Package and store processed products. 5.5 Assess product quality after processing.	• Demonstrate harvesting techniques. • Demonstrate drying and processing methods. • Guide packaging and storage operations. • Supervise quality assessment exercises.	Harvesting tools Solar dryers Mechanical dryers Packaging materials Storage containers Moisture meters
GENERAL OBJECTIVE 6.0: Understand the economic and industrial importance of herbs and spices						
14-15	6.1 Explain the economic importance of herbs and spices. 6.2 Describe industrial uses of herbs and spices. 6.3 Explain value addition opportunities in	• Discuss value chains. • Explain industrial applications. • Discuss marketing systems. • Explain export requirements	Market reports Export manuals Product samples Packaging guides	Conduct a market survey for herbs and spices. Grade and package herb and spice products. Prepare a simple enterprise budget for herb and spice production.	• Guide market survey exercises. • Demonstrate grading and packaging. • Guide enterprise budgeting. • Supervise preparation of marketing plans.	Market survey forms Packaging materials Calculator/computer Budget templates Marketing plan templates

	herb and spice production. 6.4 Describe marketing channels for herb and spice products. 6.5 Explain export opportunities for herbs and spices.			Develop a marketing plan for a herb or spice product.		
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 326: POST-HARVEST HANDLING AND VALUE CHAIN SYSTEMS

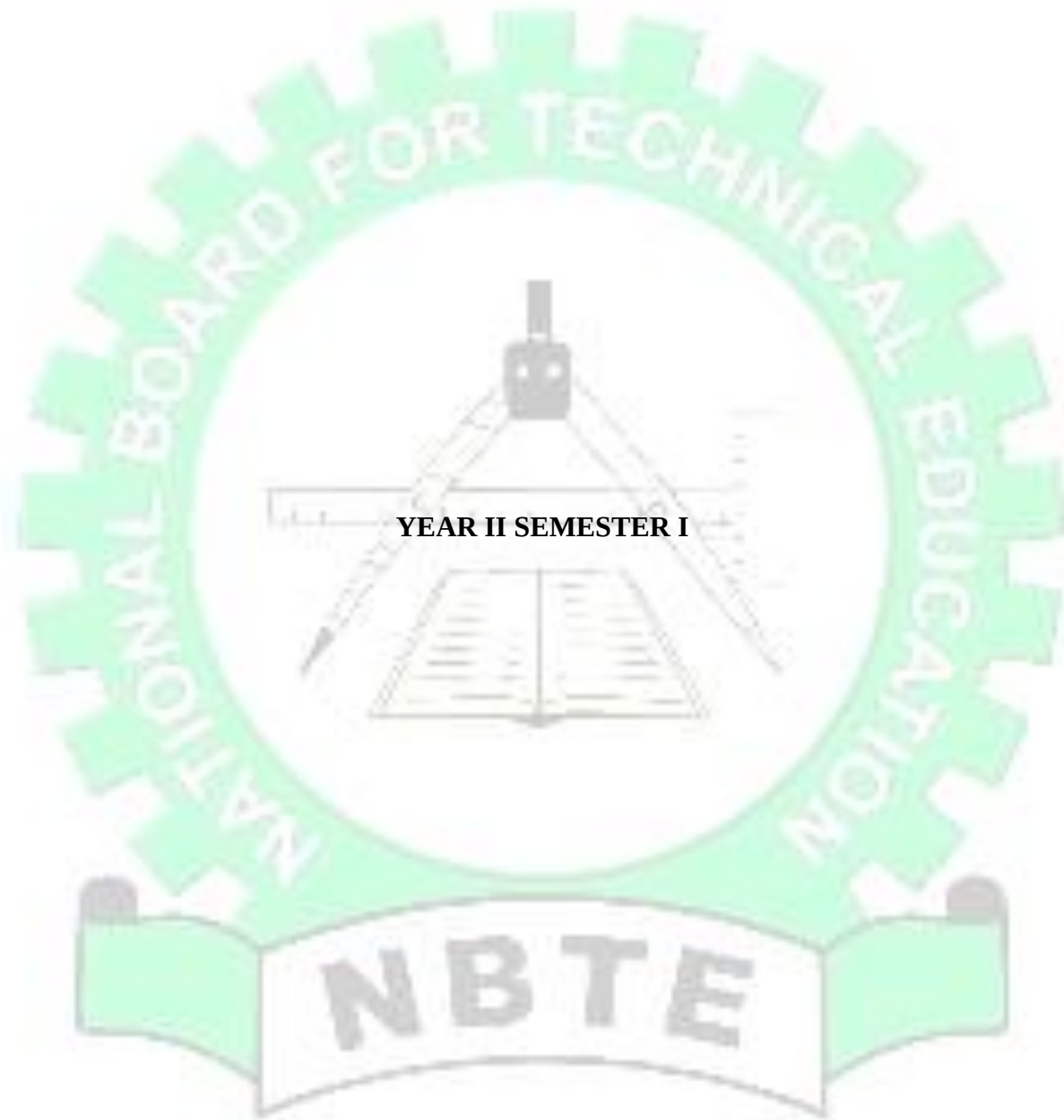
PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: POST-HARVEST HANDLING AND VALUE CHAIN SYSTEMS	COURSE CODE: HOT 326	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 3HOURS/WEEK
GOAL: This course is designed to equip students with advanced knowledge and practical skills in post-harvest management, value addition, quality assurance, and value chain development for horticultural products.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand advanced post-harvest physiology and storage technologies 2.0 Know Commercial Grading, Packaging, and Labeling Systems for Horticultural Crops. 3.0 Know Food Safety and Quality Management Systems in Post-Harvest Operations. 4.0 Know Value-Addition and Processing Technologies for Horticultural Crops. 5.0 Know Post-Harvest Value Chain Management Systems. 6.0 Know Post-Harvest Enterprise Planning and Management.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: POST-HARVEST HANDLING AND VALUE CHAIN SYSTEMS			COURSE CODE: HOT 326SS		CONTACT HOURS: 4HOURS/WEEK	
			CREDIT UNITS: 4		THEORETICAL: 1HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE: Nil		PRACTICAL: 3HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with advanced knowledge and practical skills in post-harvest management, value addition, quality assurance, and value chain development for horticultural products.						
GENERAL OBJECTIVE 1.0: Understand advanced post-harvest physiology and storage technologies						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain physiological changes occurring after harvest. 1.2 Describe factors affecting shelf life of horticultural produce. 1.3 Explain storage technologies for fruits and vegetables. 1.4 Describe modified and controlled atmosphere storage systems. 1.5 Explain causes of post-harvest losses and their control.	• Explain physiological changes occurring after harvest. • Discuss factors affecting shelf life of horticultural produce. • Explain storage technologies for fruits and vegetables. • Discuss modified and controlled atmosphere storage systems. • Explain causes of post-harvest losses	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Post-harvest manuals Storage facility models Charts and diagrams	• Assess quality changes during storage. • Operate storage facilities. • Monitor storage conditions. • Evaluate shelf life of produce. • Record post-harvest losses.	Guide students to: • Assess quality changes during storage. • Operate storage facilities. • Monitor storage conditions. • Evaluate shelf life of produce. • Record post-harvest losses.	Cold rooms Thermometers Hygrometers Storage crates

		and their control.				
GENERAL OBJECTIVE 2.0: Know Commercial Grading, Packaging, and Labeling Systems for Horticultural Crops.						
4-6	2.1 Explain grading standards. 2.2 Describe packaging materials and technologies. 2.3 Explain labeling requirements. 2.4 Describe export packaging specifications. 2.5 Explain packaging quality standards.	• Explain grading standards. • Explain packaging materials and technologies. • Explain labeling requirements. • Explain export packaging specifications. • Explain packaging quality standards.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Packaging samples Grading manuals Labeling standards	• Grade horticultural produce. • Package produce according to standards. • Design product labels. • Apply export packaging requirements. • Conduct packaging quality assessments.	• Grade horticultural produce. • Package produce according to standards. • Design product labels. • Apply export packaging requirements. • Conduct packaging quality assessments.	Packaging materials Label printers Grading equipment
GENERAL OBJECTIVE 3.0: Know Food Safety and Quality Management Systems in Post-Harvest Operations.						
7-8	3.1 Explain food safety principles. 3.2 Describe HACCP systems. 3.3 Explain contamination risks. 3.4 Describe quality assurance procedures. 3.5 Explain food safety regulations.	• Explain food safety principles. • Discuss HACCP systems. • Explain contamination risks. • Explain quality assurance procedures. • Explain food safety	Laptop Computers, smart board Projector Writing Materials White board Markers Internet HACCP manuals Food safety guides Regulatory	• Conduct food safety inspections. • Identify contamination hazards. • Apply sanitation procedures. • Conduct quality assessments. • Maintain food safety records.	Guide students to: • Conduct food safety inspections. • Identify contamination hazards. • Apply sanitation procedures. • Conduct quality assessments. • Maintain food safety records.	PPE Inspection checklists Quality control kits

		regulations.	publications			
GENERAL OBJECTIVE 4.0: Know Value-Addition and Processing Technologies for Horticultural Crops.						
9-10	4.1 Explain principles of value addition. 4.2 Describe processing technologies. 4.3 Explain preservation methods. 4.4 Describe product development procedures. 4.5 Explain quality requirements for processed products.	• Explain principles of value addition. • Discuss processing technologies. • Explain preservation methods. • Explain product development procedures. • Explain quality requirements for processed products.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Processing manuals Product samples Multimedia presentations	• Produce processed fruit products. • Produce processed vegetable products. • Apply preservation technologies. • Develop value-added products. • Evaluate product quality.	Guide students to: • Produce processed fruit products. • Produce processed vegetable products. • Apply preservation technologies. • Develop value-added products. • Evaluate product quality.	Processing equipment Dryers Blenders Packaging materials
GENERAL OBJECTIVE 5.0: Know Post-Harvest Value Chain Management Systems.						
11-12	5.1 Explain horticultural value chains. 5.2 Describe value chain actors. 5.3 Explain logistics management. 5.4 Describe market linkage systems. 5.5 Explain traceability systems.	• Explain horticultural value chains. • Explain value chain actors. • Explain logistics management. • Explain market linkage systems. • Explain traceability systems.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Value chain maps Market reports	• Map horticultural value chains. • Analyze value chain performance. • Maintain traceability records. • Evaluate logistics operations. • Develop value chain improvement plans.	Guide students to: • Map horticultural value chains. • Analyze value chain performance. • Maintain traceability records. • Evaluate logistics operations. Develop value chain	Computers Value chain templates Traceability software

			Logistics manuals		improvement plans.	
GENERAL OBJECTIVE 6.0: Know Post-Harvest Enterprise Planning and Management.						
13-15	6.1 Explain post-harvest enterprise management. 6.2 Describe enterprise budgeting. 6.3 Explain business planning. 6.4 Describe marketing strategies. 6.5 Explain commercialization opportunities.	• Explain post-harvest enterprise management. • Explain enterprise budgeting. • Explain business planning. • Explain marketing strategies. • Explain commercialization opportunities.	Laptop Computers, smart board Projector Writing Materials White board Markers Internet Business plan templates Marketing guides Enterprise manuals	• Prepare enterprise budgets. • Develop business plans. • Conduct market assessments. • Prepare commercialization strategies. • Present enterprise proposals.	Guide students to: • Prepare enterprise budgets. • Develop business plans. • Conduct market assessments. • Prepare commercialization strategies. • Present enterprise proposals.	Computers Budget templates Market reports
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



YEAR II SEMESTER I

HOT 411: HORTICULTURAL BIOTECHNOLOGY & SEED SYSTEMS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: HORTICULTURAL BIOTECHNOLOGY & SEED SYSTEMS	COURSE CODE: HOT 411	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 3HOURS/WEEK
GOAL: To Equip Students with Knowledge and Practical Skills in Horticultural Biotechnology, Tissue Culture, Plant Breeding, Seed Technology, Seed Quality Assurance, And Modern Seed Systems for Commercial Horticultural Production.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand Biotechnology Applications in Horticulture 3.0 Apply Plant Breeding Principles in Horticultural Improvement 4.0 Apply Seed Technology and Quality Testing 5.0 Understand Seed Systems and Certification in Nigeria 6.0 Apply Bioinformatics and Molecular Tools in Horticultural Research		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: HORTICULTURAL BIOTECHNOLOGY & SEED SYSTEMS				COURSE CODE: HOT 411		CONTACT HOURS: 4HOURS/WEEK
				CREDIT UNITS: 4		THEORETICAL: 1HOUR/WEEK
YEAR: II SEMESTER: I				PRE-REQUISITE: Nil		PRACTICAL: 3HOURS/WEEK
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To Equip Students with Knowledge and Practical Skills in Horticultural Biotechnology, Tissue Culture, Plant Breeding, Seed Technology, Seed Quality Assurance, And Modern Seed Systems for Commercial Horticultural Production.						
GENERAL OBJECTIVE 1.0: Understand Biotechnology Applications in Horticulture						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain the concept of biotechnology. 1.2 Describe the scope of biotechnology in horticulture. 1.3 Explain applications of biotechnology in crop improvement. 1.4 Describe advantages and limitations of biotechnology. 1.5 Explain biosafety and regulatory issues in biotechnology.	• Explain biotechnology concepts and terminologies. • Discuss applications of biotechnology in horticulture. • Explain biotechnology tools and techniques. • Discuss benefits and limitations of biotechnology. • Explain biosafety regulations and guidelines.	Biotechnology textbooks Scientific journals Multimedia projector Charts and diagrams Internet facilities	Identify biotechnology laboratory equipment. Demonstrate laboratory safety procedures. Classify biotechnology tools and materials. Examine biotechnology case studies. Prepare laboratory reports.	• Demonstrate laboratory equipment. • Guide laboratory safety exercises. • Demonstrate equipment handling procedures. • Supervise practical sessions. • Assess laboratory reports.	Biotechnology laboratory Laboratory coats Gloves Laboratory manuals Microscopes Laboratory equipment
GENERAL OBJECTIVE 2.0: Apply Plant Breeding Principles in Horticultural Improvement						
4-5	2.1 Explain principles	• Explain breeding	Plant breeding	Conduct controlled	• Demonstrate	Breeding plots

	2.2	of plant breeding. Describe breeding objectives in horticultural crops.	principles. • Discuss breeding objectives.	textbooks Charts and diagrams Breeding manuals Multimedia projector	pollination. Perform hybridization exercises. Select superior breeding materials. Evaluate breeding populations. Maintain breeding records	pollination techniques. • Guide hybridization exercises. • Supervise selection activities. • Assess breeding records.	Pollination bags Forceps Labels and tags Record books
	2.3	Explain methods of crop improvement.	• Explain hybridization methods.				
	2.4	Describe hybridization techniques.	• Discuss variety development processes.				
	2.5	Explain variety development procedures.	• Explain variety release procedures				
GENERAL OBJECTIVE 3.0: Apply Seed Technology and Quality Testing							
6-8	3.1	Explain seed formation and development.	• Explain seed biology.	Seed technology manuals Seed samples Charts and diagrams Multimedia projector	Conduct germination tests. Determine seed purity. Assess seed moisture content. Process seed samples. Prepare seed testing reports.	• Demonstrate germination testing. • Guide purity analysis. • Demonstrate moisture testing procedures. • Supervise seed processing activities.	Germination chambers Seed testing trays Moisture meter Seed sieves Weighing balance Seed samples
	3.2	Describe seed processing procedures.	• Discuss seed processing techniques.				
	3.3	Explain seed storage principles.	• Explain seed storage requirements.				
	3.4	Describe seed quality testing methods.	• Discuss seed testing procedures.				
	3.5	Explain seed quality standards.	• Explain quality standards.				
GENERAL OBJECTIVE 4.0: Understand Seed Systems and Certification in Nigeria							
9-11	4.1	Explain the concept of seed systems.	• Explain seed system concepts.	National seed regulations Seed	Inspect seed production fields. Evaluate seed lots.	• Demonstrate field inspection procedures.	Seed fields Inspection forms Certification
	4.2	Describe formal and	• Discuss seed				

	informal seed systems. 4.3 Explain seed certification procedures. 4.4 Describe seed laws and regulations. 4.5 Explain the roles of seed regulatory agencies.	certification schemes. • Explain seed regulations. • Discuss seed industry stakeholders. • Explain institutional roles.	certification manuals NASC publications Multimedia projector Internet facilities	Complete seed certification documents. Conduct seed traceability exercises. Prepare certification reports.	• Guide seed lot evaluation. • Supervise certification documentation. • Assess inspection reports.	templates Seed samples Field manuals
GENERAL OBJECTIVE 5.0: Apply Bioinformatics and Molecular Tools in Horticultural Research						
12-15	5.1 Explain bioinformatics concepts. 5.2 Describe molecular markers used in horticulture. 5.3 Explain DNA-based technologies. 5.4 Describe genomic applications in crop improvement. 5.5 Explain molecular breeding techniques.	• Explain bioinformatics concepts. • Discuss molecular marker systems. • Explain DNA technologies. • Discuss genomics applications. • Explain molecular breeding procedures	Biotechnology textbooks Scientific journals Computers Multimedia projector Internet facilities	Access bioinformatics databases. Interpret molecular marker data. Analyze genetic information. Use software for genetic analysis. Prepare molecular data reports.	• Demonstrate database access. • Guide molecular data analysis. • Supervise software applications. • Assess reports and presentations.	Computers Internet facilities Bioinformatics software DNA sequence databases Projector

