



NATIONAL BOARD FOR TECHNICAL EDUCATION

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

HIGHER NATIONAL DIPLOMA

IN

PEST MANAGEMENT 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.

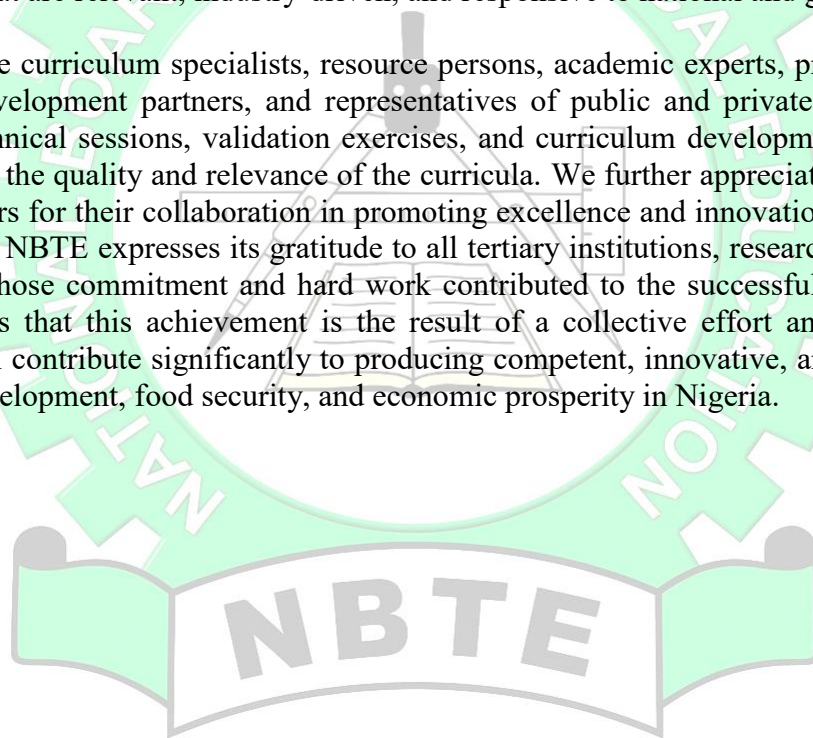
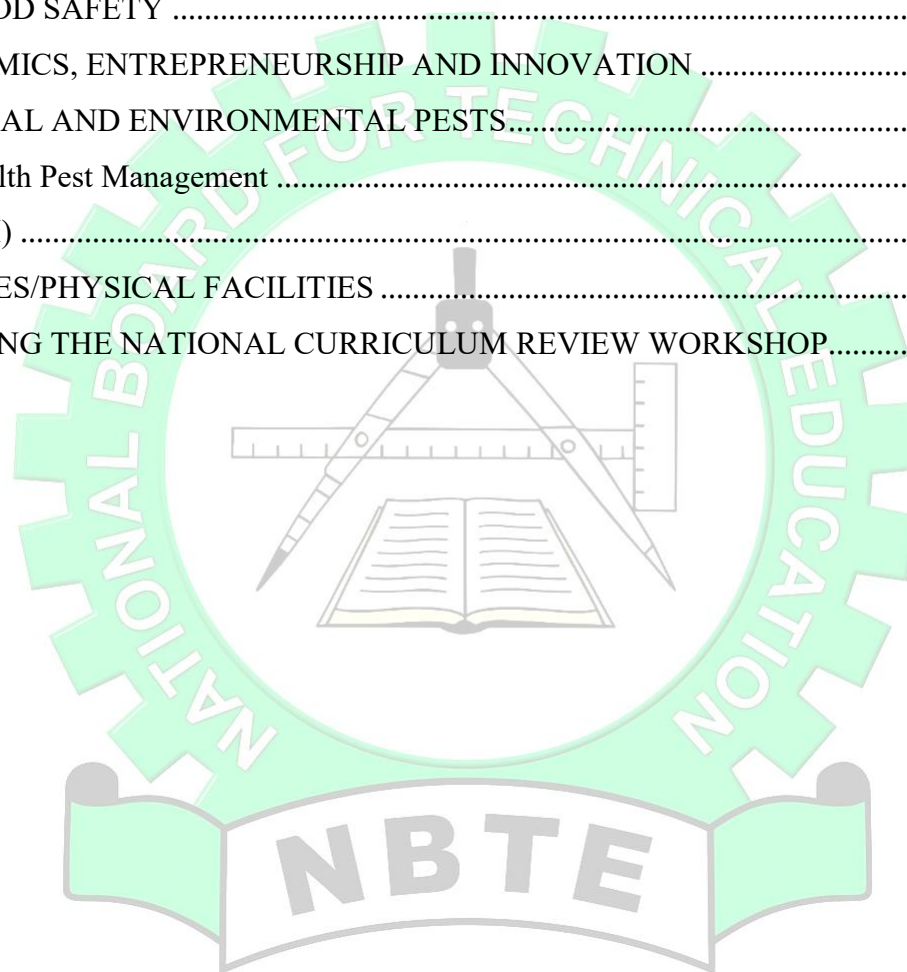


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GENERAL INFORMATION

1.0 PROGRAMME NOMENCLATURE

Higher National Diploma in Pest Management Technology

2.0 PROGRAMME GOAL

The Higher National Diploma (HND) programme in Pest Management Technology is designed to produce skilled Pest Management Technologists capable of identifying, monitoring, and managing pests in agricultural, urban, and environmental systems using climate-smart, digital technologies, and Integrated Pest Management (IPM) approaches.

3.0 OBJECTIVES OF THE PROGRAMME

On completion of the programme, the diplomates should be able to:

- I. Apply principles of insect morphology, physiology, taxonomy;
- II. Identify and classify pest organisms, including insects, weeds, nematodes, pathogens, and vertebrates;
- III. Utilize plant pathology and modern diagnostic techniques, including molecular tools;
- IV. Apply Integrated Pest Management strategies effectively;
- V. Operate and maintain Pest Management equipment and technologies;
- VI. Implement safety, environmental, and regulatory standards;
- VII. Develop and execute Pest Management plans;
- VIII. Conduct research, analyze data, and communicate findings effectively;
- IX. Interpret Pest Management policies and regulatory frameworks;
- X. Apply ICT tools for pest monitoring, data management, and reporting;
- XI. Demonstrate teamwork, leadership, and professional ethics.

4.0 ENTRY REQUIREMENTS

The minimum entry requirements into the Higher National Diploma (HND) programme in Pest Management Technology are:

- i) Credit passes in five relevant subjects in SSCE, WASSCE, NECO, NTC, NBAIS or equivalent qualification including English Language, Mathematics, Chemistry, Agricultural Science or Biology and any one of Physics, Economics or Geography;
- ii) Must have undergone one-year mandatory Industrial Training in a relevant Institution or organisation;
- iii) Candidates must possess a lower credit pass in a National Diploma (ND) in any Agricultural-related programme;
- iv) Candidates with a **Pass** grade 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 HND Pest Management Technology is a terminal programme structured to last for two (2) years (four semesters) of classroom work, laboratory, field trips and workshop practices in relevant Ministries, Departments and Agencies (MDAs) or Units.

Each semester shall be for a minimum of 17 weeks, made up as follows:

- i) 15 contact weeks of teaching (i.e. lectures and practical sessions etc.) and
- ii) 2 weeks for registration, tests, quizzes and examinations.

6.0 CURRICULUM

The HND Pest Management Technology programme consists of Four (4) main components. These are:

- i) General studies/General education courses;
- ii) Foundation courses;
- iii) Professional courses;
- iv) Supervised Project/Seminar work.

7.0 AWARD OF HIGHER NATIONAL DIPLOMA (HND)

The Higher National Diploma certificate in Pest Management 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;

7.1 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
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7.2 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

8.0 ACCREDITATION OF PROGRAMME

The Pest Management 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.

9.0 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.

10.0 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.

11.0 STAFFING REQUIREMENTS

11.1 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 Pest Management Technology or related fields.

11.2 Technical Staff

Each facility shall be staffed by a Technologist with an HND in Pest Management Technology or any related field, and they shall be assisted by technicians with ND in any Agricultural-related programme and Laboratory, Workshop and Field attendants with at least SSCE or equivalent qualification.

11.3 Headship of the Department

The Head of Department shall have at least a Master's degree in Entomology, Pathology, Nematology programmes or related fields. He or she shall not be below the rank of a Senior Lecturer and must be registered with the relevant professional body.

11.4 Career/Academic Prospects

The diplomate who is trained in Pest Management Technology can work in public and private sectors, including various tiers of agricultural institutions, government parastatals and agencies like Ministry of Agriculture, national and international agencies, private practice, research institutions, and can also pursue postgraduate studies.

12.0 CERTIFICATION

A diplomate of this programme shall be awarded HND in Pest Management Technology.

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.

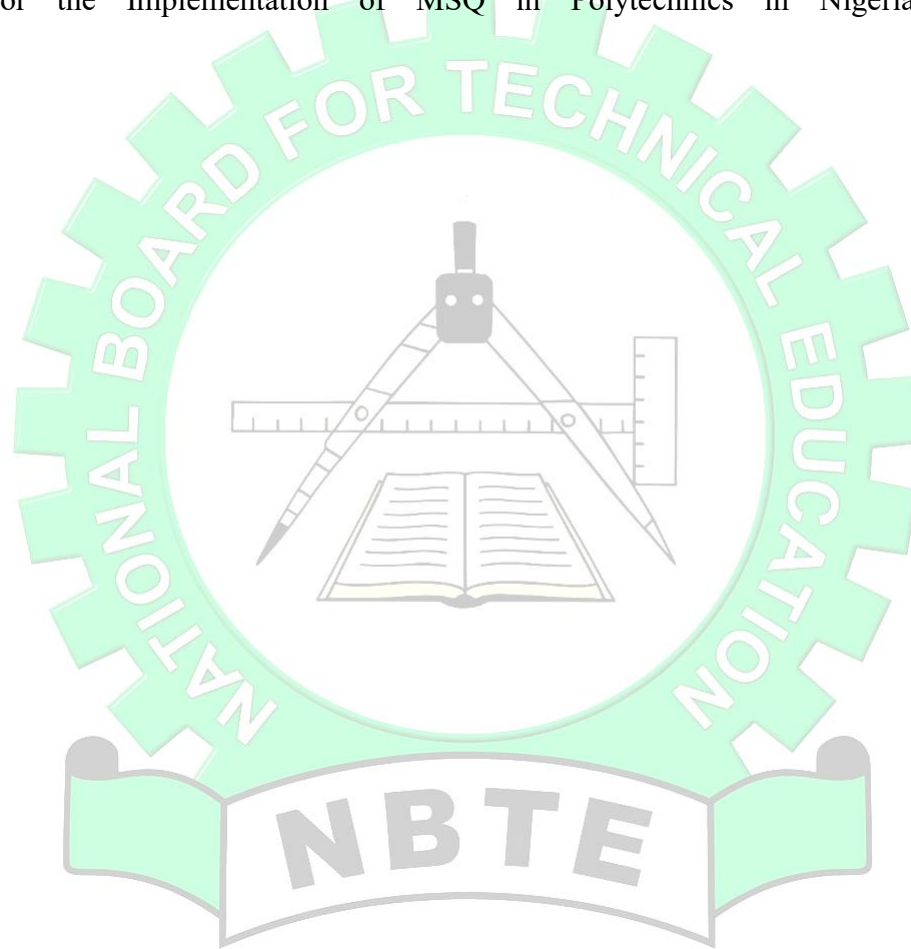
13.2 In designing the units, the principle of the modular system by product has been adopted, thus making each of the professional modules, when completed provides the student with technician operative skills, which can be used for employment purposes.

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, see the Guidelines for the Implementation of MSQ in Polytechnics in Nigeria, available on NBTE website (web.nbte.gov.ng/downloads).



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.	APT 311	Introduction to Biochemistry	1	0	3	4	4
4.	APT 312	Introduction to Microbiology	1	0	3	4	4
5.	AED 312	Agricultural Extension Methods	1	0	2	3	3
6.	PMT 311	Insect Morphology, Physiology and Taxonomy	1	0	3	4	4
7.	PMT 312	Acarology, Nematology and Other Pest Taxa	1	0	3	4	4
8.	PMT 313	Plant Physiology, Pathology and Disease Diagnostics	1	0	3	4	4
9.	PMT 314	Digital Pest Surveillance and Artificial Intelligence (AI)-Based Pest Identification	1	0	3	4	4
10.	PMT 315	Agroecology and Climate Drivers of Pest Dynamics	1	0	3	4	4
TOTAL			11	0	24	35	35

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.	AGR 302	Field Experimentation and Data Analysis	1	0	1	2	2
5.	PMT 321	Pesticide Chemistry and Toxicology	1	0	3	4	4
6.	PMT 322	Vertebrate Pest Management	1	0	3	4	4
7.	PMT 323	Push-Pull Technique and Climate-Smart Pest Management	1	0	3	4	4
8.	PMT 324	Pest Management	1	0	3	4	4
9.	PMT 325	Biosecurity in Pest Management	1	0	3	4	4
10.	PMT 326	Biological Control and Biopesticides	1	0	3	4	4
11.	PMT 327	Field Practical I	0	0	3	3	3
Total			12	0	25	37	37

YEAR II- SEMESTER I

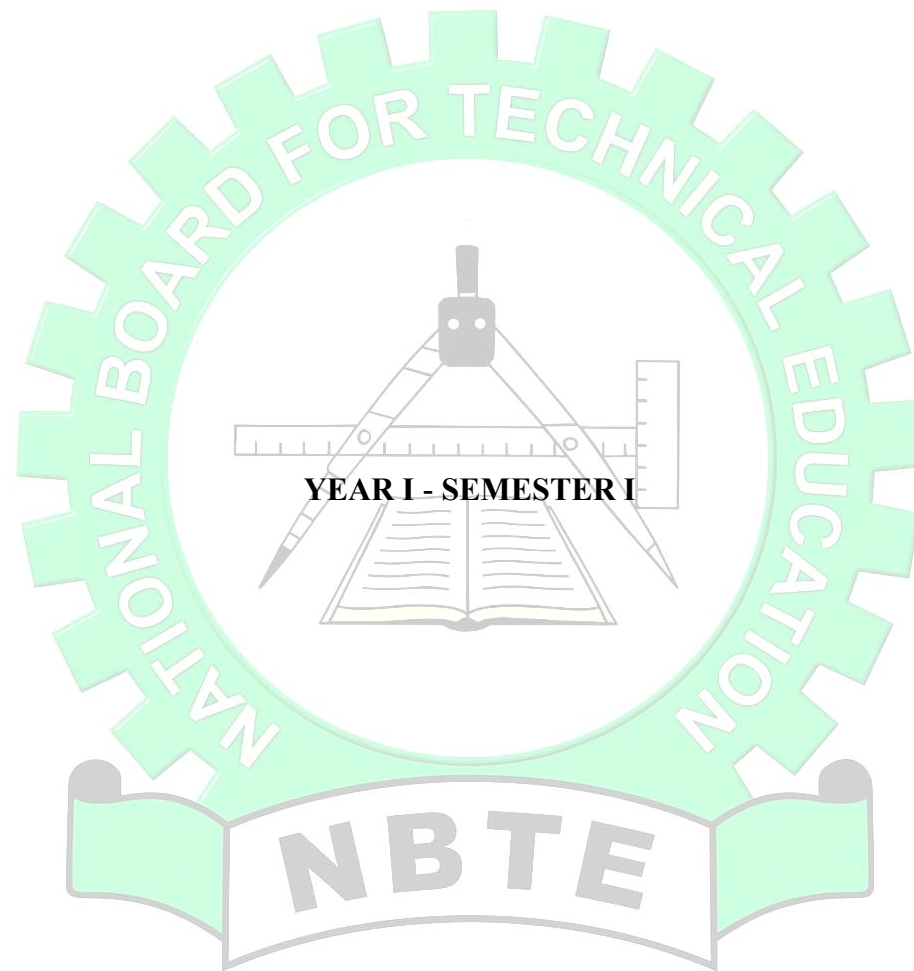
S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	AGR 401	Research Methodology and Scientific Writing	1	0	1	2	2
2.	ENT 416	Practice of Entrepreneurship II	2	0	2	4	4
3.	PMT 411	Insecticide Resistance Management and Host-Plant Resistance	1	0	3	4	4
4.	PMT 412	Precision and Digital Pest Management	1	0	3	4	4
5.	PMT 413	Invasive and Other Emerging Agricultural Pests and Diseases	1	0	3	4	4
6.	PMT 414	GIS Application and Pest Surveillance	1	0	3	4	4
7.	PMT 415	Post-Harvest and Storage Pest Management	1	0	3	4	4
8.	PMT 416	Field Practical II	0	0	4	4	4
TOTAL			8	0	22	30	30

YEAR II- SEMESTER II

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	CPT 425	Weed Science and Integrated Weed Management	1	0	2	3	3
2.	AED 424	Rural Sociology	1	0	1	2	2
3.	PMT 421	Pesticide Residue and Food Safety	1	0	3	4	4
4.	PMT 422	Pest Management Economics, Entrepreneurship and Innovation	1	0	3	4	4
5.	PMT 423	One Health: Human, Animal and Environmental Pests	1	0	3	4	4
6.	PMT 424	Urban, Household and Public Health Pest Management	1	0	3	4	4
7.	PMT 425	Integrated Pest Management (IPM)	1	0	3	4	4
8.	PMT 427	Project	0	0	4	4	4
TOTAL			7	0	22	29	29

KEY:

L: Lectures (hours/week)
 T: Tutorial (hours/week)
 P: Practical (hour/week)
 CH: Contact Hours (Hour/week)
 CU: Credit Units



INSECT MORPHOLOGY, PHYSIOLOGY AND TAXONOMY

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: INSECT MORPHOLOGY, PHYSIOLOGY AND TAXONOMY	COURSE CODE: PMT 311	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 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 the knowledge and skills in understanding insect structure, function, identification, classification, and evolutionary relationships.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand insect structure and the functions of their body parts; 2.0 Know the physiological processes that enable insects to grow, reproduce and survive; 3.0 Know insects' classification using taxonomic features; 4.0 Understand the diversity and evolutionary relationships among insect groups.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: INSECT MORPHOLOGY, PHYSIOLOGY AND TAXONOMY			COURSE CODE: PMT 311		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 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 the knowledge and skills in understanding insect structure, function, identification, classification, and evolutionary relationships.						
GENERAL OBJECTIVE 1.0: Understand insect structure and the functions of their body parts						
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 general body structure of an insect. 1.2 Describe the major parts of the insect head and their functions. 1.3 Explain adaptations of insect mouthparts. 1.4 Explain mode of feeding of different insect species. 1.5 Describe the structure and functions of the thorax. 1.6 Explain how insect	• Discuss the general body structure of an insect. • Identify the major parts of the insect head and their functions. • Explain adaptations of insect mouthparts. • Discuss mode of feeding of different insect species. • Discuss the structure and functions of the thorax. • Explain how insect legs are adapted for	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Charts, taxonomic keys Specimens, charts, photographs Multimedia presentations,	• Identify the major body regions of an insect. • Observe insect head structures. • Compare different types of insect mouthparts. • Examine insect legs and relate them to their functions. • Observe insect wings. • Identify abdominal structures and their functions. • Draw a well labelled	Guide student to: • Identify the major body regions of an insect. • Observe insect head structures. • Compare different types of insect mouthparts. • Examine insect legs and relate them to their functions. • Observe insect wings. • Show abdominal structures and their functions.	Live or Preserved Insects, Diagrams, Worksheets. Insect Specimens, Hand Lenses, Microscopes, Charts, Preserved Specimens, Diagrams, Microscopic Slides and cover slips, Identification Charts.

	legs are adapted for different functions. 1.7 Explain how wings are adapted for various functions. 1.8 Explain the structure and functions of the abdomen. 1.9 Explain insect body adaptations to survival in different environments. 10 Explain adaptations of different insect species.	different functions. • Explain how wings are adapted for various functions. • Discuss the structure and functions of the abdomen. • Discuss insect body adaptations to survival in different environments. • Discuss adaptations of different insect species.	etc.	insect body parts. • Identify thoracic appendages of 5 insects. • Draw abdominal structures and genitalia • Apply taxonomic keys for identification • Investigate the relationship between structure and function. • Conduct a field collection and observation exercise.	• Draw and label observed insect body parts. • Draw thoracic appendages of 5 insects • Examine abdominal structures and genitalia • Apply taxonomic keys for identification • Investigate the relationship between structure and function. • Conduct a field collection and observation exercise.	Insect Collections, Photographs, Drawing Sheets, Insect Boxes, Identification Keys, Sweep Nets, Collection Jars, Dissecting kits Practical manual.
GENERAL OBJECTIVE 2.0: Know the physiological processes that enable insects to grow, reproduce and survive						
4-6	2.1 Explain the meaning of insect physiology. 2.2 Describe the digestive system and its role in growth and survival. 2.3 Explain the	• Explain the concept of physiology and discuss its importance in insect life. • Explain the structure and functions of the digestive system using diagrams.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker,	• Identify the major physiological systems of insects. • Examine the digestive system of an insect. • Observe respiratory structures in insects. • Investigate insect	Guide students to: • Identify the major physiological systems of insects. • Examine the digestive system of an insect. • Observe respiratory structures in insects.	Preserved insects, Anatomical models, Charts, Microscopes, Dissecting kits, Preserved insects, Dissecting

	respiratory system of insects.	• Discuss with the aid of diagrams and models to demonstrate gaseous exchange in insects. • Discuss the open circulatory system and discuss its functions. • Explain waste removal and water conservation mechanisms in insects. Explain how insects respond to environmental stimuli. • Discuss growth stages using examples and life-cycle diagrams. • Explain the role of hormones in insect development and reproduction. • Explain reproductive structure and processes with the aid of diagram. • Discuss insect responses to environmental	Pictures, Videos, Charts, taxonomic keys Specimens, charts, photographs Multimedia presentations, etc.	responses to environmental stimuli. • Observe insect growth and development stages. • Create presentation slides to compare complete and incomplete metamorphosis. • Identify reproductive structures in insects. • Observe excretory structures and water conservation adaptations. • Investigate insect behavior related to survival. • Draw a well labelled the structure of cuticle. • Interpret physiological observations. • Relate physiological processes to environmental adaptation. • Demonstrate safe handling and ethical	• Investigate insect responses to environmental stimuli. • Observe insect growth and development stages. • Compare complete and incomplete metamorphosis. • Identify reproductive structures in insects. • Observe excretory structures and water conservation adaptations. • Investigate insect behavior related to survival. • Draw and label the structure of cuticle. • Record and interpret physiological observations. • Relate physiological processes to environmental adaptation. • Demonstrate safe handling and ethical treatment of insects. • Record data	trays, Live insects, Light source, Containers, Thermometers, Observation sheets, Life-cycle charts, Insect cultures, Videos, Specimens. Charts, Preserved specimens, Photographs, Worksheets, Hand lenses, Models, Anatomical charts, Preserved specimens, Cages, Worksheets, Drawing materials. Environmental samples, Practical manual.
2.4	Explain the circulatory system and its functions.					
2.5	Explain the excretory system and osmoregulation.					
2.6	Describe the nervous system and sensory organs.					
2.7	Explain insect growth and development.					
2.8	Describe the endocrine system and hormonal control.					
2.9	Explain insect reproduction and reproductive processes.					
2.10	Explain how insects interact with their environment.					
2.11	Describe physiological					

	adaptations for survival. 2.12 Explain the importance of physiological processes in insect success. 2.13 Describe the insect exoskeleton (cuticle) and its functions.	changes and survival strategies. • Discuss insect adaptations and discuss their significance. • Discuss physiological systems and their contributions to insect survival. • Discuss the insect exoskeleton (cuticle) and its functions.		treatment of insects. • Demonstrate how insects respond to environmental stimuli. • Record data accurately and interpreting results	accurately and interpreting results • Demonstrate how insects respond to environmental stimuli.	
GENERAL OBJECTIVE 3.0: Know insects classification using taxonomic features.						
7-9	3.1 Explain the concept of insect taxonomy. 3.2 Describe the objectives and importance of insect classification. 3.3 Explain the hierarchical taxonomic ranks used in insect classification. 3.4 Describe the principles of insect identification. 3.5 Explain the	• Discuss the concept of insect taxonomy. • Discuss the objectives and importance of insect classification. • Explain the hierarchical taxonomic ranks used in insect classification. Discuss the principles of insect identification. • Explain the concept of diagnostic characteristics. • Explain the role of	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts Marker board, Marker, Pictures, Videos, Charts, taxonomic keys Specimens, charts, photographs Multimedia presentations,	• Identify insects using observable morphological characteristics. • Carryout visual inspection to distinguish insects from other arthropods. • Use simple taxonomic keys to identify insects. • Identify major insect orders using diagnostic characteristics.	Guide students to: • Identify insects using observable morphological characteristics. • Distinguish insects from other arthropods. • Use simple taxonomic keys to identify insects. • Identify major insect orders using diagnostic characteristics. • Create visual	Preserved insects, Live insects, Hand lenses, Microscopes, Arthropod specimens, Charts, Diagrams, Models, Dichotomous keys, Insect specimens, Worksheets, Posters, Field guides,