COURSE ASSESSMENT:

Course work: 10% |

Test/Assignments: 10% |

Practical: 40% |

Examination: 40% |

Total: 100%



HOT 412: HORTICULTURAL BUSINESS MANAGEMENT AND AGRI-FINANCE

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: HORTICULTURAL BUSINESS MANAGEMENT AND AGRI-FINANCE	COURSE CODE: HOT 412	CONTACT HOURS: 3HOURS/WEEK
	CREDIT UNITS: 3	THEORETICAL: 1HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 2HOURS/WEEK
GOAL:		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Apply enterprise budgeting and financial analysis in horticultural businesses 2.0 Apply marketing strategies and value chain management in horticultural enterprises. 3.0 Apply business planning and enterprise development for horticultural ventures. 4.0 Apply human resource and operational management in horticultural enterprises. 5.0 Apply Agri finance, investment analysis, and resource mobilization in horticulture. 6.0 Apply digital business management tools and data-driven decision-making in horticultural enterprises		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY							
COURSE TITLE: HORTICULTURAL BUSINESS MANAGEMENT AND AGRI-FINANCE			COURSE CODE: HOT 412		CONTACT HOURS: 3HOURS/WEEK		
			CREDIT UNITS: 3		THEORETICAL: 1HOUR/WEEK		
YEAR: II SEMESTER: I			PRE-REQUISITE: Nil		PRACTICAL: 2HOURS/WEEK		
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL							
GOAL:							
GENERAL OBJECTIVE 1.0: Apply enterprise budgeting and financial analysis in horticultural businesses							
THEORETICAL CONTENT				PRACTICAL CONTENT			
Week	Specific Learning Outcome		Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1	Explain enterprise budgeting principles.	• Explain budgeting procedures. • Demonstrate enterprise analysis techniques. • Discuss farm financial records. • Explain profitability indicators.	Farm management textbooks Enterprise budget templates Financial records Projector	Prepare enterprise budgets.	• Demonstrate budget preparation. • Guide financial calculations. • Supervise profitability analysis.	Computers Calculators Budget worksheets Farm records
	1.2	Describe cost and return analysis.			Compute gross margins.		
	1.3	Explain financial statements used in agribusiness.			Analyze production costs.		
	1.4	Calculate profitability indicators.			Prepare cash flow statements.		
	1.5	1.5 Explain financial decision-making tools.			Evaluate enterprise profitability.		
GENERAL OBJECTIVE 2.0: Apply marketing strategies and value chain management in horticultural enterprises.							
4-5	2.1	Explain horticultural marketing	• Explain marketing concepts. • Discuss value	Marketing manuals Market reports	Conduct market surveys. Analyze value chains.	• Guide market surveys. • Demonstrate value	Survey forms Computers Market reports

	2.2	systems. Describe value chains.	chain development. • Explain market information systems. • Discuss customer management.	Value chain maps Internet facilities	Develop marketing plans. Identify market opportunities. Prepare market reports.	chain mapping. • Supervise marketing plan development.	
	2.3	Explain market intelligence systems.					
	2.4	Describe marketing strategies.					
	2.5	Explain customer relationship management.					
GENERAL OBJECTIVE 3.0: Apply business planning and enterprise development for horticultural ventures.							
6-7	3.1	Explain business planning principles.	• Explain business planning. • Discuss enterprise development. • Explain feasibility analysis. • Discuss business risks.	Business plan templates Case studies Multimedia presentations	Develop a business plan. Conduct a feasibility study. Identify enterprise risks. Develop risk management plans. Present enterprise proposals.	• Guide business plan preparation. • Supervise feasibility studies. • Evaluate enterprise proposals.	Computers Business planning software Feasibility study templates
	3.2	Describe business plan components.					
	3.3	Explain enterprise feasibility studies.					
	3.4	Describe business risks.					
	3.5	Explain enterprise growth strategies.					
GENERAL OBJECTIVE 4.0: Apply human resource and operational management in horticultural enterprises.							
8-10	4.1	Explain human resource	• Explain HR management.	HR manuals Organizational	Prepare staff schedules.	• Demonstrate workforce	Staff schedules Personnel records

	management principles. 4.2 Describe labor management systems. 4.3 Explain operational planning. 4.4 Describe performance management systems. 4.5 Explain workplace safety requirements.	• Discuss labor supervision. • Explain operational planning. • Discuss workplace safety.	charts Safety manuals	Assign operational tasks. Conduct staff evaluations. Maintain personnel records. Prepare operational plans.	planning. • Supervise operational planning exercises. • Guide personnel record keeping.	Operational templates
GENERAL OBJECTIVE 5.0: Apply Agri finance, investment analysis, and resource mobilization in horticulture.						
11-13	5.1 Explain agricultural financing systems. 5.2 Describe investment appraisal techniques. 5.3 Explain credit facilities available to agribusinesses. 5.4 Describe financial risk management. 5.5 Explain resource mobilization strategies.	• Explain financing options. • Demonstrate investment appraisal methods. • Discuss financial risk management.	Agrifinance manuals Loan application guides Financial calculators	Prepare loan applications. Conduct investment appraisals. Calculate investment returns. Evaluate financing alternatives. Develop funding proposals.	• Guide loan preparation. • Demonstrate investment calculations. • Supervise proposal writing.	Loan forms Computers Financial calculators
GENERAL OBJECTIVE 6.0: Apply digital business management tools and data-driven decision-making in horticultural enterprises						
14-15	6.1 Explain digital farm management systems. 6.2 Describe farm	• Explain digital business tools. • Demonstrate	Computers Farm software Internet facilities	Use farm management software. Maintain digital	• Demonstrate software applications.	Computers Smartphones Farm management

	management software applications. 6.3 Explain digital marketing tools. 6.4 Describe data analysis techniques. 6.5 Explain data-driven decision making.	software applications. • Discuss data analytics.		records. Analyze enterprise data. Develop digital marketing campaigns. Generate management reports.	• Guide data analysis exercises. • Supervise report generation.	software
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 413: FIELD PRACTICAL (EXPORT-ORIENTED PRODUCTION SYSTEMS)

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: FIELD PRACTICAL II (EXPORT-ORIENTED PRODUCTION SYSTEMS)	COURSE CODE: HOT 413	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 0HOURS/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 4HOURS/WEEK
GOAL:		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Apply Export-Standard Fruit and Vegetable Production Practices 2.0 Apply Phytosanitary, Food Safety, And Quality Compliance Measures on Commercial Horticultural Farms. 3.0 Apply Traceability, Record-Keeping, And Farm Documentation Systems for Export Markets. 4.0 Apply Post-Harvest Handling, Grading, Packaging, And Export Preparation Procedures. 5.0 Apply Enterprise Management, Productivity Monitoring, And Market-Oriented Production Practices. 6.0 Apply Teamwork, Leadership, Communication, And Professional Ethics in Export-Oriented Horticultural Operations.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: FIELD PRACTICAL II (EXPORT-ORIENTED PRODUCTION SYSTEMS)			COURSE CODE: HOT 413		CONTACT HOURS: 4HOURS/WEEK	
			CREDIT UNITS: 4		THEORETICAL: 0HOURS/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: Nil		PRACTICAL: 4HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL:						
GENERAL OBJECTIVE 1.0: Apply Export-Standard Fruit and Vegetable Production Practices						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain export-oriented horticultural production systems. 1.2 Describe export market requirements for fruits and vegetables. 1.3 Explain production protocols for export crops. 1.4 Describe quality requirements for export produce. 1.5 Explain challenges in export-oriented production.	• Explain export production systems. • Discuss export market standards. • Explain production protocols. • Discuss quality specifications. • Explain common production constraints.	Export production manuals GAP manuals Multimedia presentations Export market reports Internet facilities	Establish export-oriented production plots. Implement recommended crop production practices. Monitor crop growth. Maintain production records. Evaluate crop performance.	• Demonstrate field operations. • Assign production tasks. • Verify records. • Assess crop management activities.	Commercial farms Farm tools Production records Farm inputs
GENERAL OBJECTIVE 2.0: Apply Phytosanitary, Food Safety, And Quality Compliance Measures on Commercial Horticultural Farms.						
4-5	2.1 Explain phytosanitary	• Explain phytosanitary	Phytosanitary manuals	Conduct farm	• Demonstrate compliance	PPE Inspection forms

	requirements for export crops. 2.2 Describe food safety standards in horticulture. 2.3 Explain quality assurance systems. 2.4 Describe compliance auditing procedures. 2.5 Explain the consequences of non-compliance.	regulations. • Discuss food safety standards. • Explain quality assurance systems. • Discuss compliance procedures.	HACCP guidelines Compliance checklists Regulatory publications	sanitation activities. Implement phytosanitary procedures. Apply food safety measures. Conduct compliance inspections. Maintain compliance records.	procedures. • Supervise inspections. • Verify compliance documentation	Compliance manuals
GENERAL OBJECTIVE 3.0: Apply Traceability, Record-Keeping, And Farm Documentation Systems for Export Markets.						
6-8	3.1 Explain traceability principles. 3.2 Describe farm documentation systems. 3.3 Explain record-keeping requirements for export certification. 3.4 Describe digital traceability tools. 3.5 Explain the importance of traceability in market access.	• Explain traceability concepts. • Discuss documentation systems. • Demonstrate digital record management. • Explain certification requirements.	Traceability manuals Record books Farm software Computers Internet facilities	Maintain production records. Prepare traceability documentation. Track produce movement. Use digital farm records. Generate compliance reports.	• Demonstrate record management. • Guide traceability exercises. • Verify documentation.	Computers Smartphones Traceability software Record books
GENERAL OBJECTIVE 4.0: Apply Post-Harvest Handling, Grading, Packaging, And Export Preparation Procedures.						
9-11	4.1 Explain export	• Explain post-	Post-harvest	Harvest produces	• Demonstrate	Harvesting

	post-harvest handling requirements. 4.2 Describe grading standards for export produce. 4.3 Explain packaging specifications for export markets. 4.4 Describe cold chain management systems. 4.5 Explain export preparation procedures.	harvest handling principles. • Discuss grading standards. • Explain export packaging requirements. • Discuss cold chain systems.	manuals Packaging standards Grading charts Cold chain guides	according to export standards. Sort and grade produce. Package produce appropriately. Prepare export consignments. Maintain post-harvest records.	harvesting techniques. • Supervise grading and packaging. • Verify export preparation procedures.	tools Packaging materials Grading equipment Cold storage facilities
GENERAL OBJECTIVE 5.0: Apply Enterprise Management, Productivity Monitoring, And Market-Oriented Production Practices.						
12-13	5.1 Explain enterprise performance indicators. 5.2 Describe productivity assessment methods. 5.3 Explain market-oriented production systems. 5.4 Describe enterprise reporting procedures. 5.5 Explain continuous improvement strategies.	• Explain enterprise management concepts. • Discuss productivity indicators. • Explain market-driven production. • Discuss reporting procedures.	Enterprise management manuals Productivity monitoring guides Market reports Farm records		• Guide productivity assessments. • Verify reports. • Supervise market-oriented activities.	Enterprise records Market reports Productivity assessment tools
GENERAL OBJECTIVE 6.0: Apply Teamwork, Leadership, Communication, And Professional Ethics in Export-Oriented						

Horticultural Operations.						
14-15	6.1 Explain principles of teamwork. 6.2 Describe leadership roles in horticultural enterprises. 6.3 Explain workplace communication systems. 6.4 Describe professional ethics in agricultural operations. 6.5 Explain occupational health and safety requirements.	• Explain teamwork principles. • Discuss leadership responsibilities. • Explain workplace communication. • Discuss professional ethics and safety requirements.	Workplace manuals Occupational safety manuals Leadership guides Communication handbooks	Participate effectively in work teams. Demonstrate leadership during field activities. Communicate technical information effectively. Apply workplace ethics. Prepare and present field attachment reports.	• Assign team responsibilities. • Assess leadership and communication. • Evaluate reports and presentations	Industrial attachment logbooks Report templates Presentation facilities
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 414: FRUIT AND VEGETABLE PROCESSING AND STORAGE

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: FRUIT AND VEGETABLE PROCESSING AND STORAGE	COURSE CODE: HOT 414	CONTACT HOURS: 3HOURS/WEEK
	CREDIT UNITS: 3	THEORETICAL: 1HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 2HOURS/WEEK
GOAL: To equip students with knowledge and practical skills in post-harvest handling, processing, storage, quality assurance, and commercialization of fruit and vegetable products.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand post-harvest physiology, quality deterioration, and loss management in fruits and vegetables. 2.0 Understand processing techniques and value addition for fruits and vegetables. 3.0 Understand packaging, quality assurance, food safety, and traceability systems for processed fruits and vegetables. 4.0 Understand storage systems, cold chain management, and shelf-life extension technologies for fruits and vegetables 5.0 Understand the economics, marketing, branding, and commercialization of processed fruits and vegetable products.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: FRUIT AND VEGETABLE PROCESSING AND STORAGE			COURSE CODE: HOT 414		CONTACT HOURS: 3HOURS/WEEK	
			CREDIT UNITS: 3		THEORETICAL: 1HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: Nil		PRACTICAL: 2HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and practical skills in post-harvest handling, processing, storage, quality assurance, and commercialization of fruit and vegetable products.						
GENERAL OBJECTIVE 1.0: Understand post-harvest physiology, quality deterioration, and loss management in fruits and vegetables.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain physiological changes occurring after harvest. 1.2 Describe respiration and transpiration processes. 1.3 Explain factors responsible for quality deterioration. 1.4 Describe methods of reducing post-harvest losses. 1.5 Explain quality preservation techniques.	• Explain post-harvest physiology. • Discuss respiration and transpiration in produce. • Explain causes of deterioration and spoilage. • Discuss methods of maintaining produce quality. • Explain strategies for reducing post-harvest losses.	Physiology textbooks Charts and posters Multimedia presentations Quality assessment manuals Videos	Assess quality changes in stored produce. Monitor temperature and humidity during storage. Evaluate causes of quality deterioration. Determine percentage post-harvest losses. Compare shelf-life of stored produce under different conditions.	• Demonstrate quality assessment methods. • Guide storage monitoring exercises. • Supervise loss evaluation activities. • Demonstrate shelf-life assessment procedures.	Thermometers Hygrometers Weighing scales Storage facilities Record books
GENERAL OBJECTIVE 2.0: Understand processing techniques and value addition for fruits and vegetables.						
4-6	2.1 Explain principles of fruit and	• Explain principles of food	Food processing	Process fruits into juice products.	• Demonstrate juice extraction	Juice extractor Solar dryer