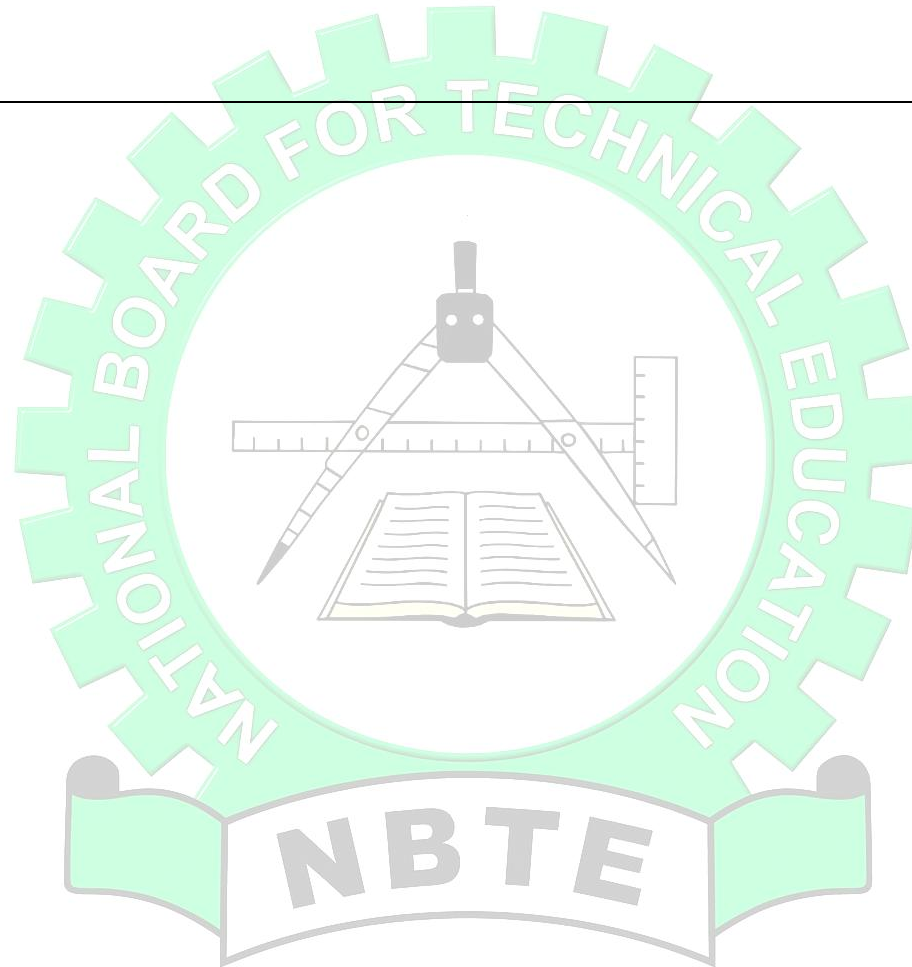
concept of diagnostic characteristics. 3.6 Describe the role of morphology in insect taxonomy. 3.7 Explain the use of taxonomic keys in insect identification. 3.8 Discuss major insect orders and their diagnostic characteristics. 3.9 Differentiate insects based on wing, mouthpart and leg adaptation characteristics. 3.10 Explain the concept of scientific nomenclature. 3.11 Explain factors influencing modern insect classification. 3.12 Explain the significance of insect taxonomy in agriculture and environmental management.	morphology in insect taxonomy. • Explain the use of taxonomic keys in insect identification. • Explain major insect orders and their diagnostic characteristics. • Explain insects based on wing, mouthpart and leg adaptation characteristics. • Explain the concept of scientific nomenclature. • Explain factors influencing modern insect classification. • Explain the significance of insect taxonomy in agriculture and environmental management. • Explain the diversity and evolutionary relationships among insects.	etc.	• Create visual content to classify insects according to wing characteristics. • Create visual content to classify insects according to mouthpart types. • Create visual content to classify insects according to leg adaptations. • Prepare an insect collection. • Construct a simple insect classification chart. • Create presentation slides to compare similarities and differences among insect groups. • Identify insects from field-collected samples. • Maintain records of identified insect species.	content to classify insects according to wing characteristics. Create visual content to classify insects according to mouthpart types. • Create visual content to classify insects according to leg adaptations. • Prepare an insect collection. • Construct a simple insect classification chart. • Create presentation slides to compare similarities and differences among insect groups. • Identify insects from field-collected samples. • Maintain records of identified insect species.	Wing charts, Sweep nets, Collection jars, Insect pins, Mounting boards, Labels, Worksheets, Reference materials, Classification guides, Forceps, Collection containers, Identification forms, Practical manual.
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	3.13 Describe the diversity and evolutionary relationships among insects.					
GENERAL OBJECTIVE 4.0: Understand the diversity and evolutionary relationships among insect groups.						
10-12	4.1 Explain the concept of insect diversity and its importance in ecosystems. 4.2 Explain major insect groups based on observable characteristics. 4.3 Explain insect orders using morphological features. 4.4 Describe evolutionary relationships among insect groups using classification systems. 4.5 Explain phylogenetic trees and evolutionary diagrams of insects. 4.6 Explain	- Describe the concept of insect diversity and its importance in ecosystems. - Discuss major insect groups based on observable characteristics. - Discuss insect orders using morphological features. - Explain evolutionary relationships among insect groups using classification systems. - Explain phylogenetic trees and evolutionary diagrams of insects. - Discuss dichotomous keys to classify insects accurately. - Differentiate ancestral and derived insect groups in	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Charts, taxonomic keys Specimens, charts, photographs Multimedia presentations, etc.	- Identify diverse insect groups from specimens, photographs, or field collections. - Carryout visual inspection to compare the physical characteristics of major insect orders and identify similarities and differences. - Classify insects into major orders based on observable characteristics. - Construct a simple table showing the diversity of insect groups found in the school or local environment. - Arrange selected insect groups according to their	Guide students to: - Identify diverse insect groups from specimens, photographs, or field collections. - Carryout visual inspection to compare the physical characteristics of major insect orders and identify similarities and differences. - Classify insects into major orders based on observable characteristics. - Construct a simple table showing the diversity of insect groups found in the school or local environment. - characteristics. - Arrange selected insect groups	Preserved insects, Live specimens, Insect photographs, Hand lenses, Insect specimens, Identification charts, Posters, Microscopes, Dichotomous keys, Classification charts, Insect collections, Field notebooks, Data sheets, Insect collection jars, Evolutionary diagrams,

	dichotomous keys to classify insects accurately. 4.7 Differentiate ancestral and derived insect groups in terms of evolution.	terms of evolution.	evolutionary development from primitive to more specialized forms. • Construct a simple phylogenetic tree showing relationships among selected insect orders. • Relate adaptations such as wings, mouthparts, and metamorphosis to insect diversification. • Investigate and present evidence supporting insect evolution and diversification. • Evaluate evolutionary relationships among insect groups using observable and documented evidence.	according to their evolutionary development from primitive to more specialized forms. • Construct a simple phylogenetic tree showing relationships among selected insect orders. • Relate adaptations such as wings, mouthparts, and metamorphosis to insect diversification. • Investigate and present evidence supporting insect evolution and diversification. • Evaluate evolutionary relationships among insect groups using observable and documented evidence.	Insect morphology charts, Multimedia presentations, Phylogenetic tree charts, Flashcards of insect groups, Projector, Chart paper, Markers, Evolutionary relationship diagrams, Insect specimens, Diagrams of insect anatomy, Videos, Internet resources, Worksheets, Assessment rubrics, Practical manual.
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COURSE ASSESSMENT:

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



ACAROLOGY, NEMATOLOGY AND OTHER PEST TAXA

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: ACAROLOGY, NEMATOLOGY AND OTHER PEST TAXA	COURSE CODE: PMT 312	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 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 identification, biology, ecology, economic importance, surveillance, diagnosis and sustainable management of mites, ticks, Nematodes and other economically important pest taxa affecting crops, livestock, stored products and public health.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Understand the classification and characteristics of Acarines, Nematodes and other Pest taxa; 2.0 Comprehend the economically important mites, ticks, Nematodes and other Pest groups; 3.0 Understand biology, ecology and life cycles of major Pest taxa; 4.0 Know the economic importance and damage caused by Pest taxa; 5.0 Know surveillance, sampling and diagnosis of Pest taxa; 6.0 Understand integrated management strategies for Acarines, Nematodes and other Pest taxa.		

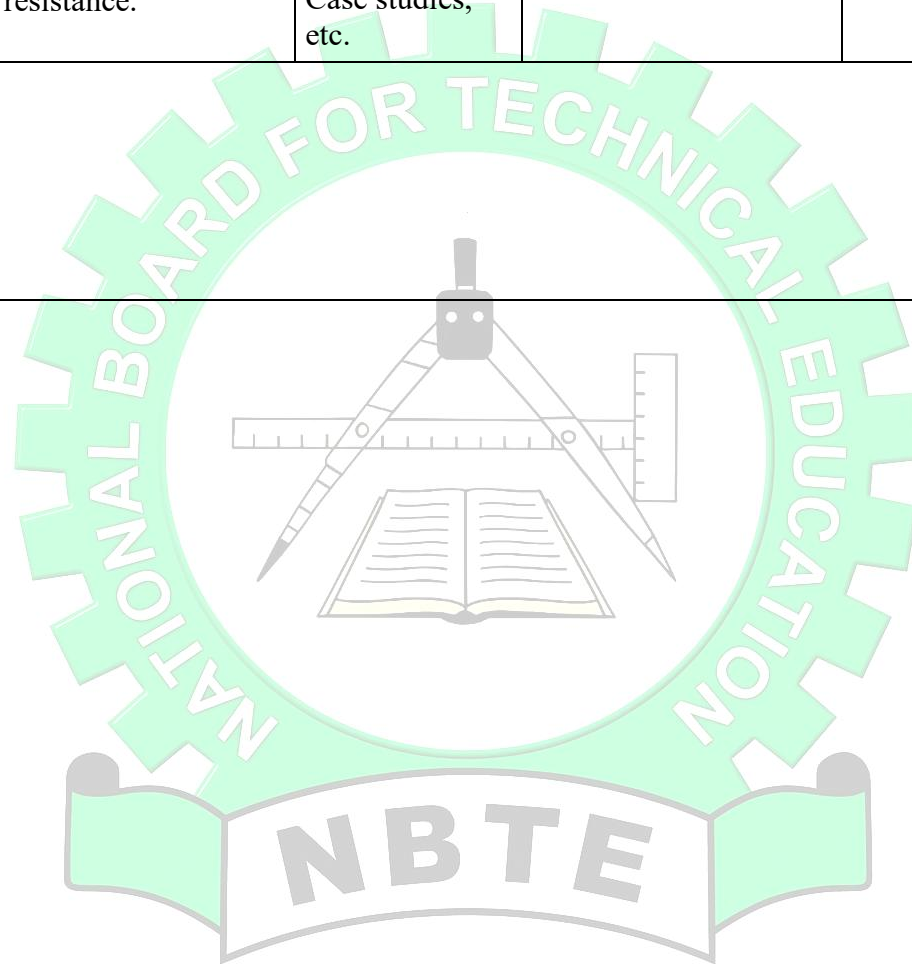
PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: ACAROLGY, NEMATOLOGY AND OTHER PEST TAXA			COURSE CODE: PMT 312		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE: NIL		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and practical skills in the identification, biology, ecology, economic importance, surveillance, diagnosis and sustainable management of mites, ticks, Nematodes and other economically important pest taxa affecting crops, livestock, stored products and public health.						
GENERAL OBJECTIVE 1.0: Understand the classification and characteristics of Acarines, Nematodes and other Pest taxa.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain acarology, nematology and pest taxonomy. 1.2 Explain the classification major pest taxa. 1.3 Explain the characteristics of mites, ticks, nematodes, molluscs and rodents. 1.4 Explain diagnostic morphological features. 1.5 Explain taxonomy to pest	• Explain acarology, nematology and pest taxonomy. • Explain major pest taxa. • Explain characteristics of mites, ticks, nematodes, molluscs and rodents. • Discuss diagnostic morphological features. • Discuss taxonomy to pest identification and control	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Charts, taxonomic keys Specimens, charts, photographs Multimedia	•Identify major pest taxa using specimens and their differences. •Use taxonomic keys for identification. •Carryout classification of collected specimens	Guide students to: • Identify major pest taxa using specimens and their differences. • Use taxonomic keys for identification. • Carryout classification of collected specimens	Preserved specimens, Identification manuals, Microscopes, Specimen boxes, Hand lenses, Practical manual.

	identification and control decisions.	decisions.	presentations, etc.			
GENERAL OBJECTIVE 2.0: Comprehend the economically important mites, ticks, Nematodes and other Pest groups.						
4-6	2.1 Describe major crop-infesting mites. 2.2 Describe livestock ticks and mites. 2.3 State important plant parasitic Nematodes. 2.4 Explain major nematode groups and hosts. 2.5 Describe rodents, termites, slugs, snails and invasive pests 2.6 Explain pest taxa of economic importance (millipedes, wood termite, woodlice, etc.)	• Explain major crop-infesting mites. • Describe livestock ticks and mites. • Discuss important plant parasitic Nematodes. • Explain major nematode groups and hosts. • Discuss rodents, termites, slugs, snails and invasive pests • Explain other pest taxa of economic importance (millipedes, wood termite, woodlice, etc.).	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Videos, Charts, Images, Specimens, Photographs, Nematode charts, Visual aids, etc.	•Identify pest taxa from field samples. •Conduct mite sampling (leaf brushing, washing, beating, etc.) •Prepare identification records. •Develop pest identification collections.	Guide students to: •Identify pest taxa from field samples •Conduct mite sampling (leaf brushing, washing, beating, etc.) •Prepare identification records •Develop pest identification collections	Mite-damaged plants, Sampling kit Microscopes, Field samples Field notebooks, Practical manual.
GENERAL OBJECTIVE 3.0: Understand the biology, ecology and life cycles of major pest taxa.						
7-9	3.1 Describe life cycles of mites, ticks and Nematodes. 3.2 Explain ecological requirements of	• Discuss life cycles of mites, ticks and Nematodes. •Explain ecological requirements of pest	Textbooks, Journals, Internet, Articles, Projector,	•Demonstrate microscopic observations •Observe developmental stages	Guide students to: •Demonstrate microscopic observations. •Observe	Nematode slides, Dissecting set, Microscopes, specimens

	pest taxa. 3.3 Explain host-pest interactions. 3.4 Explain developmental stages of mites, ticks and Nematodes. 3.5 Explain temperature, humidity and host influences.	taxa. • Explain host-pest interactions. • Explain developmental stages of mites, ticks and Nematodes. • Discuss temperature, humidity and host influences.	Computer, Diagrams/chart Marker board, Marker, Pictures, Videos, Nematology texts, Charts, Animations, Multimedia resources, Case studies, etc.	of pest taxa • Record ecological observations • Carryout field inspection to compare pest habitats	developmental stages of pest taxa. • Record ecological observations. • Carryout field inspection to compare pest habitats	Observation sheets Demonstration farms, Practical manual
GENERAL OBJECTIVE 4.0: Know the economic importance and damage caused by Pest taxa.						
10-12	4.1 Describe crop damage caused by mites and Nematodes. 4.2 Describe livestock losses caused by ticks and mites. 4.3 Explain public health significance of selected pest taxa. 4.4 Explain symptoms and yield losses 4.5 Discuss impacts of mites and ticks on animal production and health.	• Explain crop damage caused by mites and Nematodes. • Discuss livestock losses caused by ticks and mites. • Explain public health significance of selected pest taxa. • Describe symptoms and yield losses • Discuss impacts of mites and ticks on animal production and health. • Explain zoonotic and environmental	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Videos, Charts, Case studies, Reports, Publications, etc.	• Assess pest damage in the field • Estimate infestation levels. • Document economic impacts. • Demonstrate scoring methods. • Record data. • Analyse data.	Guide students to: • Assess pest damage in the field • Estimate infestation levels. • Document economic impacts. • Demonstrate scoring methods. • Record data. • Analyse data.	Field plots, Sampling sheets, Worksheet, Practical manual.

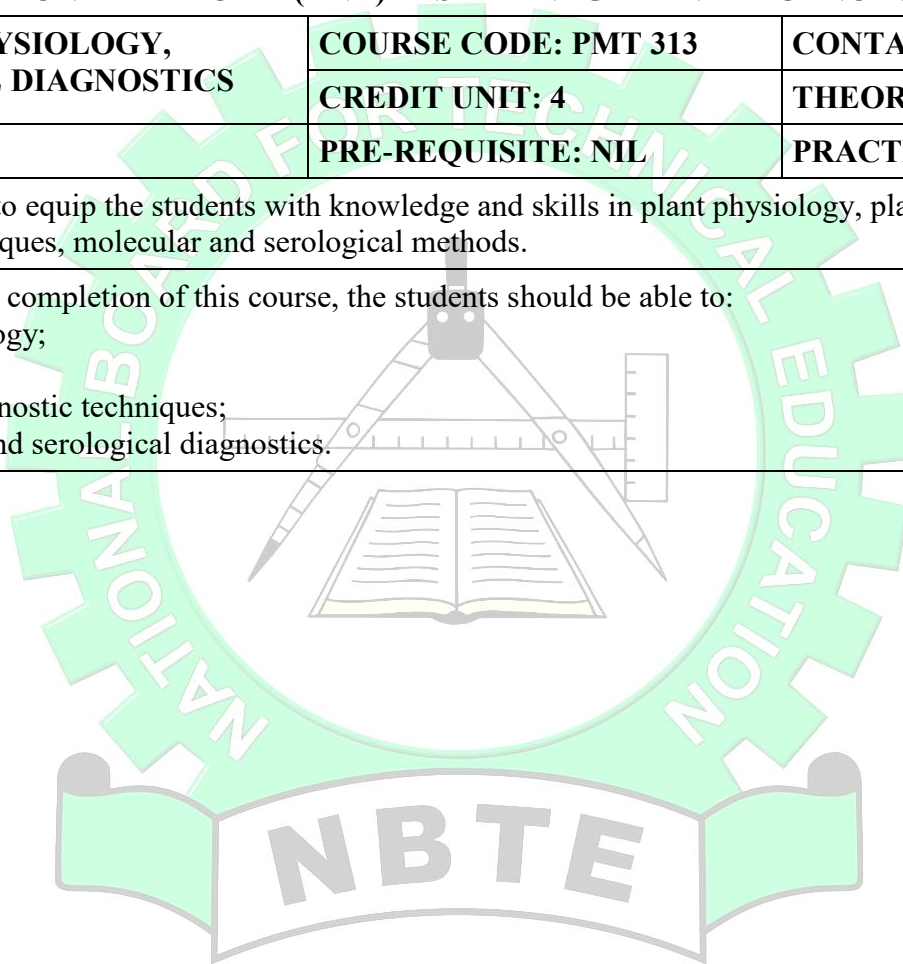
	4.6 Discuss zoonotic and environmental implications.	implications.				
GENERAL OBJECTIVE 5.0: Know surveillance, sampling and diagnosis of Pest taxa.						
13-14	5.1 Explain pest surveillance principles. 5.2 Describe sampling techniques for mites and Nematodes. 5.3 Explain diagnostic procedures. 5.4 Explain surveillance objectives and methods. 5.5 Explain field and laboratory methods. 5.6 Explain specimen identification and processing.	• Explain pest surveillance principles. • Explain sampling techniques for mites and Nematodes. • Explain diagnostic procedures. • Discuss surveillance objectives and methods. • Explain field and laboratory methods. • Discuss specimen identification and processing.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Sampling manuals, Diagnostic guides, etc.	• Collect pest samples from fields and livestock • Extract Nematodes from soil samples • Prepare diagnostic reports	Guide student to: • Collect pest samples from fields and livestock • Extract Nematodes from soil samples • Prepare diagnostic reports	Sampling tools, Baermann funnel, Sieves, Reporting templates, Practical manual.
GENERAL OBJECTIVE 6.0: Understand integrated management strategies for Acarines, Nematodes and other Pest taxa.						
15	6.1 Describe cultural, biological and chemical control methods. 6.2 Explain resistance management strategies. 6.3 Explain integrated Pest Management	• Explain cultural, biological and chemical control methods • Discuss resistance management strategies. • Discuss integrated Pest Management	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board,	• Demonstrate Pest Management practices • Evaluate effectiveness of control measures. • Carry out monitoring exercises	Guide students to: • Demonstrate Pest Management practices. • Evaluate effectiveness of control measures. • Carry out monitoring exercises.	Demonstration plots, Assessment sheets, Practical manual.

	approaches. 6.4 Outline causes and prevention of resistance.	approaches. • Discuss causes and prevention of resistance.	Marker, Pictures, Videos, Case studies, etc.			
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



PLANT PHYSIOLOGY, PATHOLOGY AND DISEASE DIAGNOSTICS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: PLANT PHYSIOLOGY, PATHOLOGY AND DISEASE DIAGNOSTICS	COURSE CODE: PMT 313	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip the students with knowledge and skills in plant physiology, plant pathology with emphasis on modern disease-diagnostic techniques, molecular and serological methods.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand plant physiology; 2.0 Know plant pathology; 3.0 Comprehend disease diagnostic techniques; 4.0 Comprehend molecular and serological diagnostics.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: PLANT PHYSIOLOGY, PATHOLOGY AND DISEASE DIAGNOSTICS			COURSE CODE: PMT 313		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 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 the students with knowledge and skills in plant physiology, plant pathology with emphasis on modern disease-diagnostic techniques, molecular and serological methods.						
GENERAL OBJECTIVE 1.0: Understand plant physiology						
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 concepts and scope of plant physiology. 1.2 Describe the structure and functions of plant cells and tissues. 1.3 Outline the processes of photosynthesis, respiration, transpiration and mineral nutrition. 1.4 Describe the synthesis of carbohydrates. 1.5 Explain the	• Discuss the concepts and scope of plant physiology. • Explain the structure and functions of plant cells and tissues. • Explain processes of photosynthesis, respiration, transpiration and mineral nutrition. • Discuss synthesis of carbohydrates. • Describe monocotyledonous and dicotyledonous plants	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/ charts, Marker board, Marker, Pictures, Videos, Magnetics s erasers, etc.	• Identify plant structure (morphology) and functions • Draw plant cells and tissues. • Conduct light and dark treatment experiments to assess photosynthetic activity. • Expose plants to mineral nutrition and those without mineral nutrition. • Categorize plants into	Guide students to: • Identify plant structure (morphology) and functions • Draw plant cells and tissues. • Conduct light and dark treatment experiments to assess photosynthetic activity. • Expose plants to mineral nutrition and those without mineral nutrition.	Microscopes, Charts, slides, plant hormones, Practical manual.

	differences between monocotyledonous and dicotyledonous plants. 1.6 Explain the role of plant hormones in growth and development. 1.7 Describe the factors affecting plant growth and productivity.	• Discuss the role of plant hormones in growth and development • Explain factors affecting plant growth and productivity		monocotyledonous and dicotyledonous • Create presentation slides to outline plant hormones in growth and development • Draw the structure and functions of plant cells and tissues	• Categorize plants into monocotyledonous and dicotyledonous • Create presentation slides to outline plant hormones in growth and development • Draw the structure and functions of plant cells and tissues	
GENERAL OBJECTIVE 2.0: Know plant pathology						
4-6	2.1 Explain the concept of pathology. 2.2 Explain the differences between plant pathogens and disease. 2.3 State the biology and life cycles of some plant pathogens. 2.4 Describe disease triangle. 2.5 Explain the roles of biotic and abiotic factors in plant diseases.	• Explain concept of pathology. • Explain the differences between plant pathogens and disease. • Explain the biology and life cycles of some plant pathogens (bacteria, fungi, Nematodes, viruses etc.) • Describe disease triangle • Explain the roles of biotic and abiotic factors in plant diseases.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/ charts, Marker board, Marker, Pictures, Videos, Magnetics s erasers, etc.	• Profile plant pathogens (bacteria, fungi, nematode, etc. and abiotic) on the field based on symptoms and signs • Develop disease triangle and disease cycles • Categorize biotic and abiotic factors on symptoms and signs • Examine bacterial pathogens (Gram stain) • Identify nematode and phytoplasma symptoms	Guide students to: • Profile plant pathogens (bacteria, fungi, nematode, etc. and abiotic) on the field based on symptoms and signs • Develop disease triangle and disease cycles • Categorize biotic and abiotic factors on symptoms and signs • Examine bacterial pathogens (Gram stain) • Identify nematode and phytoplasma	Microscope, Disease cycle charts, Field plots, Climate data, Computer, Internet, software, Practical manual.

	2.6 Explain epidemics and inoculum dynamics.	• Discuss epidemics and inoculum dynamics.		(yellowing, witches' broom) • Correlate climate data with disease incidence • Track epidemic build-up in field	symptoms (yellowing, witches' broom) • Correlate climate data with disease incidence • Track epidemic build-up in field	
GENERAL OBJECTIVE 3.0: Comprehend disease diagnostic techniques						
7-9	3.1 Describe the importance of disease diagnosis. 3.2 Explain visual diagnosis and symptomatology techniques. 3.3 Explain isolation and culture techniques 3.4 Explain Koch's postulates 3.5 Explain digital and AI-based diagnosis	• Explain the importance of disease diagnosis. • Explain visual diagnosis and symptomatology techniques. • Discuss isolation and culture techniques • Discuss Koch's postulates • Discuss digital and AI-based diagnosis (PlantVillage, Plantix)	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Magnetics s erasers, etc.	• Diagnose 10 diseases visually using symptoms and signs • Isolate bacteria/fungi from infected tissue of any organism • Use Koch's postulates to identify a named plant disease • Apply PlantVillage / Plantix mobile apps to identify 5 plant diseases • Profile at least 5 common household/urban plant pathogen	Guide students to: • Diagnose 10 diseases visually using symptoms and signs • Isolate bacteria/fungi from infected tissue of any organism • Use Koch's postulates to identify a named plant disease • Apply PlantVillage / Plantix mobile apps to identify 5 plant diseases • Profile at least 5 common household/urban plant pathogen	Crops samples, Microscope, Incubator, Hand lens, Glass slides, Reagents, Media, Litmus paper, Autoclave, Smartphones, AI apps, Practical manual, etc.
GENERAL OBJECTIVE 4.0: Comprehend molecular and serological diagnostics						
10-12	4.1 Explain molecular and ELISA	• Explain molecular and ELISA	Textbooks, Journals,	• Run ELISA for virus detection	Guide students to: • Run ELISA for virus	ELISA kit, Plate reader,

	serological diagnostics. 4.2 Explain the application of PCR and molecular markers. 4.3 Outline LAMP and rapid field tests 4.4 Describe on-site lab kits and quick-test strips	serological diagnostics. - Explain the application of PCR and molecular markers. - Discuss LAMP and rapid field tests - Explain on-site lab kits and quick-test strips	Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Magnetics s erasers, etc.	- Demonstrate PCR protocols and molecular markers - Browse LAMP protocols - Use field quick-test strips	detection - Demonstrate PCR protocols and molecular markers - Browse LAMP protocols - Use field quick-test strips	Test strips Pathogen, Smartphones, AI apps, Practical manual, etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

DIGITAL PEST SURVEILLANCE AND ARTIFICIAL INTELLIGENCE (AI)-BASED PEST IDENTIFICATION

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: DIGITAL PEST SURVEILLANCE AND ARTIFICIAL INTELLIGENCE (AI)-BASED PEST IDENTIFICATION	COURSE CODE: PMT 314	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip the students with knowledge and skills on pest detection, monitoring and the use of digital tools to monitor pest populations and their distribution.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Understand the digital pest-surveillance foundations; 2.0 Comprehend Artificial Intelligence AI-Based Pest Identification, Detection and Predictive Surveillance Systems; 3.0 Know mobile pest-scouting; 4.0 Know trap-based digital surveillance to track the occurrence, spread, and abundance of pests; 5.0 Understand Pest data analysis and visualization techniques.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: DIGITAL PEST SURVEILLANCE AND ARTIFICIAL INTELLIGENCE (AI)-BASED PEST IDENTIFICATION			COURSE CODE: PMT 314		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 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 the students with knowledge and skills on pest detection, monitoring and the use of digital tools to monitor pest populations and their distribution.						
GENERAL OBJECTIVE 1.0: Understand digital pest-surveillance foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain digital pest-surveillance concepts and ecosystem. 1.2 Outline pest-surveillance data architecture. 1.3 Outline national / regional surveillance systems (FAO Locust Watch, CABI Plantwise). 1.4 Explain the various areas where digital pest-surveillance would be applied.	• Discuss digital pest-surveillance concepts and AI-based identification • Discuss pest-surveillance data architecture. • Give a brief on the National / regional surveillance systems (FAO Locust Watch, CABI Plantwise) • Discuss the various areas where digital pest-surveillance would	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos etc.	• Draw types of digital surveillance • Map an active crop field and generate an actionable pest hotspots report • Use mobile applications for real-time pest reporting and monitoring • Apply Geographic Information Systems (GIS) for pest mapping and spatial analysis. • Use Global Positioning System	• Guide students to: • Differentiate digital surveillance types • Map an active crop field and generate an actionable pest hotspots report • Use mobile applications for real-time pest reporting and monitoring • Apply Geographic Information Systems (GIS) for pest mapping and spatial analysis. • Use Global	Computer, internet, surveillance platforms, Field observation guide on monitoring, Nigeria Agro zone maps, Digital surveillance smartphones, Tablets digital cameras, GPS Devices, Sensors and Smart Traps,

	1.5 Explain the application of digital pest-surveillance.	be applied • Discuss the application of digital pest-surveillance.		(GPS) devices for field data collection and location tracking, • Integrate digital cameras and imaging tools for pest documentation, • Use cloud-based platforms for data storage, sharing, and analysis, • Apply remote sensing technologies (drones, satellite imagery) for large-scale pest surveillance, • Use decision-support systems for Pest Management planning, • Carry out data collection, entry, and management using digital survey tools and software • Use pest surveillance mobile applications for early warning and reporting systems, • Write a short technical report on	Positioning System (GPS) devices for field data collection and location tracking, • Integrate digital cameras and imaging tools for pest documentation, • Use cloud-based platforms for data storage, sharing, and analysis, • Apply remote sensing technologies (drones, satellite imagery) for large-scale pest surveillance, • Use decision-support systems for Pest Management planning, • Carry out data collection, entry, and management using digital survey tools and software • Use pest surveillance mobile applications for early warning and reporting systems, • Write a short	GIS (QGIS and ArcGIS), Practical manual, etc.
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				weather prediction using GPS and GIS in field surveillance. • Write a technical report on a field trip on monitoring large agricultural fields to detect pest infestation.	technical report on weather prediction using GPS and GIS in field surveillance. • Write a technical report on a field trip on monitoring large agricultural fields to detect pest infestation.	
GENERAL OBJECTIVE 2.0: Comprehend Artificial Intelligence AI-Based Pest Identification, Detection and Predictive Surveillance Systems						
4-6	2.1 Explain the concept and principles of Artificial Intelligence in Pest Management and Agriculture. 2.2 Outline the role of AI in pest identification and management. 2.3 Explain the major agricultural pests using AI-powered tools and applications. 2.4 Explain the accuracy and limitations of AI-	• Discuss the concept and principles of Artificial Intelligence in Pest Management and Agriculture. • Discuss the role of AI in pest identification and management. • Describe the major agricultural pests using AI-powered tools and applications. • Discuss the accuracy and limitations of AI-Based Pest Identification systems. • Discuss the accuracy and limitations of AI-Based Pest detection	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Lecture notes, Research reports, Learning management	• Apply basic predictive techniques to forecast pest outbreaks. • Use AI-supported tools to support pest monitoring and decision-making. • Evaluate the effectiveness of AI tools in pest control strategies. • Capture high-quality images of pests and pest damage • Use AI-powered mobile applications for pest identification	Guide students to: • Apply basic predictive techniques to forecast pest outbreaks. • Use AI-supported tools to support pest monitoring and decision-making. • Evaluate the effectiveness of AI tools in pest control strategies. • Capture high-quality images of pests and pest damage • Use AI-powered mobile applications for pest identification	Smartphones, AI apps, Lucid keys, iNaturalist accounts, Digital cameras, GPS enabled devices, Internet access, Plantix, PlantVillage Nuru, Computers, Image storage devices, Spreadsheet software, GIS software,

	Based Pest Identification systems. 2.5 Explain the accuracy and limitations of AI-Based Pest detection systems. 2.6 Describe the principles of machine learning in pest classification. 2.7 Differentiate between AI-based pest identification, detection and Predictive Surveillance Systems 2.8 Explain how AI systems detect pest presence and infestation levels 2.9 Explain the role of sensors, smart traps, and remote sensing technologies in pest detection. 2.10 Explain basic predictive techniques to	systems. • Describe the principles of machine learning in pest classification. • Differentiate between AI-based pest identification and pest detection systems. • Discuss how AI systems detect pest presence and infestation levels • Discuss the role of sensors, smart traps, and remote sensing technologies in pest detection, • Outline ethical, technical and operational challenges associated with AI technologies in agriculture.	systems, etc.	• Organise pest image datasets. • Compare AI results with conventional identification methods. • Use of simple AI pest identification tools • Simulate the operation of smart pest traps or sensors. • Analyze sample data from pest detection systems (e.g., trap counts, alerts, etc.). • Interpret pest risk alerts generated from AI-based systems. • Conduct case-based exercises on pest outbreak prediction. • Map pest occurrences using AI-supported or digital surveillance tools. • Prepare a report on AI-assisted pest monitoring and management using AI-assisted data.	• Organise pest image datasets. • Compare AI results with conventional identification methods • Use of simple AI pest identification tools. • Simulate the operation of smart pest traps or sensors. • Analyze sample data from pest detection systems (e.g., trap counts, alerts). • Interpret pest risk alerts generated from AI-based systems, • Conduct case-based exercises on pest outbreak prediction • Map pest occurrences using AI-supported or digital surveillance tools • Prepare a report on AI-assisted pest monitoring and management using AI-assisted data.	Microscopes, Demonstration farms, Experimental plots, Pest-infested crop samples, Practical manual, etc.
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	forecast pest outbreaks. 2.11 Explain the concept of early warning systems in Pest Management. 2.12 List ethical, technical and operational challenges associated with AI technologies in agriculture.			• Write a technical report on field visit.	• Write a technical report on field visit.	
GENERAL OBJECTIVE 3.0: Know mobile pest-scouting						
7-9	3.1 Explain mobile pest scouting and its importance in Pest Management. 3.2 Explain the principles and objectives of mobile scouting. 3.3 Explain the different mobile technologies used in pest scouting. 3.4 State the procedure for collecting, recording, storing, and transmitting pest data. 3.5 Explain the	• Discuss the concepts of mobile pest scouting and digital agriculture. • Discuss successful digital pest surveillance programmes • Explain the principles and objectives of mobile scouting • Explain the different mobile technologies used in pest scouting • Discuss the procedure for collecting, recording, storing, and transmitting	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos Mobile scouting textbooks, research publications,	• Install mobile pest scouting applications • Operate mobile pest scouting applications • Capture quality images of pests and pest damage using mobile devices • Record pest occurrence data accurately in digital formats. • Use GPS-enabled devices to geo-reference pest surveillance • Upload field data to cloud-based	• Guide students to: • Install mobile pest scouting applications • Operate mobile pest scouting applications • Capture quality images of pests and pest damage using mobile devices • Record pest occurrence data accurately in digital formats. • Use GPS-enabled devices to geo-reference pest surveillance • Upload field data to	Smartphones, Computer, GPS-enabled devices, Digital cameras, Power banks, Demonstration farms, Experimental plots, Pest-infested crops, Insect specimen collection, GIS maps, Digital databases,

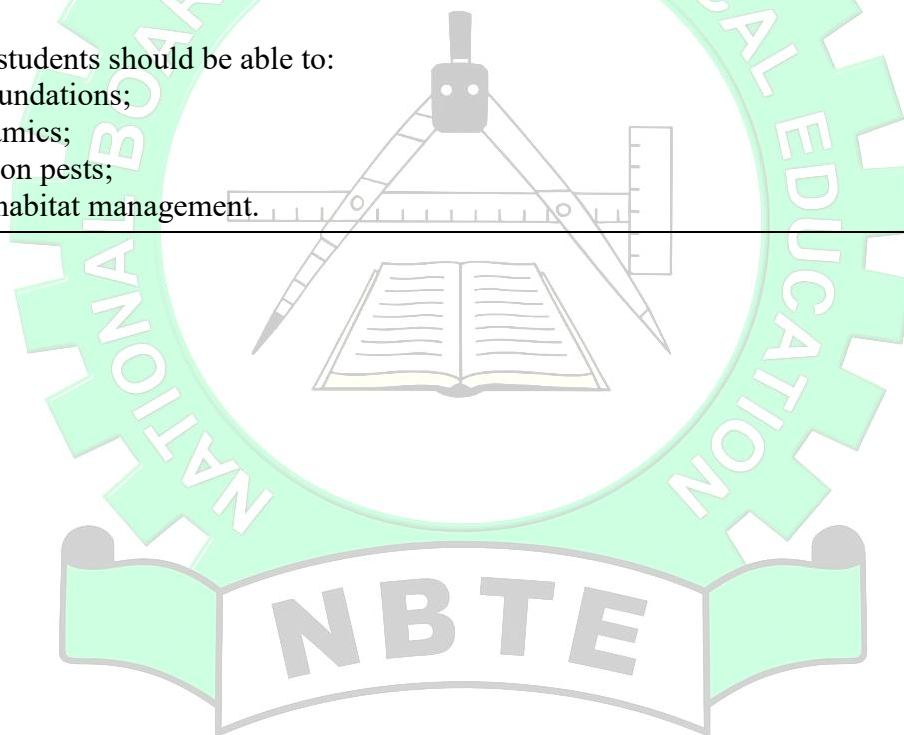
	advantages and limitations of mobile pest scouting.	pest data. Discuss the advantages and limitations of mobile pest scouting	Technical materials, multimedia, internet access mobile devices, GIS software, mobile scouting applications, data management platforms, etc.	platforms - Generate digital pest surveillance report - Map pest distribution using collected field data. - Interpret pest scouting information for management decisions	cloud-based platforms - Generate digital pest surveillance report - Map pest distribution using collected field data. - Interpret pest scouting information for management decisions	Pest surveillance forms, Pest identification guides, Practical manual, etc.
GENERAL OBJECTIVE 4.0: Know trap-based digital surveillance to track the occurrence, spread, and abundance of pests						
10-12	4.1 Explain pheromone traps with digital counters. 4.2 Describe automated / smart insect traps. 4.3 Explain trap-data dashboards. 4.4 Explain early-warning thresholds from trap data. 4.5 Explain the role of smartphones, GPS, mobile applications, and cloud-based	- Explain the use of pheromone traps with digital counters - Explain automated / smart insect traps (camera-based) - Explain the role of smartphones, GPS, mobile applications, and cloud-based systems in pest surveillance	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos Traps, surveillance textbooks,	- Set 5 pheromone traps with digital counters - Design 2 smart camera traps - Build trap-data dashboard (Excel / Power BI) - Demonstrate early-warning thresholds - Use pheromone traps with digital counters	- Guide students to: - Set 5 pheromone traps with digital counters - Illustrate how to set 2 smart camera traps - Build trap-data dashboard (Excel / Power BI) - Demonstrate early-warning thresholds - Use pheromone traps with digital counters - Create presentation	Pheromone traps, Smart traps, Computer, Dashboard software, Practical manual, etc.

	systems in pest surveillance.		internet access. Mobile devices, etc.	Create presentation slides to explain the role of smartphones, GPS, mobile applications, and cloud-based systems in pest surveillance	slides to explain the role of smartphones, GPS, mobile applications, and cloud-based systems in pest surveillance	
GENERAL OBJECTIVE 5.0: Understand pest data analysis and Visualization techniques						
13-15	5.1 State different types and sources of pest data. 5.2 Explain the principles of data collection, management, and analysis. 5.3 Explain the methods of data collection (field surveys, sampling, digital tools). 5.4 Explain Data entry and management using spreadsheets 5.5 Explain data cleaning, validation, and quality assurance procedures.	- Explain different types and sources of pest data. - Explain the principles of data collection, management, and analysis. - Discuss the methods of data collection (field surveys, sampling, digital tools). - Explain Data entry and management using spreadsheets (e.g., Microsoft Excel), - Explain data cleaning, validation, and quality assurance procedures. - Discuss data visualization techniques (charts,	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos Analytics texts, LCD projector, lecture notes, pest surveillance reports, scientific	- Demonstrate pest-population data analysis. - Use GIS for spatial analysis of pest distribution - Build heat-maps and charts. - Carry out field data recording procedure. - Carry out field survey to demonstrate trend analysis and forecasting techniques. - Demonstrate pest-outbreak visualization (charts, heat maps)	Guide students to: - Demonstrate pest-population data analysis - Use of GIS for spatial analysis of pest distribution - Carry out field data recording procedure - Carry out field survey to demonstrate trend analysis and forecasting techniques - Demonstrate pest-outbreak visualization (charts, heat maps) - Use digital tools and software for data analysis (e.g., Microsoft Excel, GIS platforms)	Datasets, R/Excel, GIS, GPS, Historical pest data, Weather data, Analytical outputs, Presentation tools, Computers Smartphones, Printers, Demonstration farms, Experimental plots, Pest monitoring stations, Practical

	5.6 Explain data visualization techniques (charts, graphs, maps), 5.7 State the difference between descriptive, diagnostic, predictive, and prescriptive analytics. 5.8 Describe key indicators used in pest monitoring and surveillance.	graphs, maps), • Explain the difference between descriptive, diagnostic, predictive, and prescriptive analytics. • Explain key indicators used in pest monitoring and surveillance.	journals, statistical manuals, computers, internet connectivity, smart boards, etc.	• Use digital tools and software for data analysis (e.g., Microsoft Excel, GIS platforms) • Write pest-surveillance bulletin • Integrate pest, weather and soil data • Prepare pest surveillance and analytical reports • Generate summary statistics from pest datasets • Produce graphs, charts, and tables for pest data presentation. • Use software to create and manage pest databases.	• Write pest-surveillance bulletin • Integrate pest, weather and soil data • Prepare pest surveillance and analytical reports • Generate summary statistics from pest datasets • Produce graphs, charts, and tables for pest data presentation. • Use software to create and manage databases	manual, etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

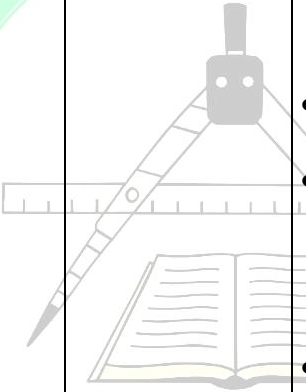
AGROECOLOGY AND CLIMATE DRIVERS OF PEST DYNAMICS

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: AGROECOLOGY AND CLIMATE DRIVERS OF PEST DYNAMICS	COURSE CODE: PMT 315	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 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 agroecology and climate drivers of pest population dynamics as foundation for climate-smart and integrated Pest Management.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Understand agroecology foundations; 2.0 Know pest population dynamics; 3.0 Understand climate effects on pests; 4.0 Understand landscape and habitat management.		