	vegetable processing. 2.2 Describe processing methods used for fruits and vegetables. 2.3 Explain preservation techniques. 2.4 Describe value-added fruit and vegetable products. 2.5 Explain quality standards in processing operations.	processing. • Discuss preservation techniques. • Explain processing operations. • Discuss value addition opportunities. • Explain quality requirements for processed products	manuals Product samples Processing flow charts Multimedia presentations Videos	Process vegetables into preserved products. Apply drying techniques to fruits and vegetables. Produce value-added fruit and vegetable products. Maintain processing records.	procedures. • Demonstrate drying and preservation techniques. • Guide production of value-added products. • Supervise processing operations.	Processing equipment Packaging materials Production record sheets
GENERAL OBJECTIVE 3.0: Understand packaging, quality assurance, food safety, and traceability systems for processed fruits and vegetables.						
7-9	3.1 Explain packaging requirements for processed products. 3.2 Describe quality assurance systems used in food processing. 3.3 Explain food safety principles and practices. 3.4 Describe	• Explain packaging standards and requirements. • Discuss quality assurance procedures. • Explain food safety principles. • Discuss traceability systems and	Food safety manuals HACCP guidelines Packaging samples Quality assurance manuals Regulatory documents	Package processed products according to standards. Label processed products appropriately. Conduct quality inspections on processed products. Maintain traceability records for processed products.	• Demonstrate packaging procedures. • Demonstrate product labeling. • Guide quality inspection exercises. • Supervise traceability record keeping.	Packaging materials Label printer Quality checklists Traceability forms Personal protective equipment (PPE)

	traceability systems in food production and processing. 3.5 Explain regulatory standards governing processed foods.	documentation. • Explain regulatory and certification requirements.		Apply food safety procedures during processing operations.	• Demonstrate food safety practices.	
GENERAL OBJECTIVE 4.0: Understand storage systems, cold chain management, and shelf-life extension technologies for fruits and vegetables						
10-12	4.1 Explain principles of produce storage. 4.2 Describe cold chain management systems. 4.3 Explain shelf-life extension technologies. 4.4 Describe storage structures and facilities. 4.5 Explain monitoring and maintenance of storage environments	• Explain storage principles and requirements. • Discuss cold chain management systems. • Explain shelf-life extension technologies. • Discuss storage facilities and structures. • Explain storage monitoring procedures.	Storage manuals Cold chain guides Charts and diagrams Multimedia presentations Videos	Store fruits and vegetables under recommended conditions. Monitor storage temperature and humidity. Operate cold storage facilities. Assess shelf-life of stored products. Maintain storage records.	• Demonstrate storage operations. • Demonstrate cold room management. • Guide environmental monitoring exercises. • Supervise shelf-life assessment activities.	Cold room Refrigerators Temperature data loggers Hygrometers Storage crates Storage record sheets
GENERAL OBJECTIVE 5.0: Understand the economics, marketing, branding, and commercialization of processed fruits and vegetable products.						
13-15	5.1 Explain the economics of fruit and vegetable	• Explain enterprise economics.	Marketing reports Enterprise	Conduct a market survey for processed fruit and vegetable	• Guide market survey exercises.	Computers Budget templates Marketing survey

	processing enterprises. 5.2 Describe marketing channels for processed products. 5.3 Explain branding and product differentiation strategies. 5.4 Describe commercialization opportunities for processed products. 5.5 Explain export requirements for processed fruit and vegetable products.	• Discuss marketing channels and strategies. • Explain branding principles. • Discuss commercialization opportunities. • Explain export standards and requirements.	management manuals Business plan templates Computers Internet facilities Product samples	products. Prepare an enterprise budget for a processing business. Design labels and branding materials for processed products. Develop a marketing plan for processed products. Prepare a business plan for a fruit and vegetable processing enterprise.	• Demonstrate enterprise budgeting procedures. • Guide branding and label design activities. • Supervise marketing plan development. • Guide business plan preparation.	forms Packaging samples Business plan templates Label design software
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 415: PHYTOSANITARY STANDARDS & EXPORT CERTIFICATION SYSTEMS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: PHYTOSANITARY STANDARDS & EXPORT CERTIFICATION SYSTEMS	COURSE CODE: HOT 415	CONTACT HOURS: 3HOURS/WEEK
	CREDIT UNITS: 3	THEORETICAL: HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 2HOURS/WEEK
GOAL: To equip students with knowledge and practical skills in implementing phytosanitary standards, food safety systems, traceability, and export certification requirements for horticultural products.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand international phytosanitary standards and their application in horticultural exports. 2.0 Apply Good Agricultural Practices (GAP) for export compliance 3.0 Apply Global G.A.P and other export certification requirements in horticultural production. 4.0 Apply food safety and quality management systems in post-harvest operations. 5.0 Apply export documentation, inspection, and certification procedures 6.0 Apply traceability and digital compliance systems in horticultural value chains.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: PHYTOSANITARY STANDARDS & EXPORT CERTIFICATION SYSTEMS			COURSE CODE: HOT 415		CONTACT HOURS: 3HOURS/WEEK	
			CREDIT UNITS: 3		THEORETICAL: HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: Nil		PRACTICAL: 2HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and practical skills in implementing phytosanitary standards, food safety systems, traceability, and export certification requirements for horticultural products.						
GENERAL OBJECTIVE 1.0: Understand international phytosanitary standards and their application in horticultural exports.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain the concept of phytosanitary standards. 1.2 Describe international phytosanitary organizations and regulations. 1.3 Explain phytosanitary requirements for horticultural exports. 1.4 Describe quarantine pests and regulated	• Explain phytosanitary concepts and principles. • Discuss international phytosanitary regulations. • Explain export requirements. • Discuss quarantine systems. • Illustrate compliance procedures.	IPPC manuals ISPM guidelines Export regulations Multimedia presentations Internet resources	Identify quarantine pests of horticultural crops. Inspect produce for phytosanitary compliance. Apply phytosanitary inspection procedures. Prepare phytosanitary inspection reports.	• Demonstrate pest inspection techniques. • Guide compliance assessment exercises. • Supervise inspection reporting.	Pest specimens Inspection kits Hand lenses Inspection forms

	1.5	articles Explain the importance of phytosanitary compliance in international trade.					
GENERAL OBJECTIVE 2.0: Apply Good Agricultural Practices (GAP) for export compliance							
4-5	2.1	Explain Good Agricultural Practices (GAP).	• Explain GAP principles.	GAP manuals	Implement GAP procedures on a demonstration farm.	• Demonstrate GAP implementation.	Demonstration farm
	2.2	Describe GAP requirements for horticultural production.	• Discuss farm compliance requirements.	Farm compliance checklists	Conduct farm hygiene inspections.	• Guide farm inspections.	Compliance forms PPE
	2.3	Explain environmental and worker safety requirements.	• Explain worker welfare provisions.	Videos	Prepare GAP compliance records.	• Supervise documentation exercises.	Record books
	2.4	Describe farm hygiene procedures.	• Discuss farm hygiene systems.	Multimedia projector	Evaluate GAP implementation status.		
	2.5	Explain GAP documentation requirements.					
GENERAL OBJECTIVE 3.0: Apply Global G.A.P and other export certification requirements in horticultural production.							
6-7	3.1	Explain GlobalG.A.	• Explain certification systems.	GlobalG.A.P manuals	Conduct a mock GlobalG.A.P audit.	• Demonstrate audit procedures.	Audit checklists
	3.2	P standards.		Certification guidelines	Prepare certification records.	• Guide compliance assessments.	Compliance records
	3.3	Describe certification procedures.	• Discuss audit procedures.	Audit templates	Evaluate farm compliance with	• Supervise corrective action	Certification templates
			• Explain				

	3.4 Explain audit requirements. 3.5 Describe certification documentation. 3.6 Explain benefits of certification.	documentation requirements. • Discuss certification benefits.	Multimedia resources	certification standards. Develop corrective action plans.	planning.	
GENERAL OBJECTIVE 4.0: Apply food safety and quality management systems in post-harvest operations.						
8-10	4.1 Explain food safety principles. 4.2 Describe HACCP concepts. 4.3 Explain quality management systems. 4.4 Describe contamination risks. 4.5 Explain quality assurance procedures.	• Explain food safety systems. • Discuss HACCP principles. • Explain quality assurance procedures. • Discuss contamination prevention.	HACCP manuals Food safety guidelines Videos Quality manuals	Apply food safety procedures during post-harvest handling. Conduct quality inspections. Identify contamination hazards. Implement corrective measures.	• Demonstrate food safety practices. • Guide quality inspections. • Supervise hazard assessments.	PPE Inspection checklists Quality control forms
GENERAL OBJECTIVE 5.0: Apply export documentation, inspection, and certification procedures						
11-12	5.1 Explain export documentation requirements. 5.2 Describe inspection procedures. 5.3 Explain certification processes.	• Explain export procedures. • Discuss certification processes. • Explain logistics requirements. • Discuss agency functions.	Export forms Certification manuals Regulatory publications	Complete export documentation. Prepare produce for export inspection. Process export certification applications. Compile export records.	• Demonstrate documentation procedures. • Guide certification exercises. • Supervise export simulations.	Export forms Computers Certification template

	5.4 Describe export logistics requirements. 5.5 Explain roles of export regulatory agencies					
GENERAL OBJECTIVE 6.0: Apply traceability and digital compliance systems in horticultural value chains.						
13-15	6.1 Explain traceability concepts. 6.2 Describe traceability systems. 6.3 Explain digital compliance tools. 6.4 Describe record management requirements. 6.5 Explain the importance of traceability in exports	• Explain traceability systems. • Discuss digital compliance technologies. • Explain record management requirements. • Discuss export traceability standards.	Traceability manuals Farm software Computers Internet facilities	Develop traceability records. Use digital compliance tools. Track produce through the supply chain. Generate compliance reports.	• Demonstrate traceability systems. • Guide digital record management. • Supervise supply-chain tracking exercises.	Computers Smartphones Traceability software Barcode/QR systems
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 416: ORNAMENTAL HORTICULTURE

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: ORNAMENTAL HORTICULTURE	COURSE CODE: HOT 416	CONTACT HOURS: 3HOURS/WEEK
	CREDIT UNITS: 3	THEORETICAL: 1HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 2HOURS/WEEK
GOAL: To equip students with knowledge and practical skills in the production, establishment, management, and commercialization of ornamental plants and landscape systems.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the nature, scope, and applications of ornamental horticulture. 2.0 Understand the propagation, production, and utilization of ornamental plants. 3.0 Understand lawn establishment, management, and maintenance systems 4.0 Understand the selection, establishment, and management of ornamental plants, trees, and shrubs for landscape purposes. 5.0 Understand the establishment and management of special gardens and urban green spaces. 6.0 Understand ornamental nursery management, landscape enterprise development, and commercialization of ornamental products and services		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: ORNAMENTAL HORTICULTURE			COURSE CODE: HOT 416		CONTACT HOURS: 3HOURS/WEEK	
			CREDIT UNITS: 3		THEORETICAL: 1HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: Nil		PRACTICAL: 2HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and practical skills in the production, establishment, management, and commercialization of ornamental plants and landscape systems.						
GENERAL OBJECTIVE 1.0: Understand the nature, scope, and applications of ornamental horticulture.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-2	1.1 Explain the concept of ornamental horticulture. 1.2 Describe the scope of ornamental horticulture. 1.3 Classify ornamental plants according to their uses. 1.4 Explain the importance of ornamental horticulture in environmental management. 1.5 Describe career	• Explain the concept and scope of ornamental horticulture. • Discuss the evolution and importance of ornamental horticulture. • Illustrate the classification of ornamental plants. • Explain the environmental and economic benefits of ornamentals. • Discuss	Ornamental horticulture textbooks Charts and posters Multimedia projector Photographs of ornamental landscapes Internet resources	Identify common ornamental plants in the environment. Classify ornamental plants according to their uses. Survey ornamental plants within the institution. Prepare an inventory of ornamental plants.	• Demonstrate identification of ornamental plants. • Guide classification exercises. • Supervise plant inventory activities. • Organize field visits.	Living ornamental plant collections Plant identification guides Field notebooks Digital camera

	opportunities in ornamental horticulture.	employment and entrepreneurial opportunities.				
GENERAL OBJECTIVE 2.0: Understand the propagation, production, and utilization of ornamental plants.						
3-5	2.1 Explain propagation methods used in ornamental plants. 2.2 Describe nursery establishment and management practices. 2.3 Explain environmental requirements for ornamental plant production. 2.4 Describe production systems for ornamental plants. 2.5 Explain the utilization of ornamental plants in landscaping and beautification	• Explain sexual and asexual propagation methods. • Discuss nursery management practices. • Explain environmental requirements of ornamental plants. • Discuss ornamental plant production systems. • Explain uses of ornamental plants.	Propagation manuals Nursery production guides Charts and diagrams Videos Multimedia projector	Propagate ornamental plants using seeds. Propagate ornamental plants using cuttings, layering, and grafting. Prepare nursery media for ornamental plant production. Establish an ornamental nursery. Maintain nursery production records.	• Demonstrate propagation techniques. • Guide preparation of nursery media. • Supervise nursery establishment. • Demonstrate nursery maintenance operations	Nursery beds Seed trays Poly pots Rooting hormones Watering cans Secateurs
GENERAL OBJECTIVE 3.0: Understand lawn establishment, management, and maintenance systems						
6-8	3.1 Identify turf grass	• Explain	Turf grass	Identify turf grass	• Demonstrate lawn	Turf grass

	species used in landscaping. 3.2 Explain methods of lawn establishment. 3.3 Describe lawn maintenance operations. 3.4 Explain irrigation and fertilization requirements of lawns. 3.5 Describe common lawn problems and control measures.	characteristics of turf grasses. • Discuss lawn establishment methods. • Explain lawn maintenance operations. • Discuss irrigation and fertilization practices. • Explain pest, disease, and weed management in lawns	samples Lawn management manuals Charts and photographs Videos Multimedia projector	species. Establish a lawn using recommended methods. Carry out mowing operations. Apply irrigation and fertilizers to lawns. Maintain lawn management records.	establishment. • Demonstrate mowing and edging operations. • Guide irrigation practices. • Supervise fertilizer application.	samples Lawn mower Sprinklers Hose pipes Measuring tapes Fertilizers
GENERAL OBJECTIVE 4.0: Understand the selection, establishment, and management of ornamental plants, trees, and shrubs for landscape purposes.						
9-10	4.1 Explain criteria for selecting ornamental plants. 4.2 Describe landscape functions of trees and shrubs. 4.3 Explain planting techniques for landscape plants. 4.4 Describe maintenance practices for ornamental trees and shrubs.	• Explain criteria for plant selection. • Discuss landscape functions of ornamental plants. • Explain planting and establishment procedures. • Discuss pruning and maintenance practices. • Explain renovation techniques	Landscape design manuals Plant catalogues Charts and photographs Multimedia presentations Landscape plans	• Select ornamental plants for specific landscape purposes. • Plant ornamental trees and shrubs. • Carry out pruning and training operations. • Maintain landscape planting areas. • Evaluate plant performance in	• Demonstrate planting techniques. • Demonstrate pruning operations. • Guide maintenance practices. • Supervise plant evaluation activities.	Tree seedlings Shrub seedlings Pruning tools Wheelbarrows Measuring equipment