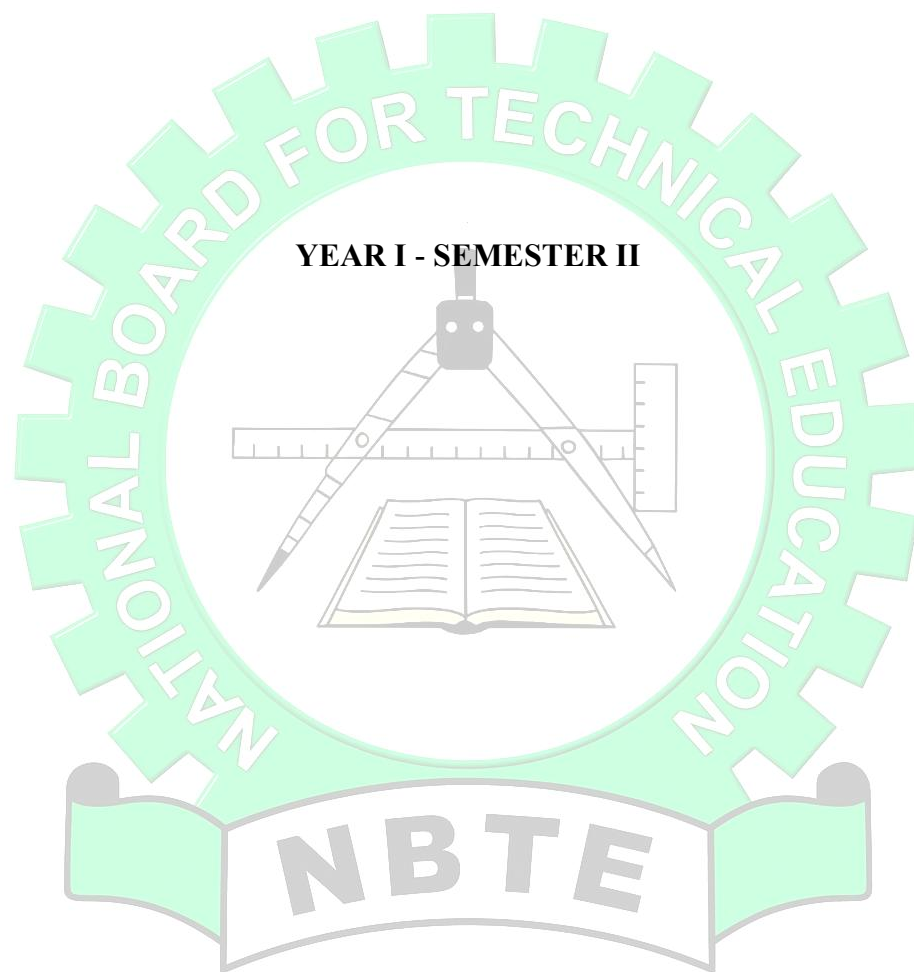


PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: AGROECOLOGY AND CLIMATE DRIVERS OF PEST DYNAMICS			COURSE CODE: PMT 315		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE: NIL		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of agroecology and climate drivers of pest population dynamics as foundation for climate-smart and integrated Pest Management.						
GENERAL OBJECTIVE 1.0: Understand agroecology foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain agroecology concepts and farming systems. 1.2 Describe ecological foundations of pest populations. 1.3 Explain how biodiversity affects pest regulation. 1.4 Describe natural enemies and ecosystem services.	• Explain agroecology • Discuss farming systems that apply agroecological concepts such as intercropping, crop rotation, crop-livestock integration, cover crops and agroforestry • Discuss pest ecology and its effect on pest populations • Explain how biodiversity affects pest regulations • Explain natural	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos Market data, Agroecology texts, Online resources, etc.	• Draw a profile map showing agroecological zones of Nigeria. • Identify prevalent pest species on the school farm. • Record the ecological factors affecting its population. • Survey biodiversity in the field. • Identify different types and classes of natural enemies on the field.	Guide students to: • Draw a profile map showing agroecological zones of Nigeria. • Identify prevalent pest species on the school farm. • Record the ecological factors affecting its population • Survey biodiversity in the field. • Identify different types and classes of natural enemies on the field Record observations in logbook	Agroecology maps, School farm, Field site, Sampling tools, Students' logbook, Practical manual, etc.

		enemies of pests • Enumerate ecosystem services provided by natural enemies		• Record observations in logbook.		
GENERAL OBJECTIVE 2.0: Know pest population dynamics						
4-7	2.1 Explain life-table analysis. 2.2 Describe pest population modelling. 2.3 Explain density-dependent regulation. 2.4 Describe pest migration and dispersal. 2.5 Explain the difference between pest migration and dispersal.	• Explain life table analysis and explain its application in entomology • Discuss pest population modelling and common modelling approaches such as exponential growth model and logistic growth model • Discuss density-dependent regulation • Differentiate between pest migration and dispersal with specific examples	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Market data, Population dynamics texts, etc.	• Build life table for a named pest • Demonstrate a simple population model practical for a named pest on the field • Demonstrate density-dependent regulations of a named pest on the school farm. • Track migration of fall armyworm/ locusts on the field.	Guide students to: • Build life table for a named pest • Demonstrate a simple population model practical for a named pest on the field • Demonstrate density-dependent regulations of a named pest on the school farm. • Track migration of fall armyworm / locusts on the field.	Life-table data, Excel, FAW / locust case studies, School farm, Logbooks, practical manual, etc.
GENERAL OBJECTIVE 3.0: Understand climate effects on pests						
8-11	3.1 Explain temperature, humidity, rainfall effects on pests. 3.2 Describe degree-day models for pest forecasting.	• Explain the effects of climate on pest populations. • Discuss degree-days and state its benefits for Pest Management. • Explain the effects of	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart	• Use internet resources to compile data to correlate temperature / humidity with pest abundance.	Guide students to: • Use internet resources to compile data to correlate temperature / humidity with pest abundance. • Conduct a simple	Climate data, Pest data, Excel, Maps, Case studies, Thermometer, Thermohydrom

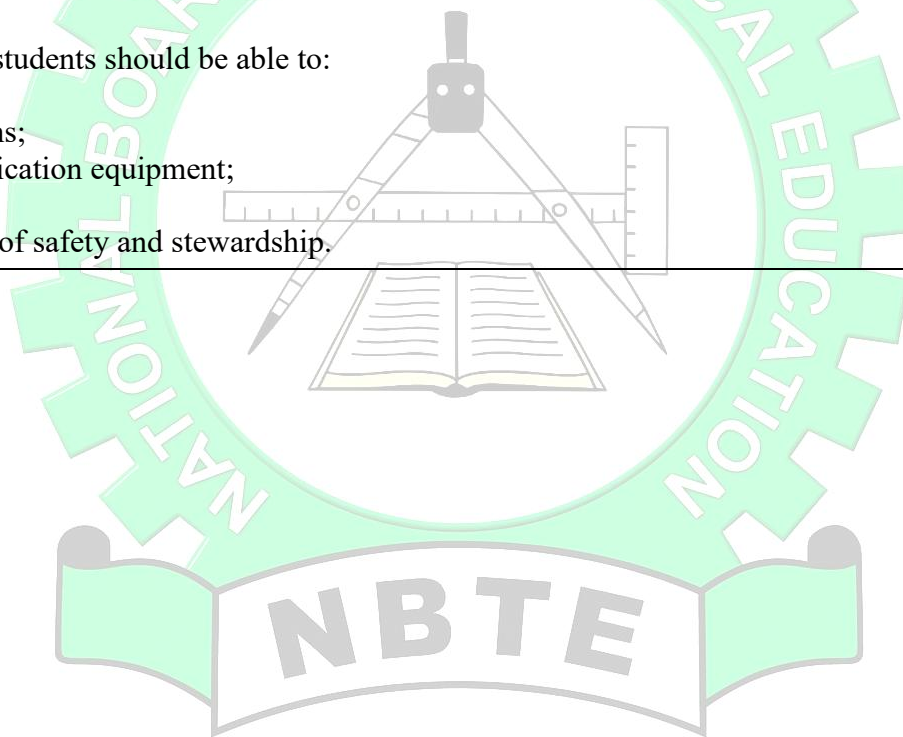
	3.3 Explain climate change and pest range shifts. 3.4 Explain the effects of climate change on pest range shifts. 3.5 Explain El Niño phenomenon and its effects on pest outbreaks.	climate change on pest range shifts. • Discuss effects of El Nino on pest outbreak in Nigeria	s, Marker board, Marker, Pictures, Videos Market data, Climate-pest texts, etc. 	• Conduct a simple degree-day practical • Use daily temperature data collected to calculate degree days. • Estimate development stages of a named pest. • Map pest range shifts in Nigeria • Review case studies of El Niño induced pest outbreak in Nigeria. • Draw a labelled diagram depicting the occurrence.	degree-day practical • Use daily temperature data collected to calculate degree days. • Estimate development stages of a named pest. • Map pest range shifts in Nigeria • Review case studies of El Niño induced pest outbreak in Nigeria. • Draw a labelled diagram depicting the occurrence.	eter, Practical manual, etc.
GENERAL OBJECTIVE 4.0: Understand landscape and habitat management						
12-15	4.1 Explain habitat manipulation. 4.2 Describe conservation biological control. 4.3 Explain field margins and refugia. 4.4 Explain the	• Explain habitat manipulation and state examples such as intercropping, trap cropping, beetle banks, etc. • Explain conservation biocontrol with	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board,	• Design a named habitat manipulation technique on the school farm. • Demonstrate a simple conservation biocontrol measure	Guide students to: • Design a named habitat manipulation technique on the school farm. • Demonstrate a simple conservation biocontrol measure on the school farm.	Field plots, Planting materials, Assessment tools, Practical manual, etc.

	differences between field margins and refugia. 4.5 Describe agroforestry effects on pests.	examples • Explain the differences between field margins and refugia • Explain the effects of agroforestry on pest	Marker, Pictures, Videos, Landscape ecology texts, Market data, etc.	on the school farm. • Establish field margins / refugia on your school farm • Write a technical report on a study visit to an agroforestry farm • Assess the prevalence of pests compared with a non-agroforestry farm.	• Establish field margins / refugia on your school farm • Write a technical report on a study visit to an agroforestry farm • Assess the prevalence of pests compared with a non-agroforestry farm	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



PESTICIDE CHEMISTRY AND TOXICOLOGY

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: PESTICIDE CHEMISTRY AND TOXICOLOGY	COURSE CODE: PMT 321	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in pesticide chemistry, formulation, toxicological principles, safe application, environmental impacts, and regulatory requirements for sustainable pest management.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Know pesticide chemistry; 2.0 Know pesticide formulations; 3.0 Comprehend pesticide application equipment; 4.0 Know spray calibration; 5.0 Understand the application of safety and stewardship.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: PESTICIDE CHEMISTRY AND TOXICOLOGY			COURSE CODE: PMT 321		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			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 pesticide chemistry, formulation, toxicological principles, safe application, environmental impacts, and regulatory requirements for sustainable pest management.						
GENERAL OBJECTIVE 1.0: Know pesticide chemistry						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain pesticide 1.2 Describe pesticides based on chemical groups, target organisms, formulation types, and modes of action. 1.3 Explain the physicochemical properties of pesticides and their influence on efficacy. 1.4 Explain pesticide formulation technology and formulation	- Explain pesticide (insecticides, herbicides, fungicides, etc.) - Discuss pesticides based on chemical groups, target organisms, formulation types, and modes of action. - Discuss the physicochemical properties of pesticides and their influence on efficacy.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Videos, Pesticide chemistry, scientific journals, pesticide labels, safety data	- Justify 20 pesticides by type and chemistry - Map modes of action for 20 pesticides - Identify common pesticide formulations and active ingredients - Write a short report on proper handling, storage, and disposal of pesticides - Use personal protective equipment (PPE) correctly - Apply pesticide	Guide students to: - Demonstrate pesticide formulations - Demonstrate preparation of pesticide mixtures and dilutions - Demonstrate safe handling, storage and disposal procedures as well as proper use of PPE - Response procedures for pesticide exposure - Demonstrate residue	Pesticide labels, Experimental plots, Demonstration farms, Data sheets, Monitoring equipment, Disposal guidelines, PPE kits, Fume hood, sprayers, pH meters, Calibration equipment, First aid box,

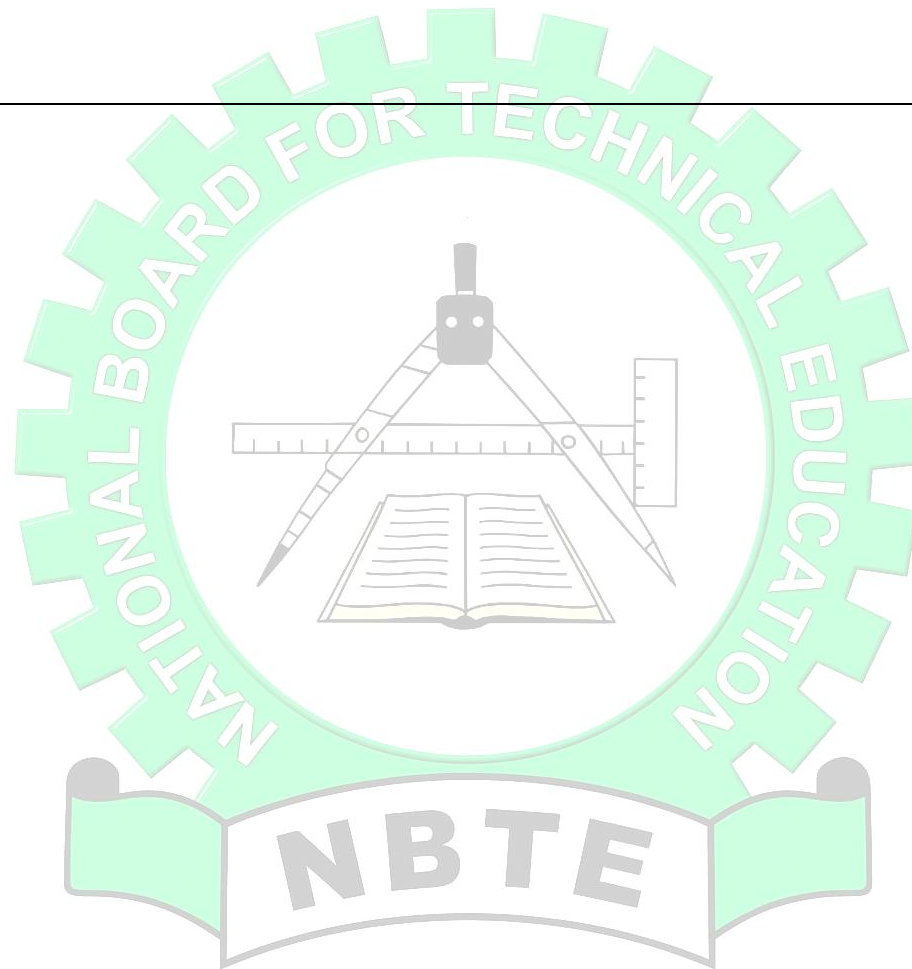
	ingredients. 1.5 Explain pesticide residues and residues management. 1.6 Explain principle of pesticide stewardship and sustainable pesticide use.	• Explain pesticide formulation technology and formulation ingredients. • Explain pesticide residues and residues management. • Discuss principle of pesticide stewardship and sustainable pesticide use.	sheets, , multimedia. Internet access, molecular visualization software, etc.	safety procedures in laboratory and field settings • Evaluate pesticide efficacy through laboratory and field observation • Interpret pesticide labels and safety data sheets • Compute LD50 and LD90 toxicity classes	detection procedures where facilities permit • Demonstrate pesticides application techniques • Supervise field calibration exercise and assess compliance with safety requirements	Fire extinguishers, balances, practical manual, etc.
GENERAL OBJECTIVE 2.0: Know pesticide formulations						
4-6	2.1 Define pesticide formulation 2.2 Explain the importance of pesticide formulation 2.3 Explain common formulation types. 2.4 Explain the differences between solid vs liquid formulations, active ingredients and inert	• Explain pesticide formulation • Explain the importance of pesticide formulation • Discuss common formulation types (Emulsifiable concentrate (EC), Wettable powder (WP), Soluble Concentrate (SC), Granules (GR), Dust, etc.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Pesticides Formulation textbooks,	• Develop charts and multimedia presentations on pesticide formulation. • Identify samples or images of various formulations. • Interpret different pesticide labels. • Write short notes on different formulations observed in a field trip.	Guide students to: • Develop charts and multimedia presentations on pesticide formulation. • Identify samples or images of various formulations. • Interpret different pesticide labels. • Write short notes on different formulations observed in a field	Pesticide samples, Labels, Adjuvants, Samples of different formulation, Sprayers, Calibration tools, Demonstration plot, PPEs, , Laboratory manuals,

	ingredients in pesticide formulations. 2.5 Explain adjuvants, surfactants and synergists.	• Explain the differences between solid vs liquid formulations, active ingredients and inert ingredients in pesticide formulations. • Explain adjuvants, surfactants and synergists.	pesticides formulation charts, product labels and safety data sheets, videos on pesticide manufacturing and application, PowerPoint presentations, etc.	• Write a short report on formulation selection for different scenarios in a field study. • Calibrate application equipment. • Record physical characteristics of formulation over time.	trip. • Write a short report on formulation selection for different scenarios in a field study. • Calibrate application equipment. • Record physical characteristics of formulation over time.	Practical worksheets, Data recording sheets, Safety data sheets, Practical manual, etc.
GENERAL OBJECTIVE 3.0: Comprehend pesticide application equipment						
7-9	3.1 Explain knapsack sprayers (manual and motorized). 3.2 Describe how to use mist blowers and ULV sprayers. 3.3 Describe boom sprayers (tractor / vehicle-mounted). 3.4 Describe drone / aerial application.	• Discuss different types of knapsack sprayers (manual and motorized) • Discuss how to use mist blowers and ULV sprayers • Demonstrate how to apply boom sprayers (tractor / vehicle-mounted) • Describe drone / aerial application using a demonstration plot	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Videos, Application equipment, etc.	• Operate knapsack sprayers • Observe the use of mist blower / ULV sprayer in a field survey • Identify a boom sprayer • Demonstrate how to apply boom sprayer. • Observe drone-spray demonstration.	Guide students on • Operate knapsack sprayers • Brief students on the report of a field study where mist blower / ULV sprayer were used. • Demonstrate the use of boom sprayer in pesticide application. • Lead demonstration on the use of drone-spray during pesticide application	Sprayers, Mist blowers, Boom sprayer, Drone, Demonstration plot, Pesticide industry facility, practical manual, etc.
GENERAL OBJECTIVE 4.0: Know spray calibration						

10-12	4.1 Describe nozzle types and selection criteria. 4.2 Outline sprayer calibration procedures. 4.3 Explain spray-volume and droplet-size calculations. 4.4 Describe spray coverage assessment (water-sensitive paper).	• Describe nozzle types and selection criteria • Engage students on sprayer calibration procedures • Describe spray-volume and droplet-size calculations • Discuss spray coverage assessment (water-sensitive paper) using a field scenario	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, etc.	• Select nozzles for 5 applications • Calibrate 3 types of sprayers. • Compute spray volume/mix • Assess spray coverage with water-sensitive paper.	Guide Students to: • Demonstrate using a farm plot different nozzles for 5 different applications • Calibrate 3 types of sprayers. • Compute spray volume / mix • Lead field demonstration on spray coverage with water-sensitive paper.	Nozzles, Calibration tools, Water-sensitive paper, Spray equipment, Practical manual, etc.
GENERAL OBJECTIVE 5.0: Understand the application of safety and stewardship						
13-15	5.1 Outline pre-application safety checks. 5.2 List different types of Personal Protective Equipment (PPE) 5.3 Describe post-application cleaning and storage 5.4 Explain incident response (poisoning, spills, etc.).	• Explain pre-application safety checks • Discuss different types of Personal Protective Equipment (PPE) • Discuss post-application cleaning and storage • Describe incident response (poisoning, spills).	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, PPE, etc.	• Conduct pre-application safety check • Wear PPE correctly • Perform calibration, cleaning and storage of equipment correctly • Conduct incident-response drill.	Guide students to: • Demonstrate pre-application safety check • Demonstrate the correct ways to don and off PPE • Perform calibration, cleaning and storage of equipment correctly • Conduct incident-response drill.	PPE, Washing facilities, Spill kit, First aid kits, Practical manual, etc.

COURSE ASSESSMENT:

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



VERTEBRATE PEST MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: VERTEBRATE PEST MANAGEMENT	COURSE CODE: PMT 322	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and practical skills in the identification, ecology, surveillance, economic importance, damage assessment, and sustainable management of vertebrate pests affecting agricultural production.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Understand the biology, ecology, and classification of vertebrate pests; 2.0 Know the economically important vertebrate pests and assess their impacts; 3.0 Know vertebrate pest surveillance, monitoring, and damage assessment; 4.0 Apply integrated vertebrate Pest Management strategies; 5.0 Understand humane, One Health, ethical and regulatory principles in vertebrate Pest Management.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: VERTEBRATE PEST MANAGEMENT			COURSE CODE: PMT 322		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and practical skills in the identification, ecology, surveillance, economic importance, damage assessment, and sustainable management of vertebrate pests affecting agricultural production.						
GENERAL OBJECTIVE 1.0: Understand the biology, ecology, and classification of vertebrate pests.						
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 and importance of vertebrate Pest Management. 1.2 Explain the classes vertebrate pests. 1.3 Describe the biology of vertebrate pests. 1.4 Explain ecological relationships of vertebrate pests.	• Explain vertebrate pests and their importance • Discuss major groups including rodents, birds, primates and reptiles • Explain anatomy, feeding habits and reproduction • Discuss habitat requirements and population dynamics	Whiteboard, projector, Charts, Taxonomic guides, Specimens, videos, Multimedia presentations Marker Computer Journals, etc.	• Identify common vertebrate pests • Observe habitats of vertebrate pests • Assess the ecological impact of vertebrate pests by collecting and interpreting field data	Guide students to: • Identify common vertebrate pests • Observe habitats of vertebrate pests • Assess the ecological impact of vertebrate pests by collecting and interpreting field data	Preserved specimens, Posters, Identification keys, Demonstration farm, Practical manual.
GENERAL OBJECTIVE 2.0: Know the economically important vertebrate pests and assess their impacts.						
4-6	2.1 Explain major rodent pests.	•Describe characteristics and	Photographs Charts,	• Identify signs of vertebrate pest	• Guide students to: • Identify signs of	Field samples Assessment

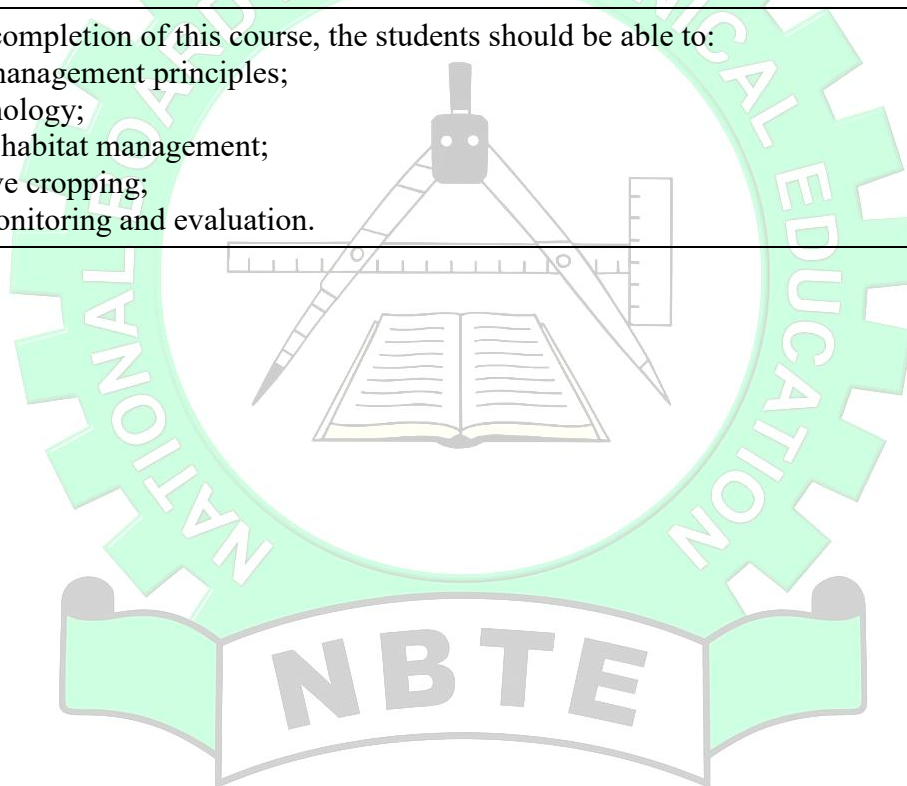
	2.2 Discuss important bird pests. 2.3 Discuss vertebrate pests affecting livestock and fisheries. 2.4 Explain economic losses caused by vertebrate pests. 2.5 Explain public health, environmental and biosecurity risks associated with vertebrate pests.	economic importance of rats, mice and squirrels • Discuss quelea birds, weaver birds and other crop-damaging birds • Describe impacts of predators and nuisance animals- reptiles, bats, etc. • Discuss crop losses, contamination and infrastructure damage • Discuss disease transmission by rodents, bats and other vertebrates; biodiversity loss and ecosystem disruption; movement and contamination pathways of vertebrate pests.	manuals, Videos, Case studies Reports, Publications	damage • Assess infestation levels • Conduct biosecurity inspections • Assess public health risks • Prepare risk assessment and damage reports	vertebrate pest damage • Assess infestation levels • Conduct biosecurity inspections • Assess public health risks • Prepare risk assessment and damage reports	sheets Reporting templates, Practical manual.
GENERAL OBJECTIVE 3.0: Know vertebrate pest surveillance, monitoring, and damage assessment.						
7-8	3.1 Explain vertebrate pest surveillance principles. 3.2 Describe monitoring techniques. 3.3 Explain damage	• Discuss objectives and methods of surveillance • Explain trapping, observation and indirect monitoring methods	Lecture notes Case studies Videos Manuals Textbooks Markerboard Marker	• Conduct field surveys for vertebrate pests • Identify pest signs and indicators • Analyze surveillance data.	Guide students to: • Conduct field surveys for vertebrate pests • Identify pest signs and indicators • Analyze surveillance	Field notebooks, Field guides, Worksheets, Practical manual.

	assessment procedures,	• Discuss sampling and evaluation methods	Journals Projector Computer		data.	
GENERAL OBJECTIVE 4.0: Apply integrated vertebrate Pest Management strategies						
9-12	4.1 Explain principles of Integrated Vertebrate Pest Management (IVPM). 4.2 Describe habitat manipulation techniques. 4.3 Explain exclusion methods. 4.4 Explain biological, botanical, mechanical, physical and chemical control options. 4.5 Explain climate change effects on vertebrate pest populations and climate-smart vertebrate Pest Management strategies. 4.6 Explain digital technologies used in vertebrate Pest Management.	• Discuss principles of Integrated Vertebrate Pest Management (IVPM). • Describe habitat manipulation techniques. • Discuss exclusion methods. • Describe biological, botanical, mechanical, physical and chemical control options. • Discuss climate change effects on vertebrate pest populations and climate-smart vertebrate Pest Management strategies. • Describe digital technologies used in vertebrate Pest Management.	Textbooks, Presentations, Videos, Case studies, Charts, Control manuals, Markerboard, Marker, Journals, Projector, Computer.	• Demonstrate rodent-proofing measures • Demonstrate fencing/trapping/netting techniques for birds and mammals • Use GPS and drones for pest mapping • Conduct camera monitoring demonstrations • Develop integrated management plans.	Guide students to: Demonstrate rodent-proofing measures • Demonstrate fencing/trapping/netting techniques for birds and mammals • Use GPS and drones for pest mapping • Conduct camera monitoring demonstrations • Develop integrated management plans	Fencing materials, Traps, Drone, Planning templates, Practical manual.

GENERAL OBJECTIVE 5.0: Understand humane, One Health, ethical and regulatory principles in vertebrate Pest Management						
13-15	5.1 Explain humane vertebrate-pest control. 5.2 Discuss One Health Pest Management as it applies to vertebrate pests. 5.3 Explain national regulations governing vertebrate pest control. 5.4 Explain safe use of vertebrate pest control methods.	• Explain humane vertebrate-pest control. • Discuss One Health Pest Management as it applies to vertebrate pests • Describe national regulations governing vertebrate pest control • Discuss safe use of vertebrate pest control methods	Relevant guidelines Regulatory documents Manuals, Ethical guidelines, etc	• Demonstrate humane trapping procedures • Assess compliance with ethical standards • Demonstrate One Health Pest Management • Develop ethical Pest Management recommendations.	Guide students to: • Demonstrate humane trapping procedures • Assess compliance with ethical standards • Demonstrate One Health Pest Management • Develop ethical Pest Management recommendations.	Case studies Traps Assessment checklist Worksheets School farm, Relevant guidelines, Regulatory documents, Manuals, Ethical guidelines Practical manual.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

PUSH-PULL TECHNIQUE AND CLIMATE-SMART PEST MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: PUSH-PULL TECHNIQUE AND CLIMATE-SMART PEST MANAGEMENT	COURSE CODE: PMT 323	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills of climate-smart Pest Management and push-pull technology.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know climate-smart pest-management principles; 2.0 Understand push-pull technology; 3.0 Understand agroecological habitat management; 4.0 Understand climate-adaptive cropping; 5.0 Understand climate-pest monitoring and evaluation.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: PUSH-PULL TECHNIQUE AND CLIMATE-SMART PEST MANAGEMENT			COURSE CODE: PMT 323		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			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 climate-smart Pest Management and push-pull technology.						
GENERAL OBJECTIVE 1.0: Know climate-smart Pest Management principles						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain climate-smart agriculture (CSA) pillars for Pest Management 1.2 Explain climate-induced pest range shifts. 1.3 Explain climate-resilient cropping for pest avoidance. 1.4 Explain climate-information services (CIS) for pest forecasting	• Discuss CSA pillars: adaptation, mitigation, and increased productivity. • Discuss pest range shifts and contributory factors. • Describe climate resilient cropping and state its core strategies such as adjusted planting calendars, plant tolerant varieties and using diversified planting systems. • Discuss CIS and the	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, CSA-pest texts, etc.	• Review case studies of application of CSA pillars to Pest Management. • Map range shifts for 3 pests in Nigeria. • Conduct a climate-resilient cropping practice identification on different crop plots on the school farm. • Use CIS data for pest forecasting of a named area or nearby farm.	Guide students to: • Review case studies of application of CSA pillars to Pest Management. • Map range shifts for 3 pests in Nigeria. • Conduct a climate-resilient cropping practice identification on different crop plots on the school farm. • Use CIS data for pest forecasting of a named area or nearby farm.	Climate data, GIS, Crop calendar, Practical manual.

		key concepts such as climate drivers, risk mapping, and early warning.				
GENERAL OBJECTIVE 2.0: Understand push-pull technology						
4-6	2.1 Explain push-pull concept 2.2 State push-pull core components. 2.3 State examples of push plants such as: Desmodium uncinatum, Melinis, etc. 2.4 Explain the types of pull plants such as; Napier, Brachiaria, etc. 2.5 Explain push-plot layout.	• Explain push-pull concept and state its core components • Discuss examples of push plants such as Desmodium uncinatum, melinis • Describe types of pull plants such as; Napier, Brachiaria, etc. • Discuss push-plot layout.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Videos, Push-pull texts, etc.	• Establish push-pull demo plot • Plant push species • Plant pull species • Layout push-pull plot using the ICIPE design	Guide students to • Establish push-pull demo plot • Plant push species • Plant pull species • Layout push-pull plot using the ICIPE design	Field plot, Desmodium / Napier seed / cuttings, Practical manual.
GENERAL OBJECTIVE 3.0: Understand agroecological habitat management						
7-9	3.1 Describe intercropping for Pest Management 3.2 Explain trap-cropping. 3.3 Explain mulching effects on pests. 3.4 Explain field-margin biodiversity.	• Explain application of intercropping to Pest Management • Discuss trap cropping • Describe mulching as it applies to pest control • Discuss field margins biodiversity	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker,	• Demonstrate 3 intercropping methods. • Establish trap crop. • Demonstrate mulching and assess pest impact • Review case studies on climate adaptive cropping practices.	Guide students to: • Identify 3 intercropping designs • Demonstrate trap crop establishment • Assess mulching impact on pests • Establish margin strips.	Field plots, Planting materials, Mulch material, practical manual.

			Pictures, Videos, Habitat management texts, etc.	• Compare their effectiveness • Demonstrate the best practice on the school farm • Establish field-margin strips.		
GENERAL OBJECTIVE 4.0: Understand climate-adaptive cropping						
10-12	4.1 Explain early maturing varieties for pest avoidance. 4.2 Describe drought-tolerant cultivars. 4.3 Explain shifting planting dates. 4.4 Explain conservation agriculture / no-till effects on pests.	• Discuss early varieties • Discuss drought tolerance and its application in pest control • Describe shifting planting dates as pest avoidance strategy • Describe conservation agriculture.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Videos, Climate-adaptive texts, etc.	• Review case studies on climate adaptive cropping practices. • Compare their effectiveness. • Demonstrate the best practice on the school farm.	Guide students to: • Review case studies on climate adaptive cropping practices. • Compare their effectiveness • Demonstrate the best practice on the school farm.	Seed varieties, Demonstration plots, Practical manual.
GENERAL OBJECTIVE 5.0: Understand climate-pest monitoring and evaluation						
13-15	5.1 Explain climate-pest data integration. 5.2 Explain climate-pest dashboards. 5.3 Explain CSA pest-management	• Discuss the importance of pest data integration • Discuss climate pest dashboards with examples • Describe CSA Pest	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart	• Integrate climate and pest data to predict outbreak of a specific pest in your locality • Identify the different climate pest	Guide students to: • Integrate climate and pest data to predict outbreak of a specific pest in your locality • Identify the different climate pest	Computer, Dashboards data, Practical manual.

	indicators.	Management indicators and state common examples.	s, Marker board, Marker, Pictures, Videos, Climate-adaptive texts, M&E texts, etc.	dashboards. - Track a specific pest in your area or locality using one of the climate-pest dashboards. - Conduct a field evaluation practical on CSA Pest Management - Score CSA Pest Management indicators in arable crops.	dashboards - Track a specific pest in your area or locality using one of the climate-pest dashboards - Conduct a field evaluation practical on CSA Pest Management - Score CSA Pest Management indicators in arable crops.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

PEST MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: PEST MANAGEMENT	COURSE CODE: PMT 324	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills, required to identify pests, assess pest problems, and apply sustainable, safe, and economically viable Pest Management strategies in agricultural, public health and environmental systems.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles and concepts of Pest Management; 2.0 Comprehend the major agricultural and veterinary pests; 3.0 Understand different pest control strategies; 4.0 Know integrated Pest Management approaches; 5.0 Understand pest management plans for different ecosystems.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: PEST MANAGEMENT			COURSE CODE: PMT 324		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge, skills, and competencies required to identify pests, assess pest problems, and apply sustainable, safe, and economically viable Pest Management strategies in agricultural, public health and environmental systems.						
GENERAL OBJECTIVE 1.0: Understand the principles and concepts of Pest Management						
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 following: i.Pest; ii.Pest control; iii.Pest Management. 1.2 Explain the differences between pest control and Pest Management. 1.3 Explain the principles of Pest Management. 1.4 Explain various strategies of Pest Management. 1.5 Explain the	• Discuss the concept of Pest Management • Describe the historical development of Pest Management • Discuss the major principles of Pest Management • Describe different Pest Management methods • Describe the importance of sustainable Pest Management	Textbooks, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Pest Management manuals, Extension publications, Scientific journals,	• Analyze Pest Management scenarios. • Analyze case studies of successful Pest Management programmes. • Design a comprehensive economically viable integrated Pest Management plan for a commercial farm facing localized chemical resistance. • Observe pest damage	Guide students to: • Analyze Pest Management scenarios • Analyze case studies of successful Pest Management programmes • Design a comprehensive economically viable integrated Pest Management plan for a commercial farm facing localized chemical resistance	Field equipment, Monitoring equipment, Pest identification guides, PPEs, Practical manual.

	importance of sustainable Pest Management.	Describe case studies to explain simple Pest Management recommendations based on identified pest problems	Lecture notes, etc.	symptoms in crops. Develop simple Pest Management plans for selected crops.	- Observe pest damage symptoms in crops - Develop simple Pest Management plans for selected crops.	
GENERAL OBJECTIVE 2.0: Comprehend the major agricultural and veterinary pests						
4-6	2.1 Explain major insect pests of field, horticultural, stored products, and animals. 2.2 Describe common weed pests, veterinary, stored products and other field pests affecting agricultural production. 2.3 Explain vertebrate pest affecting crops and stored products. 2.4 Explain nature and symptoms of pest damage to crops. 2.5 Describe the effects of veterinary pests on livestock	- Discuss the concepts of agricultural, veterinary, and public health pests. - Discuss the classification of pests according to their economic importance. - Describe distinguishing characteristics of major pest groups. - Describe crop damage caused by insect pests, weeds, Nematodes, birds, and rodents. - Discuss the importance of veterinary pests in livestock production.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Print materials (textbooks, pest identification guides, scientific Journals, veterinary Entomology manual), instruction materials, Multimedia resources, etc.	- Write a technical report on field visits to farms, livestock units, and communities. - Preserve specimens of common pests. - Demonstrate identification of agricultural and veterinary pests from specimens and photographs. - Identify common livestock parasites and pests. - Observe pest damage symptoms. - Record pest damage symptoms - Use identification keys to classify pests. - Identify beneficial	Guide students to: - Write a technical report on field visits to farms, livestock units, and communities. - Preserve specimens of common pests. - Demonstrate identification of agricultural and veterinary pests from specimens and photographs. - Identify common livestock parasites and pests. - Observe pest damage symptoms. - Record pest damage symptoms - Use identification keys to classify pests.	Agricultural pest specimens, Veterinary pest specimens, Field equipment, PPEs, Insect box, Practical manual, etc.

	productivity and welfare. 2.6 Explain pest outbreaks and their impacts.	Describe case studies to illustrate pest outbreaks and their impacts.		insects from harmful pests. - Demonstrate methods of assessing pest damage. - Carry out collection, preservation and mounting insect pest specimen. - Prepare pest identification reports and presentations.	- Identify beneficial insects from harmful pests. - Demonstrate methods of assessing pest damage. - Carry out collection, preservation and mounting insect pest specimen. - Prepare pest identification reports and presentations.	
GENERAL OBJECTIVE 3.0: Understand different pest control strategies.						
7-9	3.1 Explain the differences between Pest Management and pest control. 3.2 Explain common agricultural pests. 3.3 Explain different pest control strategies. 3.4 Explain the advantages and disadvantages of each strategy. 3.5 Explain appropriate pest control methods for different	- Explain the concept of Pest Management and pest control. - Discuss each pest control strategy using examples. - Discuss different methods of Pest Management and pest control. - Describe pest damage and control measures using charts, videos, and pictures to. - Discuss how to	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Agricultural manuals, Charts and posters of pests. PowerPoint presentations. Videos on Pest Management.	- Identify pests and pest damage in crops. - Demonstrate selected pest control methods. - Handle pest control equipment safely. - Set traps and barriers. - Demonstrate safe pesticide handling and application. - Observe beneficial insects. - Apply Integrated Pest Management principles. - Record the	Guide students to: - Identify pests and pest damage in crops. - Demonstrate selected pest control methods. - Safely handle pest control equipment. - Set traps and barriers. - Demonstrate safe pesticide handling and application. - Observe beneficial insects. - Apply Integrated Pest Management principles.	School farm or demonstration plot; Pest specimens, Hand lenses/magnifying glasses. Insect traps. PPEs, Sprayers. Approved pesticides (where applicable). Record sheets and notebooks, Practical manual, etc.

	situations.	evaluate the effectiveness of various strategies.	Pest specimens or photographs, etc.	effectiveness of pest control measures.	Record the effectiveness of pest control measures.	
GENERAL OBJECTIVE 4.0: Know integrated Pest Management approaches.						
10-12	4.1 Define IPM. 4.2 State the principles of IPM. 4.3 Explain common Pest Management approaches (cultural, biological, mechanical, and chemical methods). 4.4 Explain the advantages of IPM.	- Explain the concept of IPM using examples. - Discuss different pest control methods. - Discuss the benefits of reducing chemical pesticide use.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Videos, Charts/posters of pests, Multimedia presentations, pictures of beneficial insects and pests, etc.	- Identify pests and beneficial organisms. - Demonstrate pest scouting and monitoring. - Set traps. - Remove infected plants. - Apply cultural, mechanical, and biological control methods appropriately. - Identify suitable IPM strategies for a given situation.	Guide students to: - Organise field or garden observations. - Identify pests and beneficial organisms. - Demonstrate pest scouting and monitoring. - Set traps. - Remove infected plants. - Apply cultural, mechanical, and biological control methods appropriately. - Identify suitable IPM strategies for a given situation.	School farm/garden, Insect traps, Hand lenses, sample pests, PPEs, Field notebooks, Insect samples, Farm tools, Practical manual, etc.
GENERAL OBJECTIVE 5.0: Understand Pest Management plans for different ecosystems						
13-15	5.1 Explain Pest Management planning. 5.2 Describe different ecosystems where Pest Management	- Discuss the concept of Pest Management planning. - Discuss various ecosystems	Textbooks, Journals, Internet, Articles, Projector, Computer,	- Identify pests in different ecosystems. - Demonstrate pest scouting techniques. - Conduct pest	Guide student to: - Identify pests in different ecosystems. - Demonstrate pest scouting techniques.	Insect nets, Sampling containers, Hand lenses/magnifying glasses,

	is practiced. 5.3 Explain factors influencing pest populations in different ecosystems. 5.4 Explain components of an Integrated Pest Management (IPM) plan. 5.5 Explain suitable Pest Management strategies for different ecosystems.	(agricultural, forest, aquatic, urban, and grassland ecosystems). • Discuss common pests associated with each ecosystem. • Describe principles of Integrated Pest Management (IPM). • Discuss how Pest Management plans are developed. • Facilitate class discussions and question-and-answer sessions.	Diagrams/charts, Marker board, Marker, Pictures, Videos, Charts showing ecosystems and pests, Pest identification manuals, PowerPoint presentations, Agricultural science textbooks, Videos on Pest Management, etc.	monitoring and assessment. • Collect pest population data. • Record pest population data. • Analyse pest population data. • Design a Pest Management plan based on field observations. • Recommend appropriate IPM strategies for specific ecosystems.	• Conduct pest monitoring and assessment. • Collect pest population data. • Record pest population data. • Analyse pest population data. • Design a Pest Management plan based on field observations. • Recommend appropriate IPM strategies for specific ecosystems.	Pest traps (sticky traps, pheromone traps), Field notebooks. Cameras, Smartphones. PPEs, Crops/plants. Pest identification guides, Practical manual, etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

BIOSECURITY IN PEST MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: BIOSECURITY IN PEST MANAGEMENT	COURSE CODE: PMT 325	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in biosecurity, surveillance, and risk management to prevent biological threats to agriculture, livestock and public health.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Understand the principles of biosecurity and pathways of pest introduction and spread; 2.0 Know pest surveillance, early detection, and response to pest incursions; 3.0 Understand biosecurity measures in crop, livestock, and stored-product systems; 4.0 Understand quarantine and phytosanitary measures in Pest Management; 5.0 Know digital technologies and modern tools in biosecurity management.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: BIOSECURITY IN PEST MANAGEMENT			COURSE CODE: PMT 325		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills in biosecurity, surveillance, and risk management to prevent biological threats to agriculture, livestock and public health.						
GENERAL OBJECTIVE 1.0: Understand the principles of biosecurity and pathways of pest introduction and spread						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain biosecurity and related concepts. 1.2 Explain the importance of biosecurity. 1.3 Describe the components of biosecurity. 1.4 Explain pathways of pest movement. 1.5 Explain factors promoting pest spread. 1.6 Explain national and international biosecurity frameworks	•Discuss the scope of biosecurity in agriculture and Pest Management •Discuss the economic, environmental and public health importance of biosecurity •Describe exclusion, surveillance, containment and eradication measures •Describe pathways through trade, travel, transport and natural	Whiteboard, Projector, Textbooks, Charts, Case studies, Diagrams, Videos, Maps, Multimedia presentation s, Case studies, Policy documents, Manuals, etc.	• Identify biosecurity measures in agricultural facilities • Identify potential pest entry points in farms, markets, city border • Assess level of biosecurity compliance	Guide students to: • Identify biosecurity measures in agricultural facilities • Identify potential pest entry points in farms, markets, city border • Assess level of biosecurity compliance	Farms, Warehouses, Markets, City border, Assessment template, Field guides, Worksheets, Practical manual, etc.

		dispersal • Discuss climate, trade and human activities • Discuss relevant regulations and standards				
GENERAL OBJECTIVE 2.0: Know pest surveillance, early detection, and response to pest incursions.						
4-6	2.1 Explain pest surveillance concepts. 2.2 Describe surveillance systems. 2.3 Explain early warning systems. 2.4 Describe emergency preparedness and response to pest outbreak.	• Discuss objectives and methods of surveillance • Explain passive, active and sentinel surveillance approaches • Discuss outbreak detection and reporting mechanisms • Discuss emergency biosecurity preparedness and response	Textbooks, Lecture notes, Charts, LCD projector, Case studies, Emergency response manuals, etc.	• Conduct pest monitoring activities • Collect surveillance data • Prepare surveillance reports • Conduct outbreak simulation exercises • Develop response plans	Guide students to: • Conduct pest monitoring activities • Collect surveillance data • Prepare surveillance reports • Conduct outbreak simulation exercises • Develop response plans	Sampling tools Field notebooks, Reporting templates, Practical manual, etc.
GENERAL OBJECTIVE 3.0: Understand biosecurity measures in crop, livestock, and stored-product systems.						
7-9	3.1 Explain biosecurity planning processes. 3.2 Explain crop farm biosecurity practices. 3.3 Explain livestock biosecurity	• Describe development of biosecurity plans • Discuss biosecurity practices such as using certified disease-free seeds,	Videos, Crop and livestock manuals, Storage management guides,	• Develop biosecurity plans • Conduct biosecurity audits • Assess sanitation practices on farms	Guide students to: • Develop biosecurity plans • Conduct biosecurity audits • Assess sanitation	Planning template, Audit checklists, Farms, Storage facilities,

	principles. 3.4 Explain stored product biosecurity.	sanitation of farm machinery between different fields, restricting visitors' access, etc. • Discuss external measures such as quarantine of new animals, vehicle sanitation, visitors' control, etc. and internal measures such as all-in-all-out system, isolation of sick animals, vaccination, etc. • Discuss measures such as sanitation of storage houses and facilities, clean sorting of produce, controlled temperature and humidity in storage, etc.	Markerboard Marker Journals Projector Computer, etc	and storage facilities • Recommend corrective actions	practices on farms and storage facilities • Recommend corrective actions	Worksheets, Practical manual, etc.
GENERAL OBJECTIVE 4.0: Understand quarantine and phytosanitary measures in Pest Management.						
10-12	4.1 Explain quarantine principles. 4.2 Explain phytosanitary measures. 4.3 Explain	• Discuss domestic and international quarantine systems • Discuss inspection, certification and treatment procedures	Quarantine manuals, FAO/IPPC materials, Regulatory documents	• Carry out practical inspections of plant and animal products • Perform simple quarantine	Guide students to: • Carry out practical inspections of plant and animal products • Perform simple quarantine inspections	Sample commodities, Inspection checklists, Hand lenses, Control post,

	international standards.	Describe phytosanitary regulations and trade requirements		inspections - Identify signs of pest contamination - Write technical report on visit to border control post	- Identify signs of pest contamination - Write technical report on visit to border control post	Practical manual, etc.
GENERAL OBJECTIVE 5.0: Know digital technologies and modern tools in biosecurity management.						
13-15	5.1 Explain digital biosecurity technologies. 5.2 Explain electronic surveillance systems. 5.3 Explain data management in biosecurity.	- Discuss GIS, GPS, E-tags, remote sensing and mobile applications (barcoding, traceability apps) - Describe digital reporting and monitoring platforms - Discuss data analysis and decision support systems	Computer laboratory, Software applications, Digital datasets, Videos	- Demonstrate GPS-based pest mapping - Use mobile surveillance applications - Collect georeferenced data. - Analyse georeferenced data.	Guide students to: - Demonstrate GPS-based pest mapping - Use mobile surveillance applications - Collect georeferenced data. - Analyse georeferenced data.	GIS/GPS, Computer, Smartphones, QGIS software, Practical manual, etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

BIOLOGICAL CONTROL AND BIOPESTICIDES

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: BIOLOGICAL CONTROL AND BIOPESTICIDES	COURSE CODE: PMT 326	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in biological control and biopesticides for effective, environmentally friendly, and sustainable Pest Management.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Understand biological-control foundations; 2.0 Know predators and parasitoids; 3.0 Understand entomopathogens and microbial control; 4.0 Know botanical pesticides and semi-chemicals; 5.0 Appreciate biopesticide production and quality; 6.0 Comprehend Nanotechnology and microencapsulation technology in biopesticides development.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: BIOLOGICAL CONTROL AND BIOPESTICIDES			COURSE CODE: PMT 326		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			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 biological control and biopesticides for effective, environmentally friendly, and sustainable Pest Management.						
GENERAL OBJECTIVE 1.0: Understand biological control foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain biological control concepts (classical, augmentative, conservation, etc.). 1.2 Describe natural enemies (predators, parasitoids, pathogens and parasites). 1.3 Explain biological control history and successes. 1.4 Explain Nigerian biological control programmes.	- Describe biological control concepts (classical, augmentative, conservation) - Discuss natural enemies (predator, parasitoids, pathogens(using a Nigerian scenario - Describe biological control history and successes - Discuss Nigerian biological control programmes	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	- Identify biocontrol types - Demonstrate using 10 predators / parasitoids / pathogens/parasites - Review a report on 5 classical biocontrol successes (mealybug, green spider mite and larger grain borer). - Write technical report on a visits to Research Stations for Nigerian biocontrol programmes.	Guide student to: - Identify biocontrol types - Demonstrate using 10 predators / parasitoids / pathogens/ parasites. - Review a report on 5 classical biocontrol successes (mealybug, green spider mite and larger grain borer). - Write technical report on a visits to Research Stations for Nigerian biocontrol programmes.	Specimens, case studies, IITA / NRCRI documents, Practical manual, etc.