	4.5 Explain landscape renovation and replacement practices.			landscapes.		
GENERAL OBJECTIVE 5.0: Understand the establishment and management of special gardens and urban green spaces.						
11-12	5.1 Describe different types of special gardens. 5.2 Explain principles of urban greening. 5.3 Describe rooftop, vertical, and container gardening systems. 5.4 Explain the management of public gardens and parks. 5.5 Describe sustainable landscape practices.	• Explain concepts of special gardens. • Discuss urban greening strategies. • Explain rooftop and vertical gardening systems. • Discuss management of public gardens. • Explain sustainable landscaping practices.	Urban landscape manuals Garden design catalogues Videos Multimedia resources Photographs	• Design a simple special garden. • Establish a container garden. • Establish a vertical garden. • Maintain an urban green space. • Prepare a maintenance schedule for a special garden.	• Demonstrate garden layout techniques. • Guide special garden establishment. • Supervise maintenance exercises. • Demonstrate urban greening practices.	Containers Vertical garden structures Ornamental plants Irrigation materials Garden tools
GENERAL OBJECTIVE 6.0: Understand ornamental nursery management, landscape enterprise development, and commercialization of ornamental products and services						
13-15	6.1 Explain principles of ornamental nursery management. 6.2 Describe landscape service enterprises. 6.3 Explain costing	• Explain nursery enterprise management. • Discuss landscape contracting services. • Explain costing and pricing	Business management texts Nursery enterprise records Marketing guides Computers	• Prepare a nursery production plan. • Prepare a landscape project estimate. • Conduct a market survey for ornamental products and services.	• Guide enterprise planning exercises. • Supervise market surveys. • Demonstrate cost estimation	Enterprise record books Computers Budget templates Market survey forms Business plan template

	and pricing of ornamental products and services. 6.4 Describe marketing strategies for ornamental enterprises. 6.5 Explain business opportunities in ornamental horticulture.	methods. • Discuss marketing and promotion strategies. • Explain entrepreneurship opportunities.	Internet facilities Enterprise case studies	• Develop a business plan for an ornamental enterprise. • Prepare sales and inventory records.	techniques. • Guide business plan preparation. • Supervise record-keeping exercises.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 417: HORTICULTURAL MACHINERY AND UTILIZATION

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: HORTICULTURAL MACHINERY AND UTILIZATION	COURSE CODE: HOT 417	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: Nil	PRACTICAL: 3HOURS/WEEK
GOAL: This course is designed to acquaint students with the necessary knowledge and skills in the operation, maintenance and repairs of horticultural machineries.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Know horticultural tractors and cultivation implements. 2.0 Understand operating principles of orchard equipment. 3.0 Know the constructional features of grading equipment. 4.0 Understand the working principles of mechanical harvesting equipment.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY							
COURSE TITLE: HORTICULTURAL MACHINERY AND UTILIZATION				COURSE CODE: HOT 417		CONTACT HOURS: 4HOURS/WEEK	
				CREDIT UNITS: 4		THEORETICAL: 1HOUR/WEEK	
YEAR: II SEMESTER: I				PRE-REQUISITE: Nil		PRACTICAL: 3HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL							
GOAL: This course is designed to acquaint students with the necessary knowledge and skills in the operation, maintenance and repairs of horticultural machineries.							
GENERAL OBJECTIVE 1.0: Know horticultural tractors and cultivation implements.							
THEORETICAL CONTENT				PRACTICAL CONTENT			
Week	Specific Learning Outcome		Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1	Explain special power units used for horticultural purposes e.g small rotary cultivators, walking tractor, narrow-track orchard tractor, compact 4-wheel tractor, etc.	• Discuss special power units used for horticultural purposes e.g small rotary cultivators, walking tractor, narrow-track orchard tractor, compact 4-wheel tractor, etc.	Animal traction, Marker board, Projector, Tractors and Implements, Diagrams and charts, videos, computer	• Identify special power units used for horticultural purposes e.g small rotary cultivators, walking tractor, compact 4-wheel tractor, etc.	• Guide students to: Identify special power units used for horticultural purposes e.g small rotary cultivators, walking tractor, compact 4-wheel tractor, etc.	small rotary cultivators, walking tractor, compact 4wheel tractor, plough offset harrow, rotary weeder, boom sprayer, soil blockmaking machine,
	1.2	Describe the constructional features of various soil cultivation implements used in horticulture e.g. plough, offset harrow, soil block-	• Describe the constructional features of various soil cultivation implements used in horticulture e.g. plough, offset		• Identify the constructional features of various soil cultivation implements used in horticulture e.g. plough, offset harrow, soil block-making machine,	• Identify the constructional features of various soil cultivation implements used in horticulture e.g plough, offset harrow, soil	compost shredders, irrigation equipment, survey equipment, drone, mixers

	making machine, compost shredders and mixers, drills, rotary hoes, planters, boom sprayer etc.	harrow, soil block-making machine, compost shredders and mixers, drills, rotary hoes, planters, boom sprayer etc.		compost shredders and mixers, drills, rotary hoes, planters, etc.	block-making machine, compost shredders and mixers, drills, rotary hoes, planters, etc.	drills, rotary hoes, planters, Boiler (portable loco-type, Grease gun Tool boxes
1.3	Explain the various methods of sterilizing soil such as chemical method, steaming harrow grid method, portable electric soil sterilizer.	• Discuss the various methods of sterilizing soil such as chemical method, steaming harrow grid method, portable electric soil sterilizer.		• Assemble the construction of a typical soil sterilizing equipment e.g., Boiler (portable loco-type).	• Assemble the construction of a typical soil sterilizing equipment e.g Boiler (portable loco-type).	
1.4	Explain the construction of a typical soil sterilizing equipment e.g Boiler (portable loco-type).			• Operate and maintain various soil cultivation equipment.	• Operate and maintain various soil cultivation equipment.	
1.5	Discuss the operation and maintenance of various soil cultivation equipment.	• Explain the construction of a typical soil sterilizing equipment e.g Boiler (portable loco-type).		• Carry out sterilization of soil for horticultural purpose using steamer Determine the power ratings of the various horticultural tractors listed in 1.1 above.	• Carry out sterilization of soil for horticultural purpose using steamer Determine the power ratings of the various horticultural tractors listed in 1.1 above.	
1.6	State the power ratings of the various horticultural tractors listed in	• Discuss the operation and maintenance of various soil cultivation equipment Outline the power ratings		• Prepare nursery beds using appropriate soil cultivation implements.		
1.7	above for light, medium and heavy operations.			• Carry out routine maintenance and		
1.8	Explain the various types of soil cultivation				• Prepare nursery beds using appropriate soil	

	1.9	implements for nursery beds preparation 1.8 Discuss the routine maintenance and minor repairs of horticultural machinery and implement.	of the various horticultural tractors listed in 1.1 above for light, medium and heavy operations. • Discuss the various types of soil cultivation implements for nursery beds preparation Discuss the routine maintenance and minor repairs of horticultural machinery and implement.		minor repairs of horticultural machinery and implement.	cultivation implements. • Carry out routine maintenance and minor repairs of horticultural machinery and implement.	
GENERAL OBJECTIVE 2.0: Understand operating principles of orchard equipment.							
4-7	2.1	Describe types of orchard equipment e.g prunners, sprayers, weeders, dusters, etc.	• Discuss types of orchard equipment e.g prunners, sprayers, weeders, dusters, etc.	Marker board, Projector, Computer, Diagram and chart	• Identify types of orchard equipment e.g prunners, sprayers, weeders, dusters, narrow-track orchard tractor etc.	• Guide students to: Identify types of orchard equipment e.g prunners, sprayers, weeders, dusters, narrow-track orchard tractor etc.	Pruners, Sprayers, Weeders, Dusters, Boom Sprayers, Knapsack
	2.2	Explain types of spraying equipment e.g drones, manure distributor, sprayers, Boom	• Discuss types of spraying equipment e.g drones, manure distributor, sprayers, Boom		• Identify types of spraying equipment e.g Boom sprayers,	• Identify types of spraying equipment e.g	

	sprayers, Knapsack sprayers, etc. 2.3 Describe the different components of a spraying equipment and their functions. 2.4 Discuss the calibration of different types of spraying equipment. 2.5 Describe the operation and maintenance of spraying equipment. 2.6 Describe the constructional features and operations of mechanical weeders 2.7 Explain the maintenance, repairs and advancement of a mechanical weeders.	sprayers, Knapsack sprayers, etc. • Explain the different components of a spraying equipment and their functions. • Discuss the calibration of different types of spraying equipment. • Describe the operation and maintenance of spraying equipment. • Describe the constructional features and operations of mechanical weeders Discuss the maintenance, repairs and advancement of a mechanical weeders.		knapsack sprayers, drones etc. • Identify the different components of a spraying equipment. • Calibrate different types of spraying equipment. • Operate and maintain spraying equipment. • Describe the constructional features of a mechanical weeder. • Operate mechanical weeders Carry out routine maintenance, repairs and advancement of a mechanical weeder.	Boom sprayers, knapsack sprayers, drones etc. • Identify the different components of a spraying equipment. • Calibrate different types of spraying equipment. • Operate and maintain spraying equipment. • Describe the constructional features of a mechanical weeder. • Operate mechanical weeders Carry out routine maintenance, repairs and advancement of a mechanical weeder.	
GENERAL OBJECTIVE 3.0: Know the constructional features of grading equipment.						

8-11	3.1 Explain the importance of grading horticultural crops produce. 3.2 Describe the constructional features of grading equipment. 3.2 Explain grading of root vegetables, fruits, etc using recommended equipment. 3.3 Explain routine maintenance and minor repairs on grading equipment	• Discuss the importance of grading horticultural crops produce. • Explain the constructional features of grading equipment. • Explain grading of root vegetables, fruits, etc using recommended equipment Discuss routine maintenance and minor repairs on grading equipment	Whiteboard, Marker, Projector, Computer, Mechanical toolbox	• Carry out grading of root vegetables, fruits, etc using recommended equipment. • Carry out routine maintenance and minor repairs on grading equipment.	• Guide students to: Carry out grading of root vegetables, fruits, etc using recommended equipment. • Carry out routine maintenance and minor repairs on grading equipment.	Grading machine, Tool boxes
GENERAL OBJECTIVE 4.0: Understand the working principles of mechanical harvesting equipment.						
12-15	4.1 Explain the concept of mechanical harvesting in horticultural production 4.2 Explain the major components of different mechanical harvesting	• Explain the concept of mechanical harvesting in horticultural production Explain the major components of different mechanical harvesting	Whiteboard, Marker, Charts, Photographs, Videos and models	• Harvest fruits and root vegetables using mechanical harvesters. • Observe and report the performance of harvesting equipment during field demonstrations Carry out routine maintenance and	• Guide students to: Harvest fruits and root vegetables using mechanical harvesters. • Observe and report the performance of harvesting equipment during field	Mechanical harvesters, Tool boxes

	equipment. 4.3 Describe the operating principles of mechanical harvesters used for fruits vegetables and plantation crops. 4.4 Differentiate between manual and mechanical harvesting systems stating advantages. 4.5 Describe harvesting of fruits and root vegetables using mechanical harvesters. 4.6 Describe routine maintenance and minor repair on mechanical harvesters.	equipment. • Describe the operating principles of mechanical harvesters used for fruits vegetables and plantation crops - Differentiate between manual and mechanical harvesting systems stating advantages. • Describe harvesting of fruits and root vegetables using mechanical harvesters. • Describe routine maintenance and minor repair on mechanical harvesters.		minor repairs on mechanical harvesters	demonstration Carry out routine maintenance and minor repairs on mechanical harvesters	
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COURSE ASSESSMENT:

Course work: 10% |

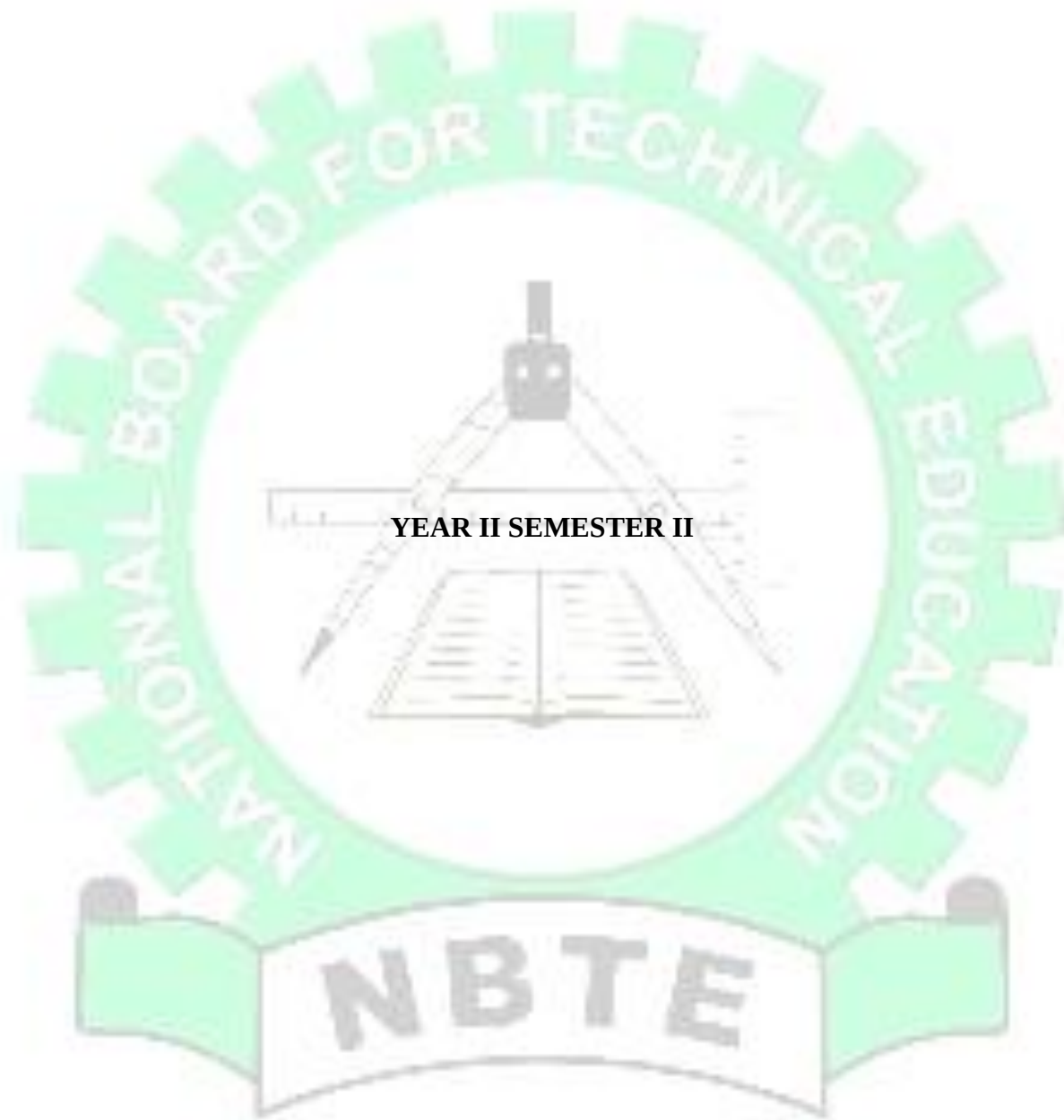
Test/Assignments: 10% |

Practical: 40% |

Examination: 40% |

Total: 100%





HOT 421: HORTICULTURAL ENTREPRENEURSHIP AND STARTUP INNOVATION

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: HORTICULTURAL ENTREPRENEURSHIP AND STARTUP INNOVATION	COURSE CODE: HOT 421	CONTACT HOURS: 3 hours/week
	CREDIT UNITS: 3	THEORETICAL: 1 hour/week
YEAR: II SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 2 hours/week
GOAL: To equip students with knowledge and skills to establish, manage and grow innovative horticultural enterprises and startups.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand entrepreneurship principles in horticulture 2.0 Apply opportunity identification and business ideation 3.0 Apply startup planning and business model development 4.0 Apply fundraising and investment access for horticultural startups 5.0 Apply innovation and technology in horticultural entrepreneurship 6.0 Apply pitch development and startup launch skills		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: HORTICULTURAL ENTREPRENEURSHIP AND STARTUP INNOVATION			COURSE CODE: HOT 421		CONTACT HOURS: 3 hours/week	
			CREDIT UNITS: 3		THEORETICAL: 1 hour/week	
YEAR: II SEMESTER: II			PRE-REQUISITE: Nil		PRACTICAL: 2 hours/week	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and skills to establish, manage and grow innovative horticultural enterprises and startups.						
GENERAL OBJECTIVE 1.0: Understand entrepreneurship principles in horticulture						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1	1.1 Define entrepreneurship and describe the entrepreneurial mindset required in horticulture 1.2 Describe the role of horticultural entrepreneurs in Nigeria's food security and economic development 1.3 Describe the characteristics of successful horticultural entrepreneurs in Nigeria	• Define entrepreneurship; describe the entrepreneurial mindset with Nigerian horticultural examples • Explain the role of horticultural entrepreneurs in food security and economic development • Describe characteristics of successful Nigerian horticultural	Entrepreneurship mindset guide, Nigerian horticultural entrepreneur case studies, enterprise failure analysis, startup definition guide, projector.	Interview one successful horticultural entrepreneur; record their background, enterprise, challenges and success factors Identify three failed horticultural enterprises near the college; record probable failure cause for each Analyse your own entrepreneurial strengths and	• Guide interview preparation and execution; review records • Guide failure analysis; review probable cause records • Provide self-assessment tool; guide completion; review results • Guide classification exercise; review justifications • Facilitate presentations;	Interview guide, enterprise failure analysis template, entrepreneurial self-assessment tool, classification worksheet, field notebooks.

	1.4 Identify the common causes of small horticultural enterprise failure in Nigeria 1.5 Explain the difference between self-employment, small business ownership and scalable startup in horticulture	entrepreneurs with case studies • Discuss common enterprise failure causes with Nigerian examples • Explain differences between self-employment, small business and scalable startup		weaknesses using a self-assessment tool; record results and one development action Classify five Nigerian horticultural businesses as self-employment, small business or scalable startup; record justification • Present one inspiring Nigerian horticultural entrepreneur case study to the class; explain success factors and lessons	give brief feedback	
GENERAL OBJECTIVE 2.0: Apply opportunity identification and business ideation						
2 – 4	2.1 Describe methods for identifying horticultural business opportunities: market gaps, trend analysis and customer problems 2.2 Describe how to	• Explain opportunity identification methods with Nigerian horticultural examples • Explain idea validation techniques:	Opportunity identification guide, idea validation tools, design thinking guide, value proposition template, Business Model Canvas,	• Identify three horticultural business opportunities in the local area; record the market gap, target customer and proposed solution for each	• Guide opportunity identification; review records • Guide interview design and execution; review validation findings • Guide design thinking exercise;	Opportunity identification template, customer interview guide, design thinking worksheet, value proposition template, Business Model

	validate a horticultural business idea before investing resources 2.3 Describe design thinking as a tool for developing innovative horticultural solutions 2.4 Describe how to develop a value proposition for a horticultural product or service 2.5 Explain how to use a Business Model Canvas for a horticultural startup	surveys, interviews and minimum viable product • Explain design thinking steps applied to one horticultural problem • Explain value proposition development with a horticultural product example • Demonstrate Business Model Canvas completion for a horticultural startup	projector.	• Validate one business idea using a five-person customer interview; record responses and whether the idea is validated • Apply design thinking to one horticultural problem; record empathise, define, ideate, prototype and test steps • Develop a value proposition for one horticultural product; record customer problem, solution and unique benefit • Complete a Business Model Canvas for one horticultural startup idea; record all nine blocks	review each step • Provide value proposition template; guide completion; review accuracy • Provide Business Model Canvas; guide completion; review all blocks	Canvas, field notebooks.
GENERAL OBJECTIVE 3.0: Apply startup planning and business model development						

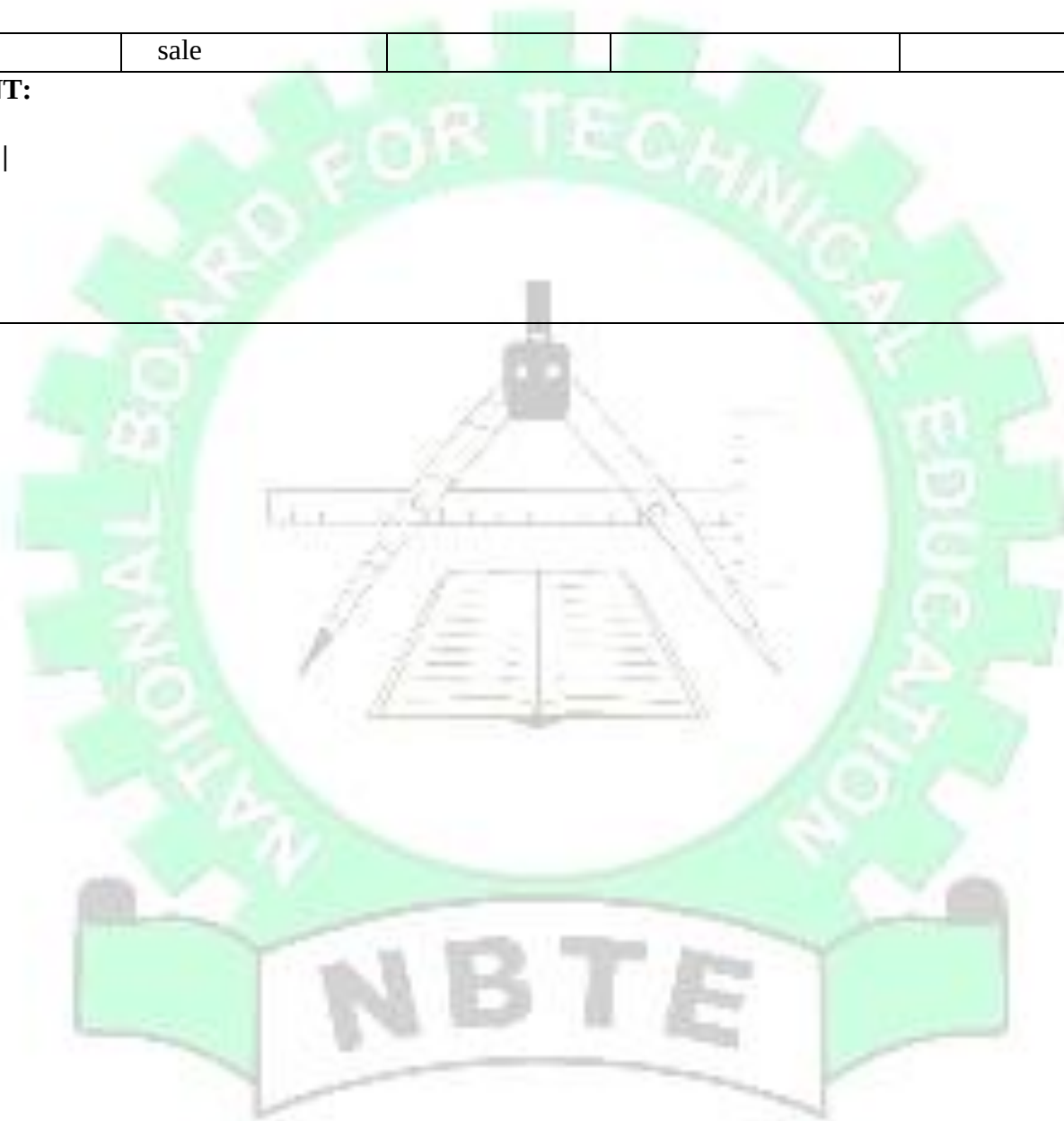
5 – 7	3.1 Describe the components of a startup business plan for a horticultural enterprise 3.2 Describe how to develop a go-to-market strategy for a new horticultural product 3.3 Describe how to set up a minimum viable product for a horticultural startup 3.4 Describe financial projections for a horticultural startup: revenue model and cost structure 3.5 Explain how to use lean startup methodology in horticultural entrepreneurship	• Explain startup business plan components with a sample horticultural startup plan • Explain go-to-market strategy development for a horticultural product • Explain MVP development; describe a simple MVP for a vegetable delivery service • Explain financial projections; demonstrate revenue model and cost structure preparation • Explain lean startup methodology applied to horticulture	Startup business plan template, go-to-market strategy guide, MVP guide, financial projection template, lean startup methodology guide, projector.	Develop a go-to-market strategy for one horticultural product; specify target customer, channel, pricing and launch plan • Develop a minimum viable product for one horticultural startup idea; describe what it is and how to test it • Prepare financial projections for one horticultural startup for year one; record revenue model, costs and expected profit • Prepare a startup business plan for one horticultural enterprise; include all required components • Present the startup business plan to the class as an investor pitch; respond to three questions from the panel	• Provide strategy template; guide preparation; review plans • Guide MVP development; review feasibility • Guide financial projection preparation; review accuracy • Provide business plan template; guide preparation; review plans • Facilitate investor pitch; act as panel; give brief feedback	Go-to-market strategy template, MVP description guide, financial projection template, startup business plan template, field notebooks.
GENERAL OBJECTIVE 4.0: Apply fundraising and investment access for horticultural startups						
8 – 10	4.1 Describe sources of	• Describe startup	Startup funding	Research three	• Guide research;	Funding sources

	startup funding for horticultural enterprises in Nigeria: grants, loans and equity 4.2 Describe government and donor programmes supporting horticultural startups in Nigeria 4.3 Describe how to prepare a funding application for a horticultural startup 4.4 Describe angel investors and venture capital in Nigerian agribusiness 4.5 Explain how to use crowdfunding platforms for horticultural startup funding in Nigeria	funding sources with Nigerian horticultural examples for each - Describe government and donor programmes with eligibility and application requirements - Demonstrate funding application preparation for one programme - Describe angel investors and VC in Nigerian agribusiness with examples - Describe crowdfunding platforms available for Nigerian agribusinesses	sources guide, government and donor programme list, funding application template, angel investor and VC guide, crowdfunding platform list, projector.	funding sources for a horticultural startup in Nigeria; record source, type, amount and eligibility for each - Prepare a funding application for one government or donor programme; include all required sections - Prepare a one-page investor summary for one horticultural startup; record problem, solution, market size and funding requested - Research one crowdfunding campaign for an agribusiness; record platform, amount raised, pitch strategy and lessons - Present the investor summary to the class as a two-minute investor pitch; respond to two questions from the panel	review records - Provide application template; guide preparation; review completeness - Provide investor summary template; guide preparation; review accuracy - Guide crowdfunding research; review records - Facilitate investor pitch; give brief feedback	research guide, funding application template, investor summary template, crowdfunding research guide, field notebooks.
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GENERAL OBJECTIVE 5.0: Apply innovation and technology in horticultural entrepreneurship						
11 – 12	5.1 Describe how digital technology creates new horticultural business opportunities in Nigeria 5.2 Describe agri-tech startup models: e-commerce, precision farming services and agri-data platforms 5.3 Describe how to develop a simple digital product for a horticultural startup 5.4 Describe intellectual property protection for horticultural innovations in Nigeria 5.5 Explain how to collaborate with research institutions for horticultural innovation	• Describe digital technology opportunities in Nigerian horticulture with startup examples • Describe agri-tech startup models with Nigerian case studies • Explain how to develop a simple digital product; demonstrate a farm app prototype • Explain IP protection for horticultural innovations in Nigeria • Explain collaboration with research institutions for horticultural innovation	Digital technology opportunity guide, agri-tech startup case studies, app prototype guide, IP protection guide, research collaboration guide, projector.	Identify one digital technology opportunity in Nigerian horticulture; record the problem, technology solution and target customer • Design a simple digital product concept for one horticultural startup; describe features, user and revenue model • Prototype one feature of the digital product using a free tool; record the tool used and feature demonstrated • Identify two IP protection measures relevant to one horticultural innovation; record each measure and how to apply it • Identify one research institution in Nigeria working on horticulture; record	• Guide opportunity identification; review records • Guide digital product design; review concept • Guide prototype development; review feasibility • Guide IP protection identification; review records • Guide institution identification and collaboration research; review records	Digital opportunity identification template, digital product design template, free prototyping tool, IP protection guide, research institution directory, field notebooks.

				research areas and how to initiate collaboration		
GENERAL OBJECTIVE 6.0: Apply pitch development and startup launch skills						
13 – 15	6.1 Describe the components of an effective startup pitch: problem, solution, market, team and ask 6.2 Describe how to develop and deliver a five-minute investor pitch for a horticultural startup 6.3 Describe how to use storytelling and visual aids in a startup pitch 6.4 Explain how to respond to investor questions and objections professionally 6.5 Describe the steps to launch a horticultural startup after funding is secured	• Explain pitch components with an example of a strong horticultural startup pitch • Demonstrate a five-minute investor pitch for a horticultural startup • Explain storytelling and visual aid use in pitching; demonstrate with a sample slide deck • Explain how to respond to investor questions and objections with role-play examples • Explain startup launch steps from funding to first	Pitch component guide, sample investor pitch, storytelling guide, investor question and response examples, startup launch checklist, projector.	Develop a five-minute investor pitch for your horticultural startup; include all required components • Prepare a five-slide pitch deck for the startup; include problem, solution, market, financials and ask • Deliver the pitch to the class; respond to three investor questions from the panel • Incorporate feedback from the first pitch into a revised version; deliver the revised pitch in three minutes • Prepare a startup launch checklist for your enterprise; record all steps from funding receipt to first sale	• Provide pitch component guide; guide preparation; review completeness • Provide slide deck template; guide preparation; assess design and content • Facilitate pitch delivery; act as investors; give feedback after each pitch • Guide pitch revision; facilitate second delivery; give final feedback • Provide launch checklist template; guide preparation; review completeness	Pitch component guide, slide deck template, investor question bank, startup launch checklist template, field notebooks.

		sale				
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



HOT 422: HORTICULTURAL PRODUCT BRANDING, PACKAGING AND EXPORT MARKETING

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: HORTICULTURAL PRODUCT BRANDING, PACKAGING AND EXPORT MARKETING	COURSE CODE: HOT 422	CONTACT HOURS: 3 hours/week
	CREDIT UNITS: 3	THEORETICAL: 1 hour/week
YEAR: II SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 2 hours/week
GOAL: To equip students with knowledge and skills in product branding, packaging design, export marketing and digital commerce for horticultural produce.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Apply product branding principles to horticultural produce 2.0 Apply packaging design and technology for horticultural products 3.0 Apply export marketing strategies for Nigerian horticultural produce 4.0 Apply digital commerce and e-export tools 5.0 Understand export compliance and documentation 6.0 Apply export marketing enterprise planning		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: HORTICULTURAL PRODUCT BRANDING, PACKAGING AND EXPORT MARKETING			COURSE CODE: HOT 422		CONTACT HOURS: 3 hours/week	
			CREDIT UNITS: 3		THEORETICAL: 1 hour/week	
YEAR: II SEMESTER: II			PRE-REQUISITE: Nil		PRACTICAL: 2 hours/week	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and skills in product branding, packaging design, export marketing and digital commerce for horticultural produce.						
GENERAL OBJECTIVE 1.0: Apply product branding principles to horticultural produce						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1 – 2	1.1 Describe the components of a product brand: name, logo, tagline, colour and story 1.2 Describe how to develop a brand identity for a horticultural product 1.3 Describe how brand differentiation creates competitive advantage for Nigerian horticultural products	• Explain brand components with Nigerian horticultural product examples • Demonstrate brand identity development for a sample horticultural product • Explain brand differentiation with competitive advantage examples • Explain	Brand component guide, Nigerian branded horticultural product examples, brand identity template, trademark registration guide, storytelling guide, projector.	• Develop a brand identity for one college farm produce; record brand name, logo concept, tagline and colour scheme • Write a brand story for one college farm produce; describe origin, production method and farmer commitment in 150 words • Design an origin label for one college farm produce; record origin story,	• Provide brand identity template; guide preparation; review completeness • Guide brand story writing; review clarity and appeal • Guide origin label design; check all elements • Guide market appeal comparison; review price premium records • Guide research;	Brand identity template, brand story guide, origin label template, branded product comparison guide, trademark research guide, field notebooks.