GENERAL OBJECTIVE 2.0: Know predators and parasitoids						
4-6	2.1 Explain major predator groups (lacewings, ladybird beetles, predatory bugs, spiders, etc.). 2.2 Describe major parasitoid groups (Hymenoptera, Diptera). 2.3 Explain rearing of natural enemies 2.4 Explain natural enemies release strategies.	• Discuss major predator groups (lacewings, ladybird beetles, predatory bugs, spiders, etc.). • Explain major parasitoid groups (Hymenoptera, Diptera). • Discuss rearing of natural enemies. • Discuss natural enemies release strategies.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, etc.	• Identify 10 predators in field • Identify 5 parasitoids and their hosts • Rear natural enemies (Trichogramma, Chrysoperla, etc.) • Conduct field release of natural enemies with monitoring.	Guide students to: • Identify 10 predators in field • Identify 5 parasitoids and their hosts • Rear natural enemies (Trichogramma, Chrysoperla, etc.) • Conduct field release of natural enemies with monitoring.	Rearing cages, Trichogramma cards, monitoring sheets, Practical manual, etc.
GENERAL OBJECTIVE 3.0: Understand entomopathogens and microbial control						
7-9	3.1 Explain entomopathogenic fungi (<i>Metarhizium</i>, <i>Beauveria</i>). 3.2 Explain entomopathogenic bacteria (Bt). 3.3 Explain entomopathogenic viruses Nuclear Polyhedrosis Virus (NPV).	• Describe entomopathogenic fungi (<i>Metarhizium</i>, <i>Beauveria</i>). • Discuss entomopathogenic bacteria (Bt) • Discuss entomopathogenic viruses Nuclear Polyhedrosis Virus (NPV).	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, etc.	• Write technical report on a visit to a farm to observe entomopathogenic fungi (<i>Metarhizium</i>, <i>Beauveria</i>). • Identify entomopathogenic bacteria (Bt) • Identify entomopathogenic viruses Nuclear	Guide students to: • Visit to research institutions • Observe samples of entomopathogenic fungi (<i>Metarhizium</i>, <i>Beauveria</i>). • Identify and entomopathogenic bacteria (Bt) • Identify samples of	Microbial products, Field plots, Practical Manuals, etc.

	3.4 Explain entomopathogenic Nematodes (<i>Steinernema</i> , <i>Heterorhabditis</i>).	Describe entomopathogenic Nematodes (<i>Steinernema</i>, <i>Heterorhabditis</i>)		Polyhedrosis Virus (NPV). Observe entomopathogenic Nematodes (<i>Steinernema</i>, <i>Heterorhabditis</i>)	entomopathogenic viruses Nuclear Polyhedrosis Virus (NPV). Observe samples of entomopathogenic Nematodes (<i>Steinernema</i>, <i>Heterorhabditis</i>)	
GENERAL OBJECTIVE 4.0: Know botanical pesticides and semi-chemicals						
10-11	4.1 Describe neem (<i>Azadirachta indica</i>) and other botanicals. 4.2 Explain Nigerian indigenous botanicals (Tephrosia, garlic, ginger, hot pepper, etc). 4.3 Explain pheromones (mating disruption, mass trapping, etc.) 4.4 Explain kairomones and allelochemicals.	- Discuss neem (<i>Azadirachta indica</i>) and other botanicals - Describe Nigerian indigenous botanicals (Tephrosia, garlic, ginger, hot pepper, etc). - Discuss pheromones (mating disruption, mass trapping, etc.) - Describe kairomones and allelochemicals.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	- Prepare neem-seed extract. - Apply neem-seed extract. - Identify 5 Nigerian botanical extracts. - Set pheromone traps for mating disruption. - Use kairomones / allelochemicals.	Guide students to: - Prepare neem-seed extract. - Apply neem-seed extract. - Demonstrate extraction of 5 Nigerian botanical extracts. - Set pheromone traps for mating disruption - Use kairomones / allelochemicals	Plant material, Blender, Neem plants, Extraction kit, Pheromone traps, Practical manual, etc.
GENERAL OBJECTIVE 5.0: Appreciate biopesticide production and quality						
12-13	5.1 Explain the application of	Discuss the application of	Textbooks, Journals,	Browse NAFDAC biopesticide	Guide students to: Browse NAFDAC	NAFDAC documents,

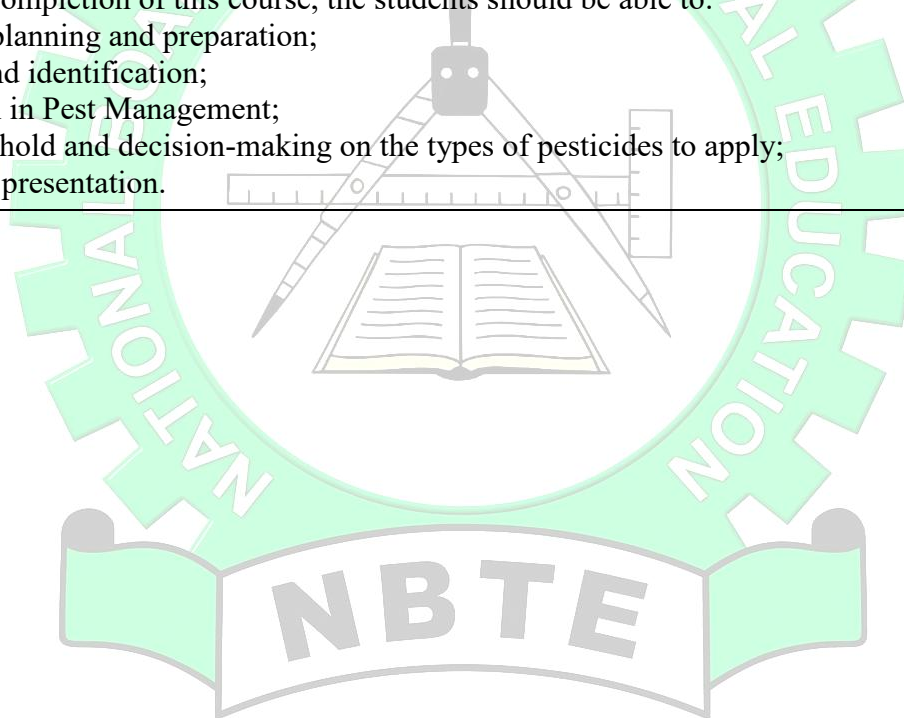
	biopesticide registration with relevant regulatory agencies e.g. NAFDAC. 5.2 Explain biopesticide production processes (lab and small-scale). 5.3 Describe the application of biopesticide quality control. 5.4 Explain biopesticide commercialization.	biopesticide registration with relevant regulatory agencies e.g. NAFDAC. • Discuss biopesticide production processes (lab and small-scale). • Discuss the application of biopesticide quality control (QC). • Describe biopesticide commercialization.	Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	registration guidelines. • Demonstrate small-scale biopesticide production • Apply QC tests (purity, viability) • Build commercialization plan. • Write technical report on visit to farm.	biopesticide registration guidelines. • Demonstrate small-scale biopesticide production • Apply QC tests (purity, viability) • Build commercialization plan. • Write technical report on visit to farm.	Production facility, QC kit, Practical manual, etc.
GENERAL OBJECTIVE 6.0: Comprehend Nanotechnology and microencapsulation technology in biopesticides development.						
14-15	6.1 Explain the concepts and principles of nanotechnology and microencapsulation. 6.2 Describe the limitations of conventional botanical insecticides and how nanotechnology	• Explain nanotechnology and its applications in agriculture. • Explain nanoparticle characteristics and properties. • Discuss current applications in crop protection. • Discuss examples of nano-formulated botanical insecticides. • Describe common	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	• Identify components of encapsulated formulations. • Extract active ingredients from selected botanicals. • Prepare extracts suitable for encapsulation • Produce microcapsules containing botanical extracts. • Observe capsule	Guide students to: • Identify components of encapsulated formulations. • Extract active ingredients from selected botanicals. • Prepare extracts suitable for encapsulation • Produce microcapsules containing botanical extracts.	Commercial botanical formulations, Product labels, Magnifying lenses, Laboratory worksheets, Neem seeds/leaves, Garlic bulbs, Essential oils, Solvents, Blenders,

	addresses them.	botanical insecticides extracts.		formation and stability.	• Observe capsule formation and stability.	Filtration equipment,
6.3	Explain different nano-formulations used in botanical insecticides.	• Discuss issues of volatility, degradation, poor persistence, and low field efficacy.		• Monitor release patterns of active ingredients.	• Monitor release patterns of active ingredients.	Sodium alginate,
6.4	Explain various microencapsulation techniques employed in botanical pesticide formulation.	• Discuss formulation challenges.		• Compare release rates between formulations.	• Compare release rates between formulations.	Calcium chloride solution,
6.5	Explain the advantages and disadvantages of nano- and microencapsulated botanical insecticides.	• Explain nanoemulsions, nanocapsules, nanosuspensions, and nanogels.		• Evaluate insecticidal efficacy.	• Evaluate insecticidal efficacy.	Botanical extracts,
6.6	Explain materials used for encapsulation of plant-derived insecticidal compounds.	• Explain methods of nanoparticle preparation.		• Compare mortality rates among formulations.	• Compare mortality rates among formulations.	Beakers
6.7	Explain the mechanisms of controlled release and targeted delivery of botanical insecticides.	• Compare conventional and nano-formulated pesticides.		• Analyze efficacy data.	• Analyze efficacy data.	Syringes,
6.8	Define micro-encapsulation and	• Explain microencapsulation and its objectives.		• Interpret formulation performance.	• Interpret formulation performance.	Stirring rods,
		• Explain encapsulation processes.		• Prepare technical reports.	• Prepare technical reports.	Encapsulated formulations,
		• Discuss controlled-release concepts.		• Prepare simple microencapsulated botanical formulations in the laboratory.	• Prepare simple microencapsulated botanical formulations in the laboratory.	Water baths,
		• Discuss wall materials used in encapsulation.		• Evaluate the effectiveness and stability of nano- and microencapsulated botanical insecticides.	• Evaluate the effectiveness and stability of nano- and microencapsulated botanical insecticides.	Measuring cylinders,
		• Explain criteria for		• Assess the environmental, health, biosafety, and regulatory issues	• Assess the environmental, health, biosafety, and	Spectrophotometer,

	its objectives. 6.9 Explain encapsulation processes. 6.10 Explain controlled-release concepts. 6.11 Explain wall materials used in encapsulation. 6.12 Explain criteria for selecting encapsulating materials. 6.13 Explain biosafety concerns. 6.14 Explain environmental risk assessment.	selecting encapsulating materials. • Discuss biosafety concerns. • Explain environmental risk assessment. • Explain regulations governing nano-pesticides.		associated with nano-enabled botanical pesticides. • Interpret experimental data from efficacy and release-rate studies. • Develop innovative botanical insecticide formulations suitable for Pest Management programmes.	regulatory issues associated with nano-enabled botanical pesticides. • Interpret experimental data from efficacy and release-rate studies. • Develop innovative botanical insecticide formulations suitable for Pest Management programmes.	Sample datasets, Practical manual, etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

FIELD PRACTICAL I

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: FIELD PRACTICAL I	COURSE CODE: PMT 327	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 0 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with hands-on skills to deliver pest-scouting and Integrated Pest Management implementation practice in real cropping systems.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand pre-fieldwork planning and preparation; 2.0 Appreciate pest scouting and identification; 3.0 Know IPM implementation in Pest Management; 4.0 Understand economic threshold and decision-making on the types of pesticides to apply; 5.0 Comprehend reporting and presentation.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: FIELD PRACTICAL I			COURSE CODE: PMT 327		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 0 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: PRACTICAL						
GOAL: This course is designed to equip students with hands-on skills to deliver pest-scouting and Integrated Pest Management implementation practice in real cropping systems.						
GENERAL OBJECTIVE 1.0: Understand pre-fieldwork planning and preparation						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3				• Plan field site visits and target crops. • Construct scouting kits (sweep nets, traps) • Prepare sample bottles. • Prepare identification/field guide for pests and diseases in the field site. • Calibrate GPS, mobile-survey tools, AI, ID apps. • Demonstrate fieldwork protocols and safety.	Guide students to: • Plan field site visits and target crops. • Construct scouting kits (sweep nets, traps) • Prepare sample bottles. • Prepare identification/field guide for pests and diseases in the field site. • Calibrate GPS, mobile-survey tools, AI, ID apps. • Demonstrate fieldwork protocols and safety.	Scouting kits (sweep nets, traps, sample bottles etc.), Logbook, Smartphones, AI apps, sensors, Lucid digital keys, PPEs, Field site, Practical Manual, etc.
GENERAL OBJECTIVE 2.0: Appreciate Pest Scouting and Identification						

4-9			• Demonstrate sweeps, beats, pitfalls, trap scouting on field crops, greenhouses, and livestock. • Identify different types of pests using morphological keys and activities (droppings, feeding habits etc.) • Record at least 5 types of diseases and their symptoms (Fungi, Bacteria, Nematodes etc.) during field visit. • Apply AI-based pest ID (Nuru, Plantix, Lucid digital keys etc.) on field pests. • Maintain GPS-tagged scouting log.	Guide students to: • Demonstrate sweeps, beats, pitfalls, trap scouting on field crops, greenhouses, and livestock. • Identify different types of pests using morphological keys and activities (droppings, feeding habits etc.) • Record at least 5 types of diseases and their symptoms (Fungi, Bacteria, Nematodes etc.) during field visit. • Apply AI-based pest ID (Nuru, Plantix, Lucid digital keys etc.) • Maintain GPS-tagged scouting log.	Field crops, Greenhouse, Animals, Scouting kit, reagents (formalin, ethanol etc.), Logbook, Pest and disease identification/field guide, Smartphones, AI apps, Sensors, Practical Manual, etc.
GENERAL OBJECTIVE 3.0: Know IPM implementation in Pest Management					
10-12			• Establish IPM demo plot (cultural + biological + chemical + physical/mechanical control). • Produce bio-pesticides using locally available materials.	Guide students to: • Establish IPM demo plot (cultural + biological + chemical + physical/mechanical control). • Produce bio-pesticides using locally available materials.	IPM demo plot, Cultural inputs, Agrochemical samples, Molasses, Sticky traps, Logbook, Practical Manual, etc.

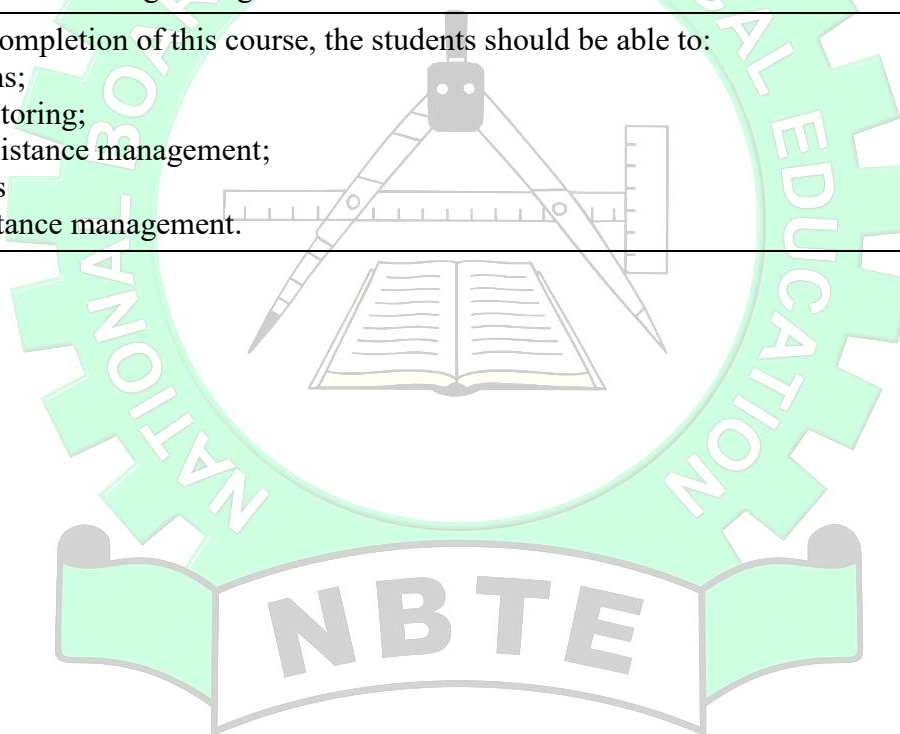
				• Compare resistant and non-resistant crop varieties to an identified pest or disease. • Use different sticky traps (blue, yellow, and red), and pitfalls on IPM demo plot. • Identify different agrochemicals and their active ingredients. • Create visual content to differentiate between pest and beneficial insects i.e. pollinators on the field.	• Compare resistant and non-resistant crop varieties to an identified pest or disease. • Use different sticky traps (blue, yellow, and red), and pitfalls on IPM demo plot. • Identify different agrochemicals and their active ingredients. • Differentiate between pest and beneficial insects i.e. pollinators on the field.	
GENERAL OBJECTIVE 4.0: Understand economic threshold and decision-making on the types of pesticides to apply						
13-14				• Scout the field differently every time. • Sample pest populations and compute density. • Identify economic thresholds (check a minimum number of plants in a spot with problems (leaf, stem, flower, fruit, roots, soil etc.) • Build pest-decision	Guide students to: • Scout the field differently every time. • Sample pest populations and compute density. • Identify economic thresholds (check a minimum number of plants in a spot with problems (leaf, stem, flower, fruit, roots, soil etc.) • Build pest-decision	Sampling tools, Decision templates, Pictures, Practical Manual, etc.

				report. • Carry out management approach and actions.	report. • Carry out management approach and actions.	
GENERAL OBJECTIVE 5.0: Comprehend reporting and presentation						
15				• Write a technical practical report minimum of 20-pages. • Prepare a 10-slide PowerPoint presentation. • Present the practical technical report to panel. • Submit corrected report.	Guide students to: • Write a technical practical report minimum of 20-pages. • Prepare a 10-slide PowerPoint presentation. • Present the practical technical report to panel. • Submit corrected report.	Report and presentation templates, Projector, Panel, Practical Manual, etc.
COURSE ASSESSMENT Course Assessment (Practical Based):10% Practical: 50% Examination (Practical Based): 40% Total: 100%						

YEAR II - SEMESTER I

INSECTICIDE RESISTANCE MANAGEMENT AND HOST-PLANT RESISTANCE

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: INSECTICIDE RESISTANCE MANAGEMENT AND HOST-PLANT RESISTANCE	COURSE CODE: PMT 411	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in insecticide-resistance management, insecticide resistance mechanisms, and host-plant resistance breeding strategies.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know resistance foundations; 2.0 Understand resistance monitoring; 3.0 Comprehend insecticide resistance management; 4.0 Know host-plant resistances 5.0 Understand integrated resistance management.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: INSECTICIDE RESISTANCE MANAGEMENT AND HOST-PLANT RESISTANCE			COURSE CODE: PMT 411		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II 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 insecticide-resistance management, insecticide resistance mechanisms, and host-plant resistance breeding strategies.						
GENERAL OBJECTIVE 1.0: Know resistance foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain insecticide resistance concepts and mechanism (target-site, metabolic, behavioural, and cuticular) 1.2 Explain the genetics of resistance 1.3 Explain resistance development (selection pressure) 1.4 Describe Insecticide resistance action committee IRAC,	• Discuss insecticide resistance concepts (target-site, metabolic, behavioural, and cuticular) • Describe the genetics of resistance • Discuss resistance development (selection pressure) • Discuss IRAC, modes of action.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	• Demonstrate resistance types both in pesticides and host-plant. • Trace inheritance patterns in resistance. • Carry out pressure selection. • Apply IRAC codes.	Guide students to: • Demonstrate resistance types both in pesticides and host-plant. • Identify inheritance patterns. • Carry out pressure selection. • Use of IRAC codes.	Mode-of-action charts, IRAC guideline manual, demonstration plot, Field plot, Practical manual, etc.