	1.4 Describe how to protect a horticultural brand through trademark registration in Nigeria 1.5 Explain how storytelling and origin labelling add value to Nigerian horticultural products	trademark registration procedure in Nigeria • Explain storytelling and origin labelling with premium price examples		production method and certification status • Compare the market appeal of three branded versus unbranded Nigerian horticultural products; record price premium for each • Research trademark registration requirements for one brand name in Nigeria; record steps, cost and timeline	review records	
GENERAL OBJECTIVE 2.0: Apply packaging design and technology for horticultural products						
3 – 5	2.1 Describe packaging functions for horticultural products: protection, communication, convenience and marketing 2.2 Describe packaging	• Explain packaging functions with examples from Nigerian horticultural marketing • Display packaging material types; explain suitability for each product	Packaging material display, well-designed and poorly-designed packaging examples, sustainable packaging guide,	• Design primary packaging for one fresh college farm produce; sketch structure and graphics; record material and cost • Design packaging for one processed college farm product; sketch label	• Provide packaging design template; guide preparation; review design quality • Guide label design; check all required elements for each market • Guide sustainable packaging	Packaging design template, label design materials, sustainable packaging guide, EU and NAFDAC labelling requirements, packaging cost calculation

	materials used in horticultural marketing: cartons, films, nets, jars and pouches 2.3 Describe packaging design principles: structure, graphics, labelling and consumer appeal 2.4 Describe sustainable packaging options and their relevance to export markets 2.5 Describe labelling requirements for fresh and processed horticultural products in Nigeria and export markets	category • Explain packaging design principles; display well-designed and poorly-designed examples • Explain sustainable packaging options and their export market relevance • Explain labelling requirements for Nigeria, EU and Gulf markets	labelling requirement guide, projector.	design with all required elements • Select sustainable packaging for two college farm products; record material, reason and estimated cost difference • Prepare export labels for one fresh produce and one processed product; check against EU and NAFDAC requirements • Calculate packaging cost per kilogram for one college farm product; record all material and labour cost components	selection; review justification • Supervise label preparation; check compliance with requirements • Guide cost calculation; review accuracy	worksheet, field notebooks.
GENERAL OBJECTIVE 3.0: Apply export marketing strategies for Nigerian horticultural produce						

6 – 8	3.1 Describe Nigerian horticultural export opportunities: crops, destination markets and demand trends 3.2 Describe how to conduct an export market analysis for one horticultural crop 3.3 Describe how to develop an export marketing plan for a Nigerian horticultural enterprise 3.4 Describe participation in international trade fairs and buyer-seller meetings 3.5 Explain how to use NEPC and NAFDAC support services	• Describe export opportunities with trade data for key Nigerian horticultural crops • Demonstrate export market analysis for one crop using trade statistics • Demonstrate export marketing plan preparation • Explain trade fair participation; describe how to prepare for a buyer-seller meeting • Explain NEPC and NAFDAC services; describe how to access each	Nigerian export trade data, export market analysis guide, export marketing plan template, trade fair preparation guide, NEPC and NAFDAC service guide, projector.	• Conduct an export market analysis for one Nigerian horticultural crop; record destination, demand, price and competitor data • Develop an export marketing plan for one college farm crop; specify target market, channel, price and promotion • Prepare a trade fair participation plan for a hypothetical Nigerian horticultural enterprise; record target event, booth concept and marketing materials • Research NEPC export support available for one horticultural product; record services, eligibility and application process • Present the export marketing plan to	Guide market analysis; • review accuracy and completeness • Provide marketing plan template; guide preparation; review plans • Provide participation plan template; guide preparation; review plans • Guide NEPC research; review records • Facilitate presentations; give brief feedback	Export trade data, export market analysis guide, export marketing plan template, trade fair participation template, NEPC service guide, field notebooks.
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	for horticultural export marketing			the class; explain market selected, strategy and expected outcome		
GENERAL OBJECTIVE 4.0: Apply digital commerce and e-export tools						
9 – 11	4.1 Describe B2B digital platforms for horticultural export: Alibaba, Tridge and NEPC Online 4.2 Describe how to create an export product listing on a B2B platform 4.3 Describe digital marketing for export: LinkedIn, Instagram and email campaigns for international buyers 4.4 Describe how to respond to an international buyer inquiry professionally	• Describe B2B export platforms with demonstration screenshots • Demonstrate product listing creation on Alibaba or NEPC Online • Demonstrate digital marketing content for international buyers • Demonstrate professional response to an international buyer inquiry • Explain international payment options and logistics management	B2B platform screenshots, Alibaba or NEPC Online access, digital marketing content examples, buyer inquiry response template, payment and logistics guide, projector.	• Create a product export listing on Alibaba or NEPC Online for one college farm produce; include description, specifications, price and MOQ • Prepare digital marketing content for one export product; create one LinkedIn post and one Instagram post targeting international buyers • Respond to a mock international buyer inquiry;	• Demonstrate listing creation; supervise student practice • Guide digital content creation; assess quality and appeal • Provide mock inquiry; facilitate response exercise; review quality • Provide pro-forma invoice template; guide preparation; review accuracy • Guide payment method research; review records	Alibaba or NEPC Online access, LinkedIn and Instagram platforms, mock buyer inquiry, pro-forma invoice template, payment method research guide, field notebooks.

	4.5 Explain how to manage international payment and logistics for a digital export transaction			record the inquiry received, response written and follow-up action • Prepare a pro-forma invoice for one mock export order; record all required fields and calculate total FOB value • Research one international payment method for Nigerian horticultural export; record method, fees, timeline and risk		
• GENERAL OBJECTIVE 5.0: Understand export compliance and documentation						
12 – 13	5.1 Describe the export documentation required for Nigerian fresh	• Explain export documentation with sample documents for each type	Sample export documents, agency role guide, documentation	• Prepare a complete mock export documentation package for one	• Provide document templates; guide preparation; review accuracy • Guide Incoterm	Export document templates, Incoterms guide, NCS clearance research guide,

	horticultural produce 5.2 Describe the role of NCS, NAFDAC and NEPC in export compliance 5.3 Describe how to prepare a complete export documentation package 5.4 Describe Incoterms and their application in horticultural export contracts 5.5 Explain how to resolve an export documentation error or shipment rejection	• Explain roles of NCS, NAFDAC and NEPC in export compliance • Demonstrate complete export documentation package preparation • Explain Incoterms: EXW, FOB, CIF and their application in horticulture • Explain how to resolve a documentation error or rejection	package checklist, Incoterms guide, error resolution procedure, projector.	consignment; include all required documents • Identify the Incoterm most suitable for one export scenario; record term, reason and responsibilities of each party • Research the NCS export clearance procedure for one horticultural product; record all steps and fees involved • Review a mock export rejection notice; identify the error and prepare a corrective action response • Prepare an export compliance checklist for	selection; review justification • Guide research; review records • Provide rejection notice; guide review; assess corrective response • Provide compliance checklist template; guide completion	mock rejection notice, export compliance checklist template, field notebooks.
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				one college farm crop targeting one export market		
GENERAL OBJECTIVE 6.0: Apply export marketing enterprise planning						
14 – 15	6.1 Describe how to develop a comprehensive export marketing enterprise plan for a horticultural business 6.2 Describe how to build and manage relationships with international buyers 6.3 Explain how to scale an export marketing enterprise from pilot to commercial volume 6.4 Describe how to use customer feedback and market data to	• Demonstrate comprehensive export marketing enterprise plan preparation • Explain international buyer relationship building and management • Explain scale-up from pilot to commercial export with a case study • Explain how to use feedback and data to improve export performance • Discuss career and entrepreneurship opportunities in export marketing for HND	Export marketing enterprise plan template, buyer relationship guide, scale-up case study, feedback and data improvement guide, career opportunity chart, projector.	• Prepare a comprehensive export marketing enterprise plan for one horticultural product; include market, strategy, operations and financials • Prepare an international buyer relationship management plan; record buyer name, contact, preferred communication and follow-up schedule • Develop a scale-up plan from 1 tonne pilot to 10 tonne commercial export for one crop; record all operational and financial changes • Analyse customer	• Provide enterprise plan template; guide preparation; review completeness • Provide buyer relationship template; guide preparation; review plans • Guide scale-up planning; review accuracy and feasibility • Provide mock buyer survey; guide analysis; review recommendations • Facilitate presentations; give brief feedback	Export marketing enterprise plan template, buyer relationship management template, scale-up planning guide, mock buyer survey, field notebooks.

	improve export marketing performance 6.5 Explain the career and entrepreneurship opportunities in horticultural export marketing for HND graduates	graduates		feedback from a mock buyer survey; identify two improvements and write implementation recommendations • Present the export marketing enterprise plan to the class; explain strategy, financial projections and first steps		
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 423: LANDSCAPING, URBAN AND COMMERCIAL HORTICULTURE SYSTEMS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: LANDSCAPING, URBAN AND COMMERCIAL HORTICULTURE SYSTEMS	COURSE CODE: HOT 423	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 3 HOURS/WEEK
GOAL: To equip students with knowledge and skills in professional landscape design, urban horticultural systems and commercial landscape enterprise management.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand professional landscape design and planning 2.0 Know the landscape installation and project management 3.0 Know urban horticulture and green infrastructure systems 4.0 Understand landscape maintenance management 5.0 Understand landscape business operations and client management 6.0 Know sustainable landscape design practices		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: LANDSCAPING, URBAN AND COMMERCIAL HORTICULTURE SYSTEMS			COURSE CODE: HOT 423		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNITS: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE: Nil		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and skills in professional landscape design, urban horticultural systems and commercial landscape enterprise management.						
GENERAL OBJECTIVE 1.0: Understand professional landscape design and planning						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1 – 3	1.1 Discuss the professional landscape design process with emphasis on client brief, site analysis, concept and detailed design 1.2 Describe principles of design notably plant massing and seasonal interest. Emphasize colour theory and texture contrast 1.3 Explain method of preparation of professional design drawing and planting plan	• Explain the design process with a real project example • Explain principles with portfolio photographs • Demonstrate professional scaled drawing and planting plan preparation • Demonstrate BQ and cost estimate preparation • Explain professional proposal presentation to a	Real project portfolio, design principle photographs, graph paper, rulers, BoQ template, proposal presentation guide, projector.	• Conduct a client brief interview using a standard form; record all client requirements and preferences • Carry out site analysis for the college grounds; record dimensions, existing features, sun path and soil • Produce a finished scaled planting plan on graph paper; include all ornamentals with	• Guide students to: • Provide client brief form; guide interview; review records • Carryout site analysis; check measurements and records • Carryout planting plan; check recommended spacings and ornamental labels • Provide BoQ template; guide preparation, costs and accuracy • Facilitate presentations;	Client brief form, measuring tape, graph paper, rulers, BoQ template, current plant and material price list, survey equipment, field notebooks.

	1.4 Explain preparation of Bill of Quantities (BoQ) for cost estimate for a landscape project 1.5 Discuss landscape design proposal presentation to a client professionally	client		circle sizes and labels • Prepare a complete BoQ and cost estimate for the design; record all materials, ornamentals and labour with prices • Present the landscape design proposal to the class; explain concept, ornamental selection and total cost	assess design concept and costs	
GENERAL OBJECTIVE 2.0: Know the landscape installation and project management						
4 – 6	2.1 Describe landscape installation sequence: site clearance, earthworks, manuring, hardscape, planting and completion 2.2 Explain Gantt	• Explain installation sequence with a project flow diagram • Demonstrate Gantt chart preparation for a one-month project • Explain material procurement and	Installation flow diagram, hard and soft landscape materials, planting materials and equipment, Gantt chart template, procurement checklist, team supervision guide, handover checklist,	Prepare a Gantt chart for the college campus landscape project; list all activities with start and end dates • Procure planting materials for the campus project; check quality against specifications; record	Guide students to: • Utilize Gantt chart template; guide preparation; review accuracy • Carryout procurement and quality check and record • Rotate team leadership activities	Gantt chart template, procurement checklist, hard and soft landscape materials, planting materials, landscape tools, handover checklist, field notebooks.

	chart preparation for project implementation 2.3 Enumerate material procurement and quality control during landscape installation 2.4 Explain how to supervise a landscape installation team 2.5 Explain way of inspection and handing over completed landscape project to a client	quality checks • Explain team supervision during installation • Explain inspection and handover procedure with a checklist	projector.	all items received • Lead a landscape installation team for one session; record activities assigned, performance and one lesson learned • Install all proposed landscape materials on the campus project; record all steps and date completed • Carry out a final inspection and prepare a handover checklist for the completed campus project	and records • Supervise all installation; check quality at each stage • Carryout inspection; provide handover checklist; ensure completeness	
GENERAL OBJECTIVE 3.0: Know urban horticulture and green infrastructure systems						
7 – 9	3.1 Outline urban horticulture systems: rooftop gardens, vertical walls, container gardens and	• Describe urban horticulture systems with Nigerian city photographs • Describe green infrastructure	Urban horticulture photographs, green infrastructure diagrams, suitable plant list, urban management guide, case studies, projector.	Design a rooftop container garden for a 20 m² area; sketch layout, list plants and estimate weight load • Establish a vertical growing unit or	• Guide students to: • Carryout design template; guide preparation and designs • Supervise; planting medium and	Containers, growing medium, urban crop seeds or seedlings, vertical growing frame, plant seeds/seedlings, watering/irrigation

	community plots 3.2 Explain green infrastructure systems: bioswales, rain gardens and green roofs 3.3 Identify suitable crops and plants for esthetic advantage in urban areas in Nigerian cities 3.4 Discuss the management of urban green spaces by watering, fertilizing, pruning, pest and disease control etc. 3.5 Itemize social and economic benefits of urban horticulture in Nigeria.	systems with design diagrams - List suitable crops and plants for Nigerian urban growing - Explain management of urban green spaces - Discuss social and economic benefits with case studies		container garden on the college campus; record plants, containers and date - Manage the urban growing unit for two weeks; record watering, fertilising and pest management activities - Harvest produce from the urban unit; record date, crop and quantity - Prepare a cost-benefit analysis for the urban growing unit; record establishment cost, produce value and net outcome	growth establishment - Supervise management; review activity and record - Supervise the completion of established hard and soft landscape materials for esthetic benefit - Provide cost-benefit template; guide preparation; review accuracy	equipment, fertilizers, chemicals, agro-chemicals, design template, cost-benefit template, field notebooks.
GENERAL OBJECTIVE 4.0: Understand landscape maintenance management						

10 – 11	4.1	Outline how to develop a comprehensive landscape maintenance programme	• Explain maintenance programme development with a monthly schedule	Early maintenance schedule at inception till establishment, site problem photographs, record, work order template, client maintenance report template, projector.	• Prepare schedule programme for college landscape area; specify all operations and frequency	Guide students to: • Carryout 2222222 template; guide preparation; review accuracy • Supervise maintenance session; review records • Carryout problem diagnosis • Prepare work order template; guide preparation; review accuracy • Provide work and maintenance template guide.	Maintenance programme template, landscape tools, plant problem photographs, work order template, client report template, field notebooks.
	4.2	Explain routine maintenance operations practices viz: manuring, propagation, fertilizing, pruning, pest and disease control etc.	• Explain each operation with correct frequency for Nigerian climate		• Carry out a complete maintenance session on the campus landscape; record all operations and observations		
	4.3	Explain common landscape establishment problems	• Explain plant problem diagnosis with photographs and decision keys		• Diagnose two plant problems in the campus landscape; record symptom, probable cause and recommended action		
	4.4	Describe how to manage a landscape maintenance team and work schedule	• Explain team management and work scheduling with a work order example		• Prepare a work order for one maintenance session; record tasks, team members assigned and time allocated		
	4.5	Describe how to prepare a landscape maintenance report for a client	• Explain client maintenance report preparation		• Prepare a client		

				maintenance report for one month; record all operations observations recommendations		
GENERAL OBJECTIVE 5.0: Understand landscape business operations and client management						
12 – 13	5.1 Describe how to set up and register a landscape contracting business in Nigeria 5.2 Describe how to prepare a competitive landscape quotation for a client 5.3 Describe how to manage client relationships and handle complaints professionally 5.4 Describe how to market landscape services: portfolio, referrals and social media 5.5 Describe how to manage cash flow	• Explain business setup and Corporate Affairs Commission (CAC) registration steps • Demonstrate quotation preparation for a sample landscape project • Explain client relationship and complaint management • Explain landscape business marketing with portfolio and social media examples • Explain cash flow management for a	CAC registration guide, quotation template, client management guide, portfolio examples, social media marketing guide, cash flow template, projector.	• Prepare a professional quotation for a hypothetical landscape project; include all cost items and total price • Develop a digital portfolio of college campus landscape work; include photographs and project descriptions • Role-play a client complaint scenario; record the complaint, response and resolution reached • Prepare a one-	• Guide students to: • Provide price quotation template; guide preparation; review accuracy • Assist portfolio development on content and quality • Carryout role-play; review response and resolution quality • Provide marketing plan template; guide preparation; review plans • Provide cash flow template; guide preparation; review accuracy	Quotation template, smartphone for portfolio photographs, client complaint scenario, marketing plan template, cash flow template, field notebooks.

	and profitability in a landscape business	seasonal landscape business		page landscape marketing plan; specify channels, content and budget • Prepare a six-month cash flow forecast for a hypothetical landscape business		
GENERAL OBJECTIVE 6.0: Know sustainable landscape design practices						
14 – 15	6.1 Explain sustainable landscape design principles: water efficiency, natural ornamentals, reduced chemicals and biodiversity 6.2 Describe rainwater harvesting and greywater recycling in landscape design 6.3 Describe the use of natural ornamentals and drought-tolerant plants in sustainable Nigerian landscapes 6.4 Explain	• Explain sustainable design principles with Nigerian landscape examples • Explain rainwater harvesting and greywater recycling in landscape design • Describe native and drought-tolerant plants for Nigerian landscapes • Explain composting and mulching in	Sustainable design guide, rainwater harvesting diagram, natural ornamentals list, composting and mulching guide, environmental performance form, projector.	• Redesign one section of the college campus using sustainable principles; sketch and annotate the design • Install a small rainwater harvesting system on the campus; record setup, capacity and first collection volume • Replace two non-native ornamentals with native or drought-tolerant	Guide students to: • Carryout redesign template; guide preparation; review designs • Supervise installation • Supervise replacement planting and review results, make recommendations and conclusion	Sustainable design template, rainwater tank components, natural ornamentals plant list, compost and mulch, environmental performance form, ornamentals, field notebooks.

	composting and organic mulching as sustainable landscape management tools 6.5 Explain how to assess and improve the environmental performance of a landscape	landscape management • Explain environmental performance assessment for a landscape		ornamentals; record details, date and justification • Apply compost and mulch to campus landscape beds and keep record • Complete an environmental performance chart for the college campus landscape.		
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 424: MICRO-GARDENING AND COMPOST MAKING

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: MICRO-GARDENING AND COMPOST MAKING	COURSE CODE: HOT 424	CONTACT HOURS: 4 hours/week
	CREDIT UNITS: 4	THEORETICAL: 1 hour/week
YEAR: II SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 3 hours/week
GOAL: To equip students with knowledge and practical skills in micro gardening, compost production, organic waste recycling, and small-space crop production systems.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the Concept of Micro Gardening and Compost Making 2.0 Know the Different Types of Micro Gardening System 3.0 Understand Growing Media Preparation and Container Selection 4.0 Understand Composting Techniques 5.0 Understand Crop Production and its Management Practices in Micro Gardens 6.0 Understand Application of Enterprise Development in Environmental Sustainability and Economic Evaluation in Micro Gardening and Compost Making		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: MICRO-GARDENING AND COMPOST MAKING			COURSE CODE: HOT 424		CONTACT HOURS: 4 hours/week	
			CREDIT UNITS: 4		THEORETICAL: 1 hour/week	
YEAR: II SEMESTER: II			PRE-REQUISITE: Nil		PRACTICAL: 3 hours/week	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and practical skills in micro gardening, compost production, organic waste recycling, and small-space crop production systems.						
GENERAL OBJECTIVE 1.0: Understand the Concept of Micro Gardening and Compost Making						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1 – 2	1.1 Describe the concept, principles and importance of micro gardening for household food production and urban agriculture. 1.2 Describe the historical development, scope and applications of micro gardening in horticultural production systems.	• Explain the concept and evolution of micro gardening using diagrams and photographs. • Discuss the role of micro gardening in urban food production and household nutrition. • Compare conventional and micro gardening systems using practical examples.	Charts and posters, Projector and multimedia presentations, Photographs of micro gardens, Samples of compost, Organic waste materials, Compost process diagrams, school compost sites, Whiteboard and markers.	Identify various micro gardening systems. Differentiate compostable and non-compostable materials. Identify stages of compost decomposition. Assess compost quality based on physical characteristics.	• Guide students to Identify compost field sites. • Demonstrate waste sorting procedures. • Collect compost samples for assessment. • Carryout practical exercises and record observations.	compost samples, organic waste materials, waste sorting containers, observation sheets, compost kits, field notebooks

	1.3 Explain the importance of micro gardening in food security, nutrition improvement, income generation and environmental sustainability. 1.4 1.4 Describe the concept of composting and its role in sustainable organic waste management.	• Explain the biological process of decomposition and compost formation. • Discuss the functions of microorganisms during composting. • Explain factors affecting compost production and quality. • Present case studies on composting and sustainable waste management.				
GENERAL OBJECTIVE 2.0: Know the Different Types of Micro Gardening System						
3 – 4	2.1 Explain site selection criteria, garden layout and space optimization techniques used in micro gardening systems. 2.2 Discuss	• Discuss advantages and limitations of each system Explain different micro gardening systems with illustrations. • Demonstrate site selection procedures. • Explain garden	garden layout plans, container samples, sack garden models, vertical garden structures, raised-bed, sunken bed models, gardening kits,	Construct various micro gardening systems. Select suitable locations for micro gardens. Prepare garden layouts.	• Guide students to: Collect required materials to carryout land preparation Construct container gardens. • Establish sack gardens. • Build a simple vertical garden.	containers, sacks, pegs, pesticides, herbicides, rodenticides, nails, hand tools, measuring tapes

	different container gardening systems and their suitability for vegetable and ornamental crop production.	design and layout principles. .	measuring tapes.		• Design a micro garden layout.	
2.3	Explain sack gardening systems and their application in limited-space crop production.					
2.4	Discuss vertical gardening structures, materials and management practices for urban horticulture.					
2.5	Explain raised-bed, sunken bed gardening systems, stating their advantages and disadvantages in crop					

		establishment and maintenance.					
GENERAL OBJECTIVE 3.0: Understand Growing Media Preparation and Container Selection							
5 – 6	3.1	Explain the characteristics of an ideal growing medium for micro gardening.	• Explain growing media properties. • Demonstrate media preparation procedures. • Demonstrate sterilization techniques. • Explain container selection criteria.	soil samples, sand, compost, cocopeat, rice husk, containers.	Prepare growing media mixtures. Sterilize growing media. Select suitable containers	• Guide students to: Mix potting media. • Sterilize media using solarization - Fill and label containers.	Soil Sand Compost Wheelbarrow Shovel Polythene sheets
	3.2	Discuss the properties and functions of soil, sand, compost, cocopeat and other growing media components.					
	3.3	Explain procedures for preparing growing media mixtures for different horticultural crops.					
	3.4	Explain growing media sterilization methods and					

	3.5	their importance in disease prevention. Explain the selection and management of containers used in micro gardening production systems.				
GENERAL OBJECTIVE 4.0: Understand Composting Techniques						
7-9	4.1	Explain principles and stages of compost production from organic wastes.	• Explain composting principles. • Demonstrate compost pile construction. • Discuss factors affecting decomposition. • Explain compost maturity indicators.	Compost bins, Organic waste materials, Compost thermometers, Moisture meter	Produce compost. Monitor compost development. Assess compost quality. Carryout compost analysis	• Construct compost heaps. • Monitor temperature and moisture. • Turn compost piles. • Record composting progress
	4.2	Identify compostable materials according to their carbon and nitrogen contents.				
	4.3	Enumerate composting techniques and management requirements.				
	4.4	Explain heap composting				

	techniques and management. 4.5 Explain bin composting systems and applications in household and institutions. 4.6 Explain vermicomposting and role of earthworms in production. 4.7 Discuss the benefits of compost application in improving soil fertility, soil structure, soil texture, water-holding capacity and crop productivity.					
GENERAL OBJECTIVE 5.0: Understand Crop Production and its Management Practices in Micro Gardens						
10-12	5.1 Explain the criteria for selecting suitable crops for micro gardening	• Demonstrate planting techniques. • Explain irrigation scheduling.	Seeds, Seedlings, Compost, Watering cans, Pest management	Establish micro garden crops. Apply compost correctly. Manage pests and	• Sow seeds and transplant seedlings. • Irrigate crops. • Apply compost.	Seeds Seedlings Compost Hand tools Watering cans Record sheets .

	systems. 5.2 Explain nursery establishment techniques for vegetable and herb production. 5.3 Discuss seed sowing, transplanting and crop establishment procedures in micro gardens. 5.4 Explain irrigation methods suitable for container, sack and vertical gardening systems. 5.5 Explain nutrient management practices using compost and supplementary organic fertilizers. 5.6 Explain weed management practices in	• Demonstrate compost application. • Discuss pest and disease management.	guides.	diseases	• Monitor crop growth. • Record pest and disease incidence	
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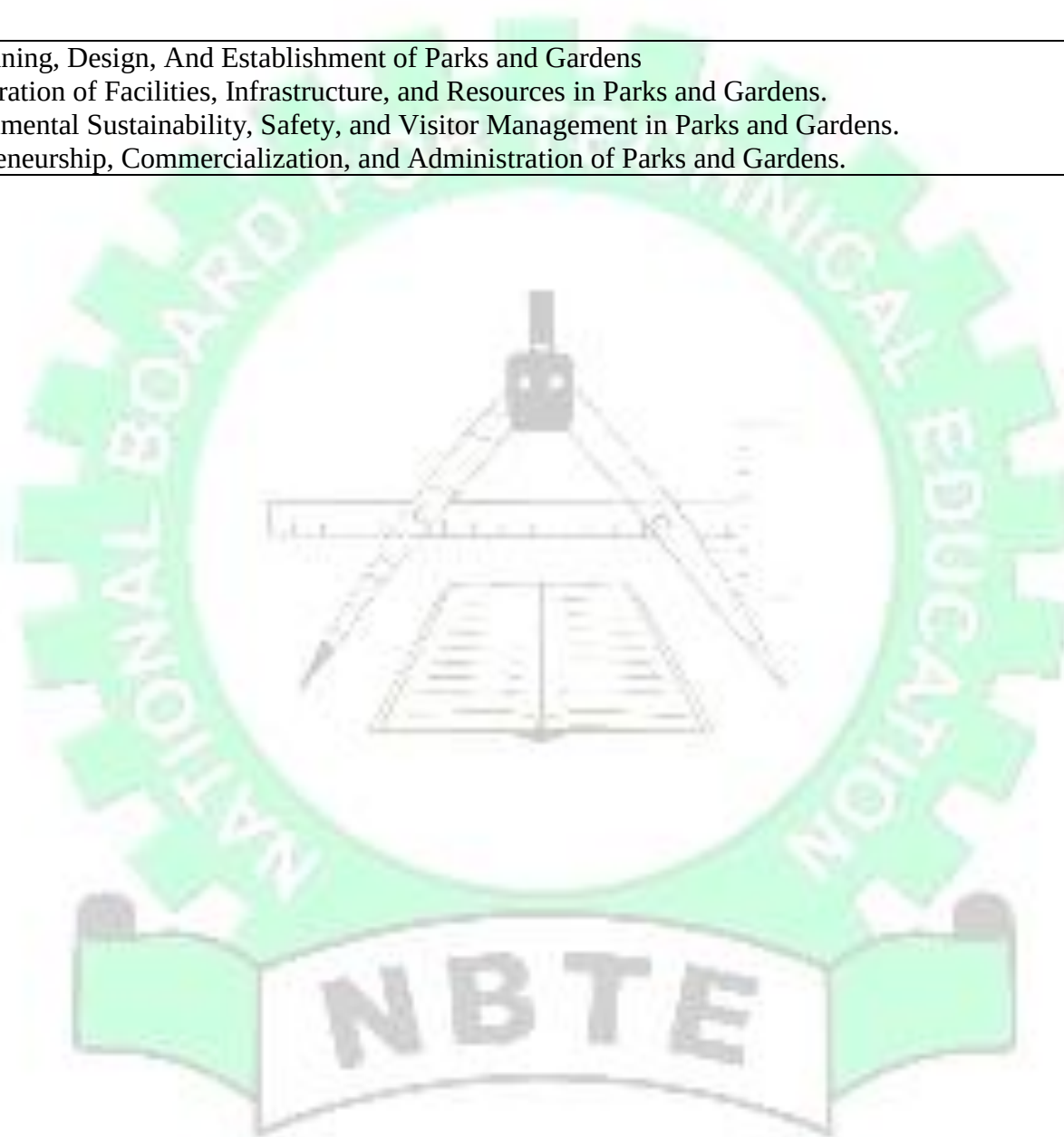
	micro gardening systems.					
GENERAL OBJECTIVE 6.0: Understand Application of Enterprise Development in Environmental Sustainability and Economic Evaluation in Micro Gardening and Compost Making						
13 – 15	6.1 Explain the role of micro gardening in household nutrition, food security and livelihood improvement. 6.2 Explain the environmental benefits of composting and organic waste recycling. 6.3 Explain the economic opportunities associated with commercial micro gardening and compost production enterprise. 6.4 Explain the procedures for estimating production costs, revenues	• Explain agribusiness opportunities in micro gardening. • Demonstrate simple budgeting procedures. • Explain business plan preparation. • Discuss environmental sustainability.	Budget templates Business plan templates Enterprise records Calculator	Prepare enterprise budgets. Calculate production costs and returns. Develop business plans.	• Guide students to: Prepare enterprise budgets SWOT analysis Calculate gross margins. • Develop a simple business plan. • Present business proposals	Budget worksheets, Calculator, Business plan template, SWOT, analysis Field notebooks

	and profitability of micro gardening enterprises. 6.5 Explain methods for preparing enterprise budgets and gross margin analyses for micro gardening projects.					
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

HOT 425: PARKS AND GARDENS MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY		
COURSE TITLE: PARKS AND GARDENS MANAGEMENT	COURSE CODE: HOT 425	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: Nil	PRACTICAL: 3HOURS/WEEK
GOAL: To equip students with knowledge and practical skills in the planning, establishment, management, maintenance, and commercialization of parks, gardens, and urban green spaces.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to:		
1.0 Understand the Principles, Functions, and Types of Parks and Gardens.		
2.0 Understand the Planning, Design, And Establishment of Parks and Gardens		

- 3.0 Understand the Planning, Design, And Establishment of Parks and Gardens
- 4.0 Understand the Operation of Facilities, Infrastructure, and Resources in Parks and Gardens.
- 5.0 Understand Environmental Sustainability, Safety, and Visitor Management in Parks and Gardens.
- 6.0 Understand Entrepreneurship, Commercialization, and Administration of Parks and Gardens.