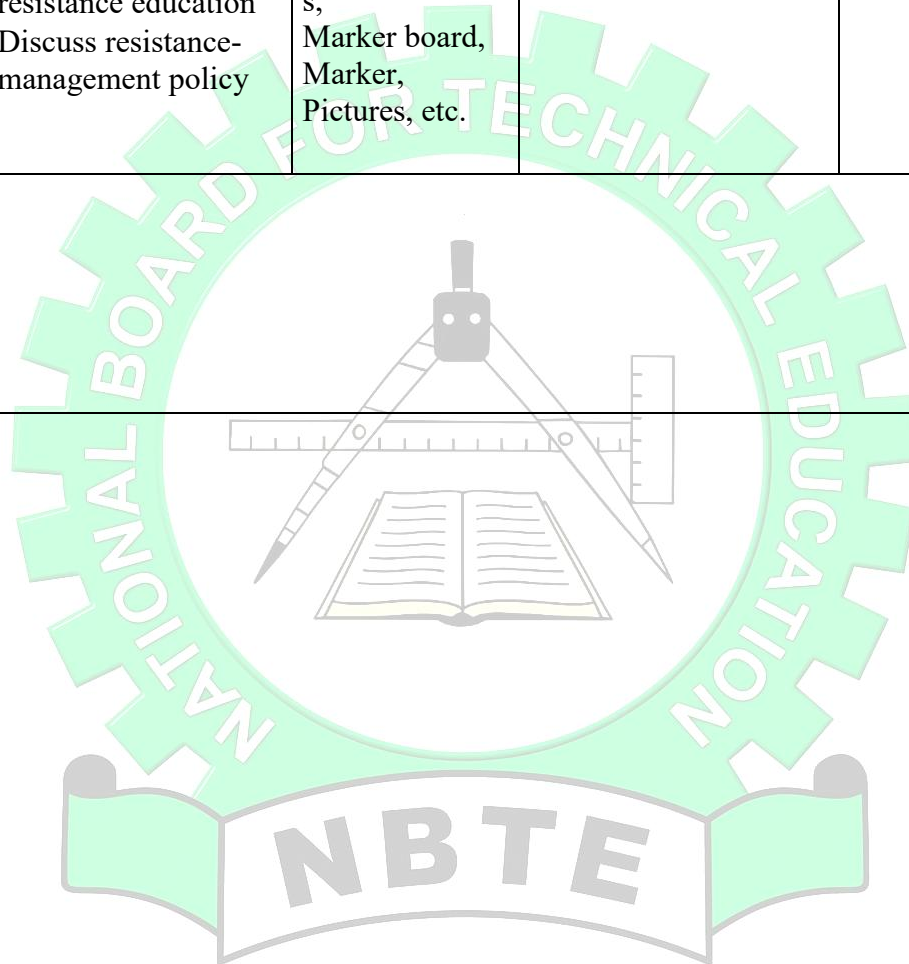
	modes of action.					
GENERAL OBJECTIVE 2.0: Understand resistance monitoring						
4-6	2.1 Explain bioassay methods (topical, dip, leaf-dip, etc.). 2.2 Describe discriminating doses of insecticides. 2.3 Explain molecular resistance detection Polymerase Chain Reaction (PCR). 2.4 Explain resistance-monitoring programmes.	• Discuss bioassay methods (topical, dip, leaf-dip, etc.). • Discuss discriminating doses of insecticides. • Describe molecular resistance detection Polymerase Chain Reaction (PCR) • Discuss resistance-monitoring programmes.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	• Conduct topical / leaf-dip bioassay • Apply discriminating dose of insecticides. • Browse PCR-based resistance detection • Write short technical report visit to a molecular biology laboratory to observe PCR-based resistance detection • Demonstrate resistance monitoring programmes	Guide students to: • Conduct topical / leaf-dip bioassay • Apply discriminating dose of insecticides. • Browse PCR-based resistance detection • Write short technical report visit to a molecular biology laboratory to observe PCR-based resistance detection • Demonstrate resistance monitoring programmes	Bioassay materials, pesticides, insects, Phenotypic bioassay equipment, Environmental chamber, Molecular and genetic tools, Field and plant testing devices, Multispectral cameras, Drones, Practical manual, etc.
GENERAL OBJECTIVE 3.0: Comprehend insecticide resistance management						
7-9	3.1 Explain Insecticide Resistance Management (IRM) strategies (rotation, mixtures, refuges, etc.) 3.2 Describe Bt-crop resistance management. 3.3 Explain resistance	• Describe Insecticide Resistance Management (IRM) strategies (rotation, mixtures, refuges, etc.) • Explain Bt-crop resistance management using a field scenario to	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker,	• Design IRM rotation, mixture, etc. • Apply Bt-resistance management using case studies. • Plan IRM treatment windows • Replicate 1 Nigerian case.	Guide students to: • Design IRM rotation, mixture, etc. • Apply Bt-resistance management using case studies. • Plan IRM treatment windows • Replicate 1 Nigerian case.	IRM templates, Case studies, Demonstration plot, Field and plant testing devices, Practical manual, etc.

	treatment windows for IRM. 3.4 Describe Nigerian IRM cases (cotton, vegetables, etc.).	- Describe resistance treatment windows for IRM - Discuss Nigerian IRM cases (cotton, vegetables, etc.)	Pictures, etc.			
GENERAL OBJECTIVE 4.0: Know host-plant resistance						
10-12	4.1 List types of host-plant resistance (antixenosis, antibiosis and tolerance). 4.2 Describe resistance screening and breeding. 4.3 Explain marker-assisted selection (MAS). 4.4 Explain genetically modified (GM) crops / <i>Bacillus thuringiensis</i> (Bt) crops for resistance.	- Explain types of host-plant resistance (antixenosis, antibiosis and tolerance). - Explain resistance screening and breeding. - Discuss marker-assisted selection. - Describe genetically modified (GM) crops / <i>Bacillus thuringiensis</i> (Bt) crops for resistance.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, etc.	- Identify resistance types in cultivars - Demonstrate 5 cultivars for resistance. - Use MAS protocols - Browse GM crops in Nigeria. - Apply Genetically modified (GM) crops/ <i>Bacillus thuringiensis</i> (Bt) crops for resistance.	Guide students to: - Identify resistance types in cultivars - Demonstrate 5 cultivars for resistance. - Use MAS protocols - Browse GM crops in Nigeria. - Apply Genetically modified (GM) crops/ <i>Bacillus thuringiensis</i> (Bt) crops for resistance.	Cultivar collection, Screening protocols, Demonstration plot, Breeding station/Research Institutes, Practical manual, etc.
GENERAL OBJECTIVE 5.0: Understand integrated resistance management						
13-15	5.1 Explain IPM and resistance management. 5.2 Describe weed and	- Discuss IPM and resistance management - Describe weed and	Textbooks, Journals, Internet, Articles,	- Design integrated resistance plan - Apply weed / disease RM	Guide students to: - Design integrated resistance plan - Apply weed / disease	Templates, training materials, Policy

disease resistance management. 5.3 Describe farmer-level resistance education. 5.4 Explain resistance-management policy.	disease resistance management. •Describe farmer-level resistance education •Discuss resistance-management policy	Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	• Browse Nigerian policy on resistance.	RM • Browse Nigerian policy on resistance.	documents, Field plot, Practical manual, etc.
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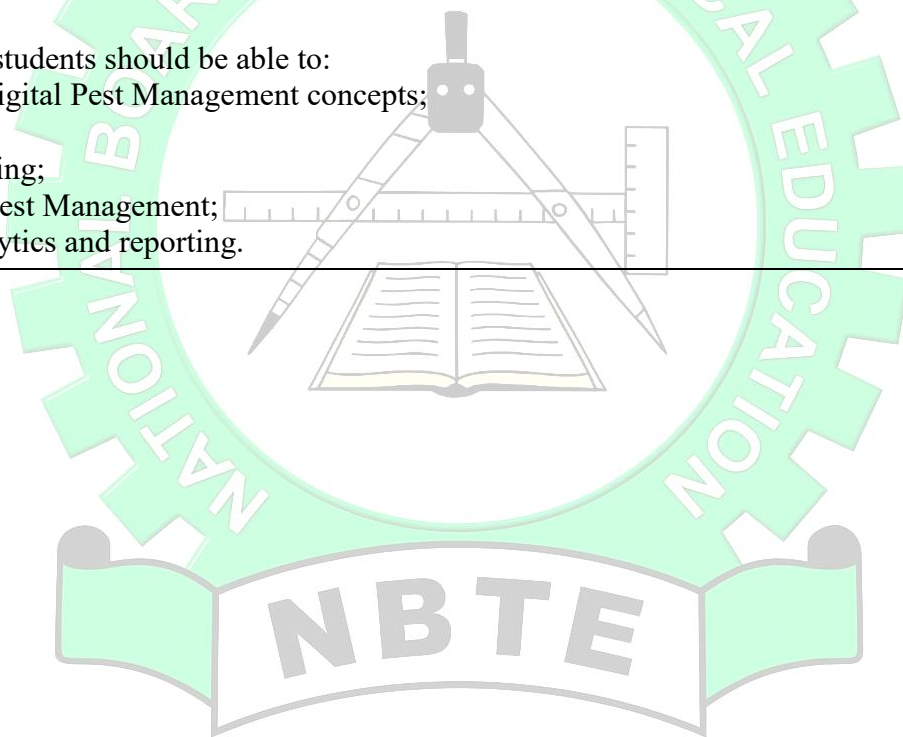
COURSE ASSESSMENT:

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



PRECISION AND DIGITAL PEST MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: PRECISION AND DIGITAL PEST MANAGEMENT	COURSE CODE: PMT 412	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip the students with the knowledge and skills to cover precision and digital Pest Management concepts, drone pest scouting, precision spraying, site-specific Pest Management, drone data analytics and reporting in Pest Management.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Understand precision and digital Pest Management concepts; 2.0 Know drone pest scouting; 3.0 Understand precision spraying; 4.0 Comprehend site-specific Pest Management; 5.0 Understand drone data analytics and reporting.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: PRECISION AND DIGITAL PEST MANAGEMENT			COURSE CODE: PMT 412		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip the students with the knowledge and skills to cover precision and digital Pest Management concepts, drone pest scouting, precision spraying, site-specific Pest Management, drone data analytics and reporting in Pest Management.						
GENERAL OBJECTIVE 1.0: Understand precision and digital Pest Management concepts						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain precision and digital Pest Management concepts. 1.2 Itemize precision and digital Pest Management tools (sensors, IoT, etc.). 1.3 Describe drone/UAV classification. 1.4 List drone components (frame, motors, GPS, cameras, etc.) 1.5 Explain drone-pilot regulations (NCAA).	• Explain precision and digital Pest Management concepts • Describe precision and digital Pest Management tools • Explain drone/UAV classification • Describe drone components (frame, motors, GPS, cameras, etc.) • Explain drone-pilot regulations (NCAA) • Discuss drone safety operating procedures	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, etc.	• Categorize different types of drones. • Identify components (frame, motors, GPS, cameras, etc.) • Assemble drone • Inspect drone • Browse NCAA drone regulations • Apply pre-flight safety checklists	Guide students to: • Categorize different types of drones. • Identify components (frame, motors, GPS, cameras, etc.) • Assemble drone • Inspect drone • Browse NCAA drone regulations. • Apply pre-flight safety checklists	UAV/Drones, NCAA documents, Pre-flight checklists, Field crops, Internet, Computer, GPS, QGIS apps, Smartphones, AI apps, Maps, Projector, Practical manual etc.

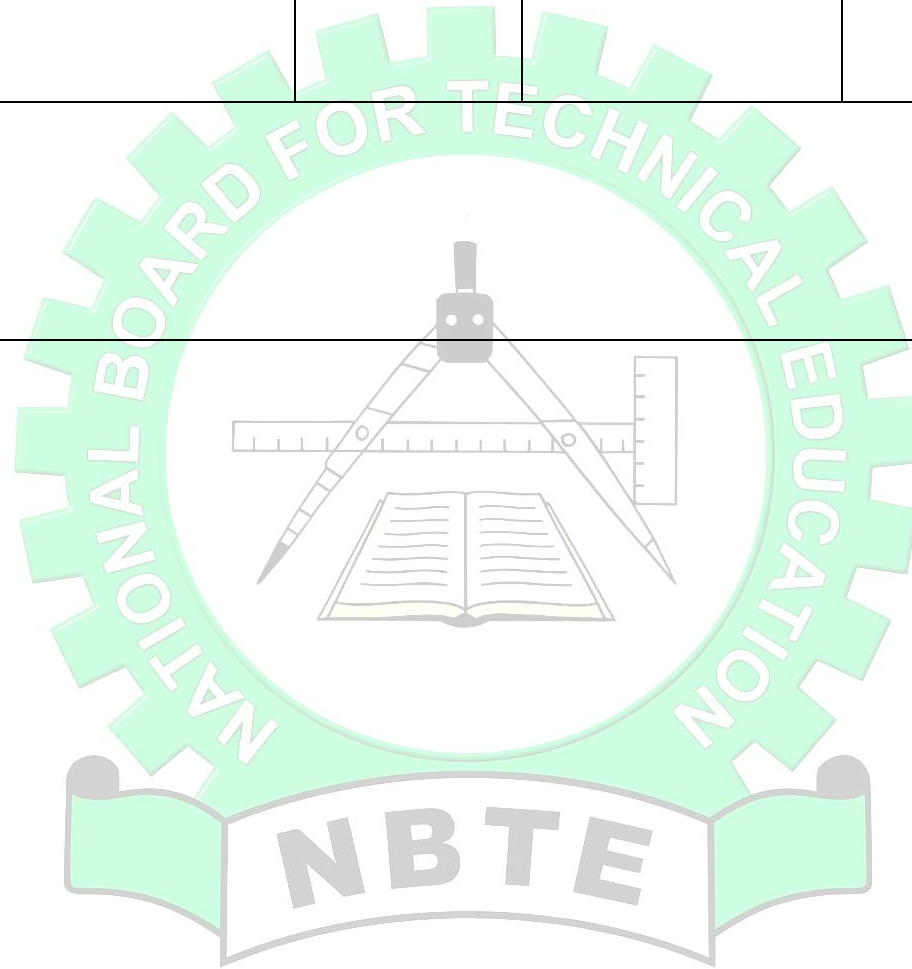
	1.6 Explain drone safety operating procedures.					
GENERAL OBJECTIVE 2.0: Know drone pest scouting						
4-6	2.1 Explain drone flight planning (Pix4D, Drone Deploy). 2.2 Describe Red, Green, Blue (RGB) and multispectral imaging. 2.3 Explain Normalised Different Vegetation Index (NDVI) for pest / disease detection. 2.4 Describe ground-truthing of drone data.	- Explain drone flight planning (Pix4D, Drone Deploy) - Describe RGB and multispectral imaging - Discuss NDVI for pest / disease detection - Describe ground-truthing of drone data	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, etc.	- Plan drone flight for 1 ha field - Capture RGB and multispectral imagery - Compute NDVI - Detect anomalies in the computed NDVI - Conduct ground-truthing visit.	Guide students to: - Plan drone flight for 1 ha field - Capture RGB and multispectral imagery - Compute NDVI - Detect anomalies in the computed NDVI - Conduct ground-truthing visit	UAV/Drones, NCAA documents, Pre-flight checklists, Field crops, Internet, Computer, GPS, QGIS apps, Smartphones, AI apps, Maps, Projector, Practical manual etc.
GENERAL OBJECTIVE 3.0: Understand precision spraying.						
7-9	3.1 Explain spray-drone equipment and capacity. 3.2 Describe spray-drone calibration. 3.3 Explain the application rates and droplet size. 3.4 Outline spray-	- Explain spray-drone equipment and capacity - Discuss spray-drone calibration - Explain the application rates and droplet size - Discuss spray-drone	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board,	- Demonstrate spray-drone operation - Calibrate spray-drone - Compute application rate and droplet size - Apply spray-drone	Guide students to: - Demonstrate spray-drone operation - Calibrate spray-drone - Compute application rate and droplet size	UAV/Drones, NCAA documents, Pre-flight checklists, Field crops, Internet, Computer, GPS,

	drone safety, NCAA flight checklists.	safety, NCAA flight checklists	Marker, Pictures, etc.	safety protocols, NCAA flight checklists	Apply spray-drone safety protocols, NCAA flight checklists	QGIS apps, Smartphones, AI apps, Maps, Projector, Practical manual etc.
GENERAL OBJECTIVE 4.0: Comprehend site-specific Pest Management						
10-12	4.1 Explain variable-rate application (VRA). 4.2 Describe prescription maps for Pest Management. 4.3 Explain pest zone management. 4.4 Explain yield-loss prediction.	- Explain variable-rate application (VRA) - Discuss prescription maps for Pest Management - Discuss pest zone management. - Explain yield-loss prediction.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	- Design VRA plan - Build prescription maps for Pest Management (QGIS / ArcGIS) - Demonstrate pest zone management - Predict yield-loss by pest damage	Guide students to: - Design VRA plan - Build prescription maps for Pest Management (QGIS / ArcGIS) - Demonstrate pest zone management - Predict yield-loss by pest damage	Field crops, Internet, Computer, GPS, ArcGIS, QGIS apps, Smartphones, AI apps, Maps, Projector, Practical manual etc.
GENERAL OBJECTIVE 5.0: Understand drone data analytics and reporting						
13-15	5.1 Explain drone-imagery processing. 5.2 Describe AI/ML for pest detection in drone data. 5.3 Outline the steps in establishment of drone pest dashboard.	- Explain drone-imagery processing - Describe AI/ML for pest detection in drone data - Discuss the steps in establishment of drone pest dashboard - Discuss reporting	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	- Run drone imagery (orthomosaic, NDVI) - Demonstrate AI/ML for pest detection - Build drone-pest dashboard - Compute ROI of drone service	Guide student to: - Run drone imagery (orthomosaic, NDVI) - Demonstrate AI/ML for pest detection (intro) - Build drone-pest dashboard - Compute ROI of	UAV/Drones, NCAA documents, Pre-flight Checklists, Field crops, Internet, Computer, GPS, QGIS apps,

	5.4 Explain reporting and ROI of drone services.	and ROI of drone services	Pictures, etc.		drone service	Smartphones, AI apps, Maps, Projector, Practical manual etc.
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COURSE ASSESSMENT:

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



INVASIVE AND OTHER EMERGING AGRICULTURAL PESTS AND DISEASES

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY –		
COURSE TITLE: INVASIVE AND OTHER EMERGING AGRICULTURAL PESTS AND DISEASES	COURSE CODE: PMT 413	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills required to identify, monitor, assess, prevent, and manage invasive and emerging agricultural pests and diseases while safeguarding crop production, livestock health, biodiversity, food security and trade.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the concepts and impact of invasive and emerging pests and diseases; 2.0 Know the pathways of introduction, establishment, and spread of invasive species; 3.0 Understand major invasive pests and diseases affecting crops, livestock, stored products, and forestry; 4.0 Comprehend integrated management strategies for invasive pests and diseases; 5.0 Know national and international regulations relating to quarantine and phytosanitary measures; 6.0 Appreciate response plans for emerging pest and disease outbreaks.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: INVASIVE AND OTHER EMERGING AGRICULTURAL PESTS AND DISEASES			COURSE CODE: PMT 413	CONTACT HOURS: 4 HOURS/WEEK		
			CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK		
YEAR: II SEMESTER: I			PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK		
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and skills required to identify, monitor, assess, prevent, and manage invasive and emerging agricultural pests and diseases while safeguarding crop production, livestock health, biodiversity, food security, and trade.						
GENERAL OBJECTIVE 1.0: Understand the concepts and impact of invasive and emerging pests and diseases						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define invasive pests, invasive diseases, emerging pests, and emerging diseases. 1.2 Explain the differences between native, introduced, invasive, and emerging pest species. 1.3 Explain the characteristics of invasive and emerging	• Explain invasive pests, invasive diseases, emerging pests, and emerging diseases. • Discuss the differences between native, introduced, invasive, and emerging pest species. • Discuss the characteristics of invasive and emerging agricultural pests	Lecture notes Textbooks on invasive species and biosecurity Scientific journals Case study reports Fact sheets and extension publications Maps and charts Projector computer	• Identify common invasive and emerging pests and disease symptoms in the field. • Distinguish invasive species from indigenous species using identification guides. • Document observation and signs of pest infestation and disease outbreaks. • Carryout collection	Guide Students to: • Identify common invasive and emerging pests and disease symptoms in the field. • Distinguish invasive species from indigenous species using identification guides. • Document observation and signs of pest infestation and disease outbreaks..	Demonstration farms, Greenhouses, Sampling and monitoring equipment, Nets, Traps, Aspirators, Collection jars, Forceps, Hand lenses, Microscopes, Dissecting kits, Petri dishes, Identification

agricultural pests and diseases. 1.4 Describe the pathways through which invasive pests and diseases are introduced and spread. 1.5 Explain factors responsible for the emergence and establishment of pests and diseases. 1.6 Explain the economic impacts of invasive pests and diseases on agricultural production. 1.7 Explain the environmental impacts of invasive species on biodiversity and ecosystems. 1.8 Describe the social and public health implications of invasive and emerging pests and diseases. 1.9 Explain the role of climate change,	and diseases. - Describe the pathways through which invasive pests and diseases are introduced and spread. - Discuss factors responsible for the emergence and establishment of pests and diseases. - Discuss the economic impacts of invasive pests and diseases on agricultural production. - Explain the environmental impacts of invasive species on biodiversity and ecosystems. - Describe the social and public health implications of invasive and emerging pests and diseases. - Explain the role of climate change, globalization, and	Regulatory documents and guidelines Multimedia presentations Educational videos Computers Internet facilities Projectors Online pest databases	and preservation of pest and diseased plant specimens. - Assess the extent of damage caused by invasive pests and diseases. - Prepare simple reports on the impacts of invasive pests and diseases observed in the field. - Present findings from field observations and case studies. - Analyze case studies of important invasive pests and diseases affecting agriculture.	- Carryout collection and preservation of pest and diseased plant specimens. - Assess the extent of damage caused by invasive pests and diseases. - Prepare simple reports on the impacts of invasive pests and diseases observed in the field. - Present findings from field observations and case studies. - Analyze case studies of important invasive pests and diseases affecting agriculture.	keys, Specimen, Preservatives, Diagnostic kits, Digital Resources, Smartphones, Computer, GPS devices, Pest surveillance mobile applications, GIS software, Digital cameras, Reference Materials, Pest identification manuals, Disease symptom guides, Invasive species databases, National biosecurity guidelines, Pest surveillance protocols,
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	globalization, and trade in pest and disease emergence.	trade in pest and disease emergence.				Practical manual, etc.
GENERAL OBJECTIVE 2.0: Know the pathways of introduction, establishment, and spread of invasive species						
4-5	2.1 Define pathways of introduction, establishment, and spread of invasive species. 2.2 Explain the major human-mediated and natural pathways of pest introduction. 2.3 Describe how international trade contributes to invasive species movement. 2.4 Explain natural dispersal mechanisms such as wind, water, animals, etc. 2.5 Explain the biological and environmental factors that support establishment. 2.6 Explain the conditions that favor rapid	• Discuss pathways of introduction, establishment, and spread of invasive species. • Explain the major human-mediated and natural pathways of pest introduction. • Describe how international trade contributes to invasive species movement. • Discuss natural dispersal mechanisms such as wind, water, animals, etc. • Explain the biological and environmental factors that support establishment. • Explain conditions that favor rapid population growth of invasive species. • Describe mechanisms of local and regional	Lecture notes and handouts Diagrams of invasion pathways Textbooks management Policy documents on quarantine and biosecurity Charts and flow diagrams Scientific journals and extension bulletins Computers and projectors Internet access GIS and mapping software Online pest databases Educational videos and simulations	• Identify possible pathways of pest introduction in real agricultural systems. • Trace sources of infestation in crop or storage environments. • Conduct field surveillance to detect early pest invasion. • Simulate spread pathways using mapping or case study data. • Inspect planting materials for signs of pest contamination • Use traps and sampling tools to monitor pest movement. • Analyze pest distribution data. • Prepare reports on observed or simulated pest spread	Guide students to: • Identify possible pathways of pest introduction in real agricultural systems. • Trace sources of infestation in crop or storage environments. • Conduct field surveillance to detect early pest invasion. • Simulate spread pathways using mapping or case study data. • Inspect planting materials for signs of pest contamination • Use traps and sampling tools to monitor pest movement. • Analyze pest distribution data. • Prepare reports on observed or	Diagrams of invasion pathways, Case study outbreak reports, Management policy document, Charts and flow diagrams, Online pest databases, Educational videos and simulations, PowerPoint presentations, Practical manual, etc.