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) IN HORTICULTURAL TECHNOLOGY						
COURSE TITLE: PARKS AND GARDENS MANAGEMENT			COURSE CODE: HOT 425		CONTACT HOURS: 4HOURS/WEEK	
			CREDIT UNITS: 4		THEORETICAL: 1HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE: Nil		PRACTICAL: 3HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: To equip students with knowledge and practical skills in the planning, establishment, management, maintenance, and commercialization of parks, gardens, and urban green spaces.						
GENERAL OBJECTIVE 1.0: Understand the Principles, Functions, and Types of Parks and Gardens.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain the concept of parks and gardens. 1.2 Classify parks and gardens according to purpose and ownership. 1.3 Describe the functions of parks and gardens. 1.4 Explain the social, environmental, and economic importance of parks and gardens. 1.5 Describe current trends in parks and garden	• Explain concepts and principles of parks and gardens. • Discuss classifications and functions of parks. • Explain environmental and recreational benefits. • Discuss emerging trends in urban green spaces.	Parks and recreation manuals Charts and photographs Multimedia presentations Urban greening publications Internet resources	• Identify different types of parks and gardens. • Assess the functions of selected parks and gardens. • Conduct a survey of parks and gardens within the locality. • Prepare an inventory of park and garden features.	• Organize field visits. • Guide Park assessment exercises. • Supervise inventory preparation. • Demonstrate site evaluation procedures	Parks and gardens Field notebooks GPS device Digital camera Survey forms

		management.					
GENERAL OBJECTIVE 2.0: Understand the Planning, Design, And Establishment of Parks and Gardens							
4-6	2.1	Explain principles of park and garden planning.	• Explain planning principles. • Discuss landscape design elements.	Landscape design manuals Site plans Design software Plant catalogues Multimedia projector	• Conduct site analysis for park development. • Prepare a simple park or garden layout. • Select suitable plants for a landscape project. • Establish a demonstration garden. • Prepare a planting plan.	• Demonstrate site analysis procedures. • Guide landscape planning exercises. • Supervise garden establishment. • Demonstrate planting operations.	Drawing materials CAD software Measuring tapes Planting materials Garden tools
	2.2	Describe elements of landscape design.	• Explain site analysis procedures. • Discuss plant selection criteria.				
	2.3	Explain site selection criteria.					
	2.4	Describe procedures for park and garden establishment.					
	2.5	Explain plant selection for parks and gardens.					
GENERAL OBJECTIVE 3.0: Understand the Planning, Design, And Establishment of Parks and Gardens							
7-9	3.1	Explain maintenance requirements of parks and gardens.	• Explain landscape maintenance practices. • Discuss turf management techniques. • Explain plant care operations. • Discuss integrated	Maintenance manuals Turf management guides Videos Charts Plant health guides	• Maintain lawns and turf areas. • Prune ornamental trees and shrubs. • Operate irrigation systems.	• Demonstrate mowing operations. • Demonstrate pruning techniques. • Guide irrigation management. • Supervise	Lawn mowers Irrigation equipment Pruning tools Fertilizers Sprayers
	3.2	Describe lawn and turf management practices.					

	3.3 Explain pruning and plant maintenance techniques. 3.4 Describe irrigation and fertilization practices. 3.5 Explain pest, disease, and weed management in parks and gardens	pest management practices.		• Apply fertilizers appropriately. • Implement pest and weed management measures.	maintenance activities.	
GENERAL OBJECTIVE 4.0: Understand the Operation of Facilities, Infrastructure, and Resources in Parks and Gardens.						
10-11	4.1 Identify facilities commonly found in parks and gardens. 4.2 Explain maintenance requirements of park infrastructure. 4.3 Describe management of recreational facilities. 4.4 Explain resource allocation in parks and gardens. 4.5 Describe equipment	• Explain types of park facilities. • Discuss infrastructure maintenance requirements. • Explain equipment management procedures. • Discuss resource utilization strategies	Facility management manuals Equipment catalogues Maintenance schedules Videos Photographs	Inspect facilities and infrastructure. Prepare maintenance schedules. Operate basic landscape equipment. Maintain Park infrastructure records. Conduct facility condition assessments.	• Demonstrate facility inspection procedures. • Guide maintenance planning exercises. • Demonstrate equipment operation. • Supervise condition assessment activities.	Maintenance checklists Equipment inventory records Landscape machinery Inspection tools

	management procedures.					
GENERAL OBJECTIVE 5.0: Understand Environmental Sustainability, Safety, and Visitor Management in Parks and Gardens.						
12-13	5.1 Explain principles of environmental sustainability in parks and gardens. 5.2 Describe waste management practices. 5.3 Explain occupational health and safety requirements. 5.4 Describe visitor management strategies. 5.5 Explain risk assessment procedures in parks and gardens.	• Explain sustainable landscape management. • Discuss waste management systems. • Explain safety regulations and procedures. • Discuss visitor management practices.	Safety manuals Environmental management guidelines Risk assessment templates Videos Policy documents	Conduct environmental audits of parks and gardens. Implement waste management practices. Carry out safety inspections. Prepare visitor management plans. Conduct risk assessments.	• Demonstrate safety inspection procedures. • Guide environmental audits. • Supervise risk assessment activities. • Demonstrate waste management practices.	PPE Waste bins Audit checklists Safety signs Risk assessment forms
GENERAL OBJECTIVE 6.0: Understand Entrepreneurship, Commercialization, and Administration of Parks and Gardens.						
14-15	6.1 Explain principles of park and garden administration. 6.2 Describe budgeting and financial management procedures. 6.3 Explain revenue generation	• Explain administrative procedures. • Discuss budgeting and financial planning. • Explain commercialization opportunities.	Administrative manuals Budget templates Marketing guides Computers Internet facilities	Prepare a maintenance budget for a park or garden. Conduct a market survey for park services. Develop a promotional plan for a park or garden.	• Guide budget preparation exercises. • Supervise market surveys. • Guide business plan development. • Demonstrate record-keeping	Computers Budget templates Survey forms Record books Business plan templates

	opportunities in parks and gardens. 6.4 Describe marketing and promotional strategies. 6.5 Explain entrepreneurship opportunities in parks and garden management.	• Discuss marketing and customer relations. • Explain entrepreneurship concepts.		Prepare administrative and maintenance records. Develop a business plan for a parks and gardens enterprise.	procedures.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

LIST OF EQUIPMENT FOR HND IN HORTICULTURAL TECHNOLOGY

The following minimum equipment and facilities are required for the effective delivery of the Higher National Diploma (HND) in Horticultural Technology. Quantities are minimum requirements for an intake of 40 students per session.

1.0 Horticultural Teaching Farms

S/N	Item / Equipment	Quantity
1	Horticultural Teaching Farm	5 ha
2	Orchard Demonstration Unit	3 ha
3	Vegetable Production Unit	2 ha
4	Nursery Unit	2 ha
5	Protected Cultivation Unit	1 ha
6	Hydroponic Grow Channels/ Unit	0.5
7	Composting Unit	0.5
8	Demonstration Apiary	0.5
9	Landscape Demonstration Garden	1

2.0 Farm Tools and Field Equipment

S/N	Item / Equipment	Quantity
1	Spades	30
2	Hoes	30
3	Rakes	20
4	Cutlasses	50
5	Wheelbarrows	20
6	Hand Trowels/ Hand fork/Garden Fork	50
7	Secateurs	50
8	Pruning Saws	20
9	Budding Knives	40
10	Grafting Knives	40

11	Measuring Tapes	20
12	Soil Augers	10
13	Knapsack Sprayers/Boom Sprayers	25
14	Motorized Mist Blowers	10
15	Weighing Scales	15
16	Head Pan	20
17	Watering can	20
18	Garden Fork	20
19	Axe	10
20	Tractors/ Implements	2

3.0 Nursery and Propagation Laboratory

S/N	Item / Equipment	Quantity
1	Mist Propagation Unit	5
2	Propagation Trays	100
3	Root Trainers	200
4	Seed Germination Cabinets	10
5	Potting Benches	10
6	Poly Pots	5,000 /year
7	Rooting Chambers	10
8	Digital Moisture Meter	5
9	Grafting Tools Sets	40
10	Budding Tools Sets	40
11	Seed Storage Cabinet	10
12	Barrier Callipers	

4.0 Soil Fertility and Crop Nutrition Laboratory

S/N	Item / Equipment	Quantity
1	Soil pH Meters	10
2	EC Meters	10
3	Soil Sampling Augers	20

4	Electronic Balances	10
5	Drying Oven	5
6	Muffle Furnace	10
7	Kjeldahl Digestion Unit	3
8	Spectrophotometer	2
9	Soil Sieves	20
10	Soil Test Kits	20
11	Soil Shaker	2

5.0 Plant Physiology and Biotechnology Laboratory

S/N	Item / Equipment	Quantity
1	Compound Microscopes	20
2	Stereo Microscopes	5
3	Growth Chambers	5
4	Chlorophyll Meters	10
5	Refractometers	10
6	Autoclaves	10
7	Laminar Flow Cabinets	5
8	Incubators	5
9	PCR Machine	2
10	Tissue Culture Racks	10

6.0 Entomology, Pest and Disease Management Laboratory

S/N	Item / Equipment	Quantity
1	Compound Microscopes	20
2	Hand Lenses	50
3	Insect Collection Nets	30
4	Insect Cabinets	10
5	Specimen Bottles	100
6	Disease Diagnostic Kits	20
7	Insect Rearing Cages	15

8	Digital Cameras	5
9	Pheromone Traps	20
10	Sticky Traps	100
11	Autoclave	10

7.0 Beekeeping Training Unit

S/N	Item / Equipment	Quantity
1	Langstroth Hives	20
2	Kenyan Top Bar Hives	20
3	Protective Bee Suits	30
4	Bee Veils	30
5	Hive Tools	30
6	Smokers	20
7	Honey Extractors	5
8	Honey Sieves	10
9	Wax Processing Unit	1
10	Queen Excluders	20
11	Bee Feeders	20
12	Containers	20

8.0 Irrigation and Water Management Laboratory

S/N	Item / Equipment	Quantity
1	Drip Irrigation Demonstration Kits	20
2	Sprinkler Irrigation Kits/Irrigation Layout Pipes	100
3	Tensiometers	10
4	Water Flow Meters	10
5	Pressure Gauges	10
6	Soil Moisture Sensors	15
7	Water Quality Testing Kits	10
8	Irrigation Design Software	20 Licences
9	Water Pumps	5

10	Fertigation Units	5
11	Irrigation Pump	
12	Rain Water Tank and Stands	5

9.0 Hydroponics and Soilless Cultivation Laboratory

S/N	Item / Equipment	Quantity
1	NFT Systems	5
2	Deep Water Culture Systems	5
3	Cocopeat Substrates	100 Bags
4	Rockwool Blocks	1,000
5	Nutrient Mixing Tanks	10
6	EC Meters	10
7	pH Meters/Repelif	10
8	Dosing Pumps	10
9	Hydroponic Grow Channels	100
10	Water Reservoirs	10

10.0 Greenhouse and Controlled Environment Unit

S/N	Item / Equipment	Quantity
1	Greenhouses	4
2	Climate Control Units	3
3	Ventilation Fans	20
4	Fogging Systems	5
5	Automated Controllers	5
6	Temperature Sensors	20
7	Relative Humidity Sensors	20
8	CO ₂ Meters	10
9	Data Loggers	10
10	Shade Nets	As Required

11.0 AI Automation and Precision Horticulture Laboratory

S/N	Item / Equipment	Quantity
1	Desktop Computers	30
2	Laptops	20
3	Smart Tablets	20
4	Internet Network System	1
5	Soil Moisture Sensors	20
6	Weather Stations/Digital	2
7	IoT Sensor Kits	20
8	Data Loggers	20
9	Smart Irrigation Controllers	10
10	GPS Receivers	10
11	GIS Software Licences	20
12	AI Crop Monitoring Software	20 Licences
13	Solar energy	As required

12.0 Drone and Precision Agriculture Unit

S/N	Item / Equipment	Quantity
1	Agricultural Drones	3
2	Drone Batteries	12
3	Drone Charging Stations	3
4	Multispectral Cameras	3
5	GPS Survey Equipment	5
6	GIS Workstations	10
7	Image Processing Software	10 Licences

13.0 Post-Harvest Processing and Storage Laboratory

S/N	Item / Equipment	Quantity
1	Fruit Washers	5
2	Sorting Tables	10
3	Grading Machines	5
4	Mechanical Dryers	5

5	Juice Extractors	10
6	Vacuum Sealers	5
7	Packaging Machines	5
8	Cold Rooms	2
9	Refrigerated Storage Units	5
10	Moisture Meters	10
11	Refractometers	10
12	Horticultural Machineries	
13	Survey Equipments	

14.0 Landscape Design and Construction Unit

S/N	Item / Equipment	Quantity
1	Landscape Drawing Tables	20
2	AutoCAD Software Licences	20
3	GPS Survey Equipment	5
4	Lawn Mowers	20
5	Brush Cutters	25
6	Hedge Trimmers	20
7	Irrigation Installation Tools	20 set
8	Concrete Mixers	5
9	Wheelbarrows	25
10	Surveying Equipment Sets	5

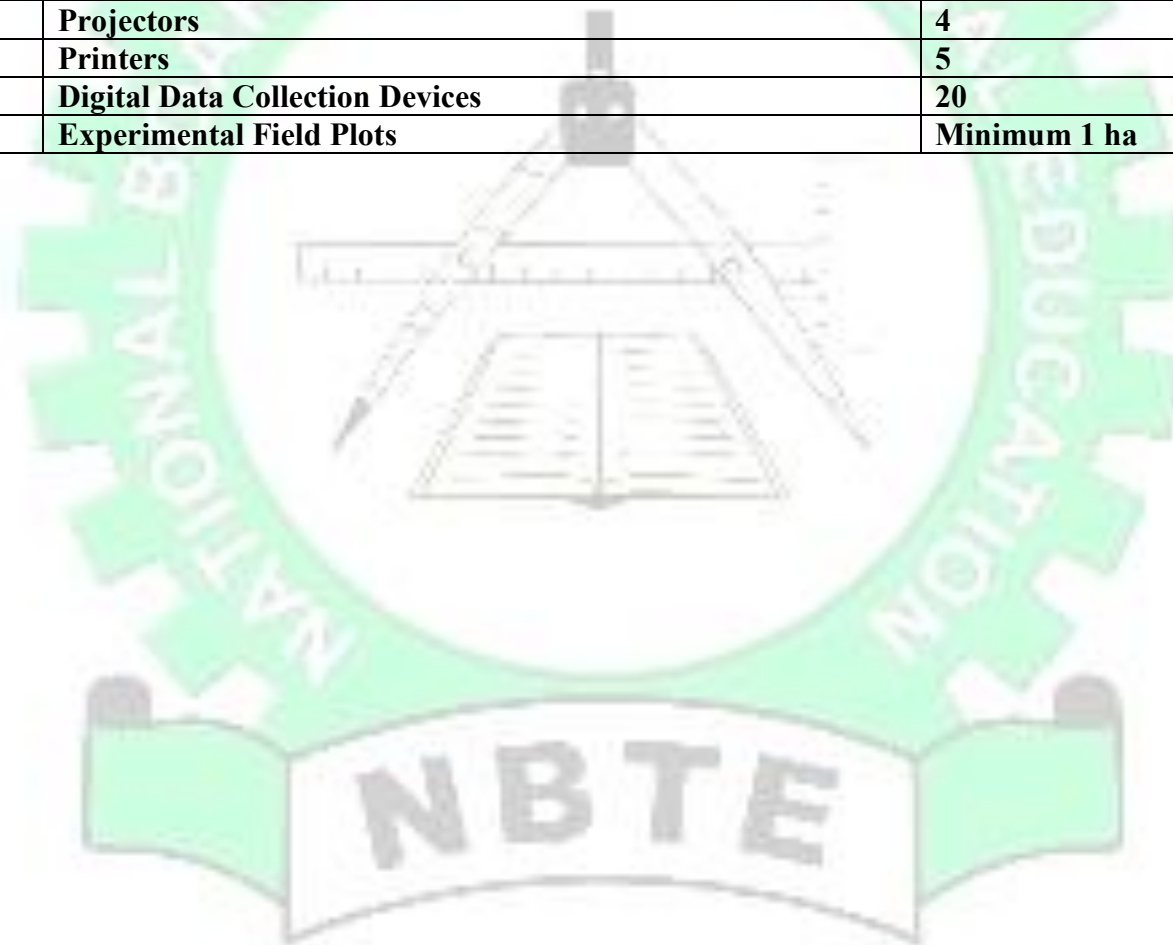
15.0 Packaging, Branding and Export Certification Unit

S/N	Item / Equipment	Quantity
1	Packaging Machines	5
2	Label Printers	5
3	Barcode Scanners	5
4	Digital Weighing Scales	10
5	Export Packaging Materials	Assorted
6	Quality Inspection Tables	10

7	Traceability Software	10 Licences
8	Sample Export Documentation Sets	Assorted

16.0 Research and Statistics Laboratory

S/N	Item / Equipment	Quantity
1	Desktop Computers	30
2	Statistical Software (R/SPSS/GenStat)	30 Licences
3	Projectors	4
4	Printers	5
5	Digital Data Collection Devices	20
6	Experimental Field Plots	Minimum 1 ha



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