	population growth of invasive species. 2.7 Describe mechanisms of local and regional spread of invasive pests and diseases. 2.8 Explain the role of climate change in invasion success. 2.9 Explain the role of agricultural practices facilitating pest spread.	spread of invasive pests and diseases. • Explain the role of climate change in invasion success. • Discuss the role of agricultural practices facilitating pest spread.	PowerPoint presentations	scenarios.	simulated pest spread scenarios.	
GENERAL OBJECTIVE 3.0: Understand major invasive pests and diseases affecting crops, livestock, stored products, and forestry.						
6-7	3.1 Explain major invasive pests and diseases in agriculture. 3.2 Explain the classification of invasive organisms affecting crops, livestock, stored products, and forestry. 3.3 Describe key invasive insect pests, plant diseases, weeds, and animal	• Explain major invasive pests and diseases in agriculture. • Discuss the classification of invasive organisms affecting crops, livestock, stored products, and forestry. • Discuss key invasive insect pests, plant diseases, weeds, and animal diseases. • Explain the biology	Lecture notes Pest and disease atlases Scientific journals Case studies outbreaks Charts and diagrams Manuals on pest identification Markerboard Marker Government biosecurity	• Identify major invasive pests and disease symptoms in the field and laboratory. • Create posters to differentiate between damage caused by different invasive organisms. • Conduct field scouting for invasive pests and diseases. • Assist to collect, preserve, and label specimens of pests	Guide students to: • Identify major invasive pests and disease symptoms in the field and laboratory. • Create posters to differentiate between damage caused by different invasive organisms.. • Conduct field scouting for invasive pests and diseases. • Assist to collect, preserve, and label	Demonstration farm, Livestock farms, Grain storage facilities, Forestry plantations and nurseries, Sampling and monitoring tools, Soil sampling tools, Hand lenses, Dissecting kits,

	diseases. 3.4 Explain the biology and ecology of major invasive species. 3.5 Describe symptoms, host range, and damage caused by invasive pests and diseases. 3.6 Explain the economic, environmental, and social impacts of major invasive species. 3.7 Explain the spread and establishment mechanisms of major invasive pests and diseases. 3.8 Explain control and management strategies for invasive agricultural pests and diseases.	and ecology of major invasive species. • Describe symptoms, host range, and damage caused by invasive pests and diseases. • Discuss the economic, environmental, and social impacts of major invasive species. • Explain the spread and establishment mechanisms of major invasive pests and diseases. • Discuss control and management strategies for invasive agricultural pests and diseases.	guidelines Computers and projectors Internet access, etc	and diseases samples. • Use identification keys and guides for classification. • Assess severity and incidence of pest and disease outbreaks. • Use traps and sampling tools for monitoring invasive insects. • Analyze recorded field data on pest distribution. • Map pest occurrence using GPS or mobile applications. • Prepare technical reports on invasive pest and disease assessments. • Interpret case studies of major invasive outbreaks in agriculture.	specimens of pests and diseases samples. • Use identification keys and guides for classification. • Assess severity and incidence of pest and disease outbreaks. • Use traps and sampling tools for monitoring invasive insects. • Analyze recorded field data on pest distribution.. • Map pest occurrence using GPS or mobile applications. • Prepare technical reports on invasive pest and disease assessments. • Interpret case studies of major invasive outbreaks in agriculture.	Microscopes, Diagnostic kits, Culture media, Specimen preservation materials, Disease symptom reference guides, Educational videos and simulations, Practical manual, etc.
GENERAL OBJECTIVE 4.0: Design integrated management strategies for invasive pests and diseases.						
8-9	4.1 Define Integrated Pest and Disease Management (IPDM) in the	• Explain Integrated Pest and Disease Management (IPDM) in the	Lecture notes and manuals on IPDM Case study	• Develop integrated management plans for selected invasive pests and diseases.	Guide student to: • Develop integrated management plans for selected invasive	Demonstration farms, Greenhouses, Livestock units,

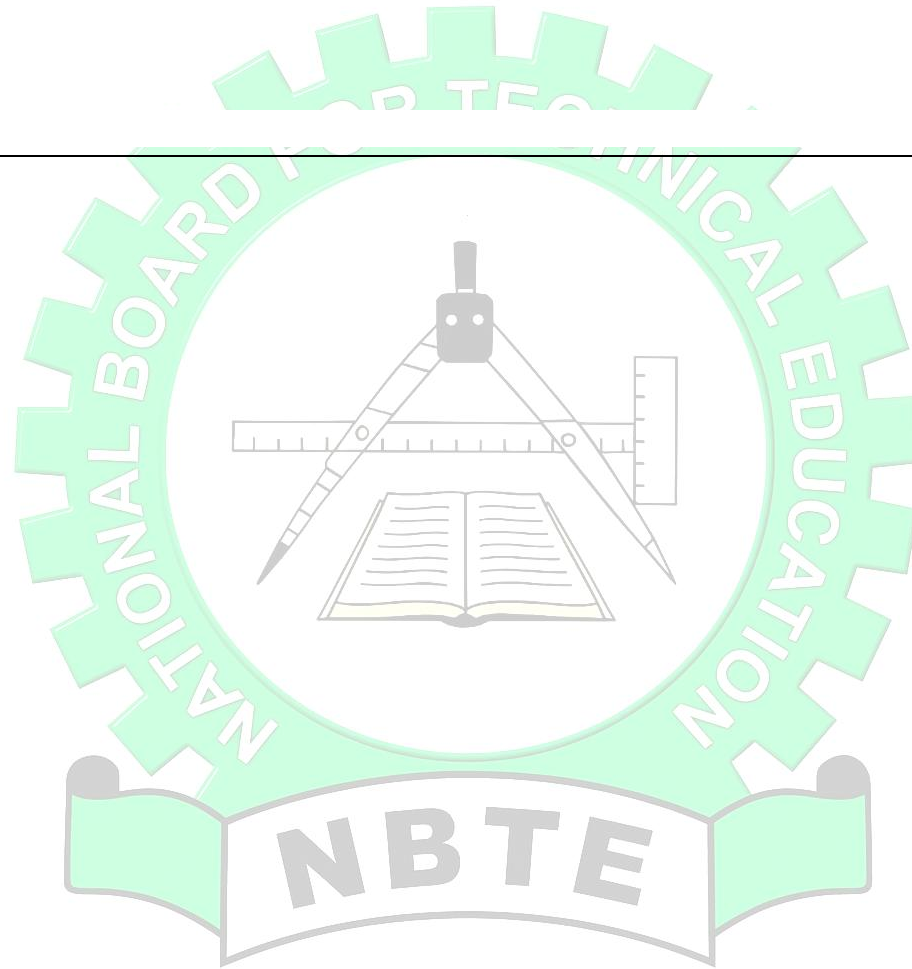
	context of invasive species. 4.2 Explain the principles and components of IPDM. 4.3 Explain key invasive pests and diseases requiring integrated management. 4.4 Describe cultural, biological, chemical, physical, and legislative control methods. 4.5 Explain resistance development and management in invasive species. 4.6 Explain ecological principles underlying integrated management strategies. 4.7 Explain the advantages and limitations of different control methods. 4.8 Explain decision-making tools used	context of invasive species. • Explain the principles and components of IPDM. • Discuss key invasive pests and diseases requiring integrated management. • Describe cultural, biological, chemical, physical, and legislative control methods. • Explain resistance development and management in invasive species. • Discuss ecological principles underlying integrated management strategies. • Explain the advantages and limitations of different control methods. • Explain decision-	reports on invasive pest control Charts showing pest life cycles and control points Scientific journals and extension bulletins National and international Pest Management guidelines Pest threshold and decision-making charts Computers and projectors Internet access IPM simulation software GIS and pest monitoring platforms Online databases Educational videos and animations	• Conduct pest and disease surveillance to inform management decisions. • Set up traps and other control tools. • Collect pest population data for decision-making. • Monitor traps and other control tools. • Interpret pest population data for decision-making • Evaluate effectiveness of different management interventions. • Prepare IPDM field reports and recommendations. • Use digital tools for pest monitoring and management planning.	pests and diseases. • Conduct pest and disease surveillance to inform management decisions. • Set up traps and other control tools. • Monitor traps and other control tools • Collect pest population data for decision-making. • Collect pest population data for decision-making • Evaluate effectiveness of different management interventions. • Prepare IPDM field reports and recommendations. • Use digital tools for pest monitoring and management planning.	Storage facilities, Sampling and control equipment, Sprayers, PPEs, Culture media (for pathogens), Diagnostic kits, Pest identification keys, Storage and preservation materials, Practical manual etc.
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	in Pest Management (thresholds, monitoring data).	making tools used in Pest Management (thresholds, monitoring data).				
GENERAL OBJECTIVE 5.0: Interpret national and international regulations relating to quarantine and phytosanitary measures.						
10-11	5.1 Define quarantine, phytosanitary measures, and biosecurity in agriculture. 5.2 Explain the purpose and importance of plant and animal quarantine systems. 5.3 Describe national regulatory frameworks for pest and disease control. 5.4 Explain the role of international agreements in plant health regulation. 5.5 Explain key provisions of the International Plant Protection Convention (IPPC). 5.6 Explain the role of National Plant	• Discuss quarantine, phytosanitary measures, and biosecurity in agriculture. • Explain the purpose and importance of plant and animal quarantine systems. • Describe national regulatory frameworks for pest and disease control. • Explain the role of international agreements in plant health regulation. • Discuss key provisions of the International Plant Protection Convention (IPPC). • Discuss the role of National Plant Protection Organisations (NPPOs).	National plant protection regulations IPPC (International Plant Protection Convention) documents Quarantine pest lists Phytosanitary Flowcharts of inspection procedures Lecture notes and manuals Computers and projectors Internet access Online databases Training videos on quarantine procedures Presentation software	• Interpret phytosanitary certificates and related documentation. • Identify regulated pests and quarantine pests from reference lists. • Simulate inspection procedures for agricultural imports and exports. • Complete basic phytosanitary documentation forms. • Conduct mock border inspection of agricultural commodities. • Assess risk status of agricultural materials for import/export. • Apply quarantine protocols in field and storage settings.	Guide students to: • Interpret phytosanitary certificates and related documentation. • Identify regulated pests and quarantine pests from reference lists. • Simulate inspection procedures for agricultural imports and exports. • Complete basic phytosanitary documentation forms. • Conduct mock border inspection of agricultural commodities. • Assess risk status of agricultural materials for import/export. • Apply quarantine protocols in field and	Quarantine stations, Agricultural inspection units, Demonstration farms, Seed certification centers, Storage facilities, Inspection and monitoring tools, Hand lenses, Sampling kits, Pest identification guides, Inspection trays and containers, Collection bottles and labeling materials, Phytosanitary

	Protection Organisations (NPPOs). 5.7 Explain types of phytosanitary certificates and their uses. 5.8 Describe import and export inspection procedures for agricultural commodities. 5.9 Explain the consequences of non-compliance with phytosanitary regulations.	• Discuss types of phytosanitary certificates and their uses. • Describe import and export inspection procedures for agricultural commodities. • Discuss the consequences of non-compliance with phytosanitary regulations.		• Record and report suspected quarantine pest findings. • Use pest identification guides for regulatory decision-making. • Develop compliance checklists for agricultural trade.	storage settings. • Record and report suspected quarantine pest findings. • Use pest identification guides for regulatory decision-making. • Develop compliance checklists for agricultural trade.	certificate templates, Import/export declaration forms, Inspection checklists, Recording registers, Compliance reporting forms, Digital tools, Practical manual, etc.
GENERAL OBJECTIVE 6.0: Appreciate response plans for emerging pest and disease outbreaks.						
12-15	6.1 Define outbreak response planning and emergency preparedness in agriculture. 6.2 Explain the stages of pest and disease outbreak management. 6.3 Describe components of an emergency response plan.	• Explain outbreak response planning and emergency preparedness in agriculture. • Explain the stages of pest and disease outbreak management. • Describe components of an emergency response plan. • Explain the principles	Lecture notes and manuals Emergency response guidelines Outbreak case study reports National biosecurity policies Pest and disease surveillance	• Conduct rapid field assessments during simulated outbreaks. • Identify and document signs of pest and disease emergencies. • Develop outbreak reporting and notification procedures. • Design emergency response plans for	Guide students to: • Conduct rapid field assessments during simulated outbreaks. • Identify and document signs of pest and disease emergencies. • Develop outbreak reporting and notification procedures. • Design emergency	Demonstration farms, Livestock farms, Nurseries, Greenhouses, Storage facilities, Surveillance and monitoring equipment, Sampling kits, Hand lenses,

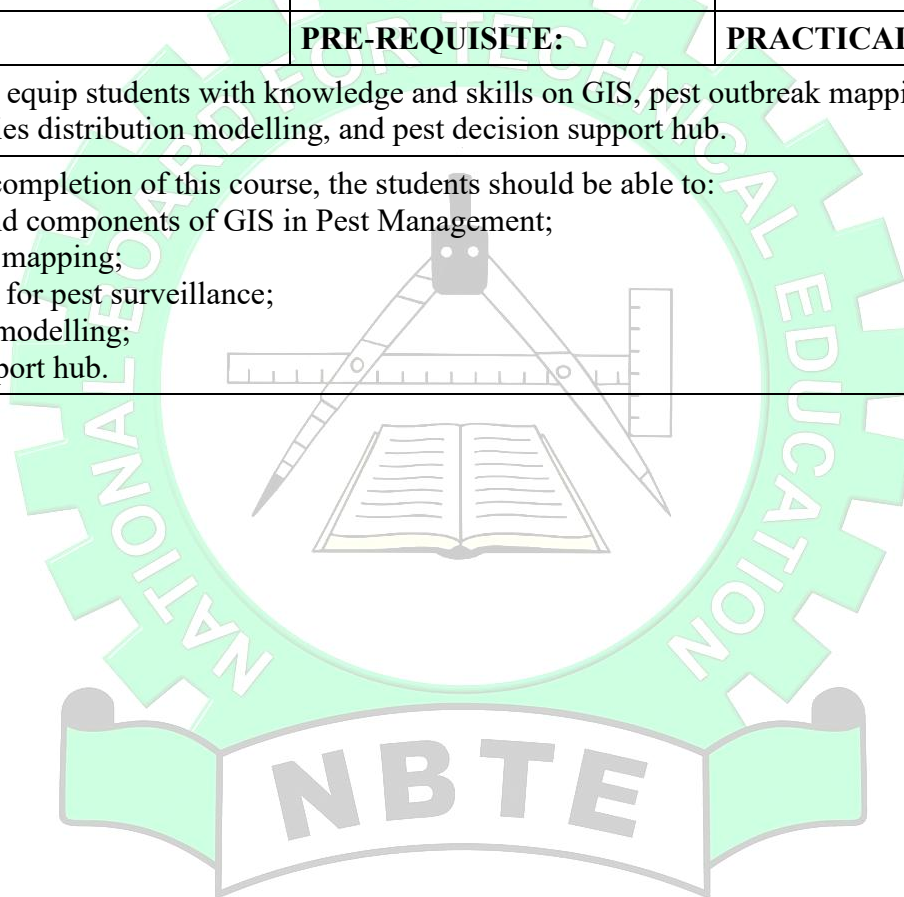
6.4 Explain the principles of early warning and rapid response systems. 6.5 Describe roles and responsibilities of key stakeholders during outbreaks. 6.6 Discuss surveillance and reporting mechanisms used during emergencies. 6.7 Explain containment, eradication, and recovery strategies. 6.8 Explain the economic, environmental, and social impacts of pest and disease outbreaks. 6.9 Describe national and international frameworks guiding outbreak response.	of early warning and rapid response systems. • Explain the roles and responsibilities of key stakeholders during outbreaks. • Discuss surveillance and reporting mechanisms used during emergencies. • Explain containment, eradication, and recovery strategies. • Discuss the economic, environmental, and social impacts of pest and disease outbreaks. • Describe national and international frameworks guiding outbreak response.	manuals Risk communication materials Maps, charts, and flow diagrams ICT Resources Computers and projectors Internet access Learning management systems GIS software Digital surveillance platforms Educational videos on outbreak management Resources for Practical Content	specific pest or disease scenarios. • Conduct pest and disease surveillance during outbreak situations. • Use GPS and digital tools for outbreak mapping and monitoring. • Establish containment zones and quarantine measures in simulations. • Coordinate response activities among stakeholders. • Analyze outbreak data and prepare situation reports. • Evaluate effectiveness of response interventions. • Conduct mock emergency response exercises. • Prepare post-outbreak recovery and monitoring plans.	response plans for specific pest or disease scenarios. • Conduct pest and disease surveillance during outbreak situations. • Use GPS and digital tools for outbreak mapping and monitoring. • Establish containment zones and quarantine measures in simulations. • Coordinate response activities among stakeholders. • Analyze outbreak data and prepare situation reports. • Evaluate effectiveness of response interventions. • Conduct mock emergency response exercises. • Prepare post-outbreak recovery and monitoring	Specimen containers, Microscopes, Diagnostic kits, Culture media, Specimen preservation materials, Pest and disease identification guides, Digital tools, Pest reporting applications, Digital cameras, Data collection software, Incident report forms, Surveillance data sheets, Emergency response templates, Quarantine and inspection checklists, Situation report formats, Practical manual, etc.
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					plans.	
COURSE ASSESSMENT:						
Course work:	10%					
Test/Assignments:	10%					
Practical:	40%					
Examination:	40%					
Total:	100%					



GIS APPLICATION AND PEST SURVEILLANCE

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: GIS APPLICATION AND PEST SURVEILLANCE	COURSE CODE: PMT 414	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills on GIS, pest outbreak mapping, remote sensing for pest surveillance, identification of species distribution modelling, and pest decision support hub.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the concepts and components of GIS in Pest Management; 2.0 Comprehend pest outbreak mapping; 3.0 Understand remote sensing for pest surveillance; 4.0 Know species distribution modelling; 5.0 Establish pest decision support hub.		



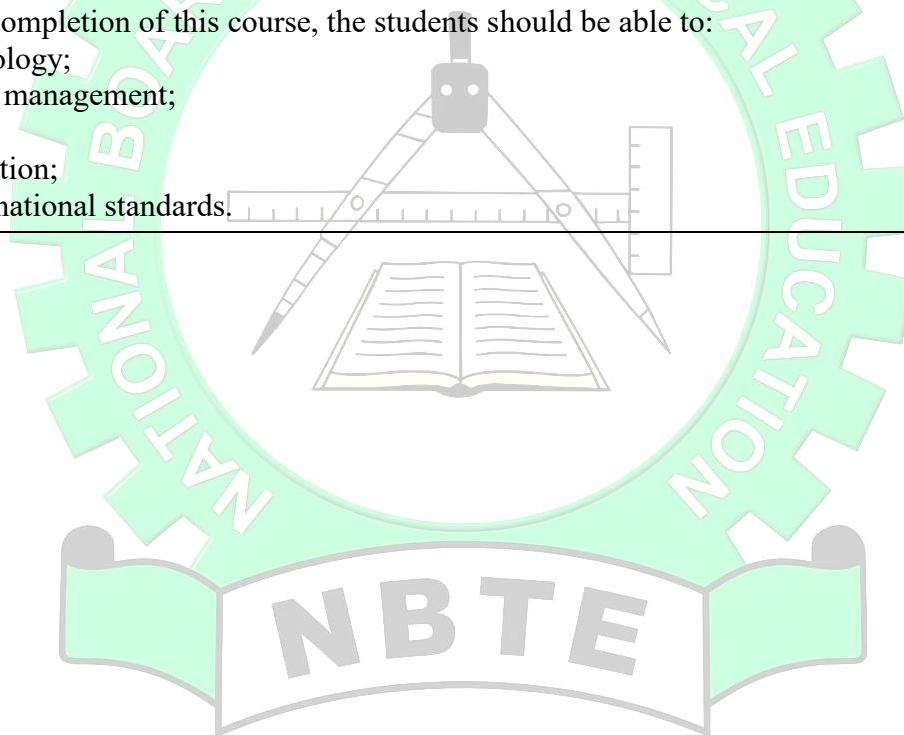
PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: GIS APPLICATION AND PEST SURVEILLANCE			COURSE CODE: PMT 414		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills on GIS, pest outbreak mapping, remote sensing for pest surveillance, identification of species distribution modelling, and pest decision support hub.						
GENERAL OBJECTIVE 1.0 Understand the concepts and components of GIS in Pest Management.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define GIS concepts and components. 1.2 Describe vector and raster data. 1.3 Explain coordinate systems and projections. 1.4 Explain data input, analytics and digitization of pest occurrence.	•Explain GIS concepts and components •Demonstrate vector and raster data •Discuss coordinate systems and projections •Discuss data input, analytics and digitization of pest occurrence	Textbooks, Journals, Internet, Map, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	• Install GPS and QGIS apps • Identify vector and raster data • Apply coordinate systems and projections for Nigeria • Digitise pest occurrence points	Guide students to: • Install GPS and QGIS apps in their devices • Identify vector and raster data • Collect pest coordinates and projections for Nigeria • Digitise pest occurrence points	Internet, Computer, GPS, QGIS apps, Smartphones, AI apps, Maps, Projector, Practical manual etc.
GENERAL OBJECTIVE 2.0: Comprehend pest outbreak mapping						
4-6	2.1 Explain pest occurrence mapping (GPS-	• Explain pest occurrence mapping (GPS-tagged)	Textbooks, Journals, Internet,	• Install GPS and QGIS apps. • Map 50 GPS-tagged	Guide students to: • Install GPS and QGIS apps in	Field crops, Internet, Computer,

	tagged). 2.2 Describe hot-spot analysis. 2.3 Describe outbreak progression mapping. 2.4 Illustrate risk-zone mapping	• Discuss hot-spot analysis • Describe outbreak progression mapping • Illustrate risk-zone mapping	Map, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	pest occurrences. • Conduct hot-spot analysis. • Map outbreak progression. • Build risk-zone map.	their devices • Map 50 GPS-tagged pest occurrences • Conduct hot-spot analysis • Map outbreak progression • Build risk-zone map	GPS, QGIS apps, Smartphones, AI apps, Maps, Projector, Practical manual etc.
GENERAL OBJECTIVE 3.0: Understand remote sensing for pest surveillance						
7-9	3.1 Explain satellite imagery (Sentinel, Landsat, etc). 3.2 Explain NDVI for crop-stress detection. 3.3 Describe drone-based RS integration. 3.4 Explain NIMET weather-pest data integration.	• Explain satellite imagery (Sentinel, Landsat, etc.). • Discuss NDVI for crop-stress detection • Demonstrate drone-based RS integration • Illustrate NIMET weather-pest data integration.	Textbooks, Journals, Internet, Map, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	• Install GPS and QGIS apps • Map 50 GPS-tagged pest occurrences • Conduct GPS-tagged scouting on 3 crops with AI, ID apps • Conduct drone flight and pest detection (NDVI) • Build pest-occurrence map (GPS and QGIS apps,)	Guide students to: • Install GPS and QGIS apps in their devices. • Map 50 GPS-tagged pest occurrences. • Lead scouting • Demonstrate drone flight. • Build pest-occurrence map (GPS and QGIS apps,)	Field crops, Internet, Computer, GPS, QGIS apps, Smartphones, AI apps, Maps, Projector, Practical manual etc.
GENERAL OBJECTIVE 4.0: Know species distribution modelling						
10-12	4.1 Explain species distribution modelling (SDM) concepts. 4.2 Describe	• Explain species distribution modelling (SDM) concepts (MaxEnt) • Describe	Textbooks, Journals, Internet, Map, Articles,	• Install GPS and QGIS apps • Run MaxEnt SDM for 2 pests • Build environmental	Guide students to: • Install GPS and QGIS apps in their devices • Run MaxEnt SDM for 2 pests	Field crops, Internet, Computer, GPS, QGIS apps,

	environmental layers (climate, land cover, etc.). 4.3 Discuss current and future pest range modelling 4.4 Explain climate change pest projections.	environmental layers (climate, land cover) • Apply current and future pest range modelling • Discuss climate change pest projections	Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	layers (climate, land cover, etc) • Apply current and future pest range • Download climate change pest scenarios	• Build environmental layers (climate, land cover, etc) • Project current and future pest range • Download climate change pest scenarios	Smartphones, AI apps, Maps, Projector, Practical manual etc.
GENERAL OBJECTIVE 5.0: Establish pest decision support hub						
13-15	5.1 Explain pest-risk mapping for decisions. 5.2 Describe web-GIS / pest dashboards. 5.3 Explain pest surveillance bulletin design.	• Highlight pest-risk mapping for decisions • Describe web-GIS / pest dashboards • Discuss pest surveillance bulletin design	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.	• Install GPS and QGIS apps in their devices • Build pest-risk map • Build web-GIS pest dashboard • Design surveillance bulletin	Guide students to: • Install GPS and QGIS apps in their devices • Build pest-risk map • Build web-GIS pest dashboard • Design surveillance bulletin	Field crops, Internet, Computer, GPS, QGIS apps, Smartphones, AI apps, Maps, Projector, Practical manual etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical 40% Examination: 40% Total: 100%						

POST-HARVEST AND STORAGE PEST MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: POST-HARVEST AND STORAGE PEST MANAGEMENT	COURSE CODE: PMT 415	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOURS/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills to cover storage pest biology, storage facility management, storage pest control, phytosanitary inspection, and quarantine.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand storage pest biology; 2.0 Understand storage facility management; 3.0 Know storage pest control; 4.0 Know phytosanitary inspection; 5.0 Understand IPPC and international standards.		



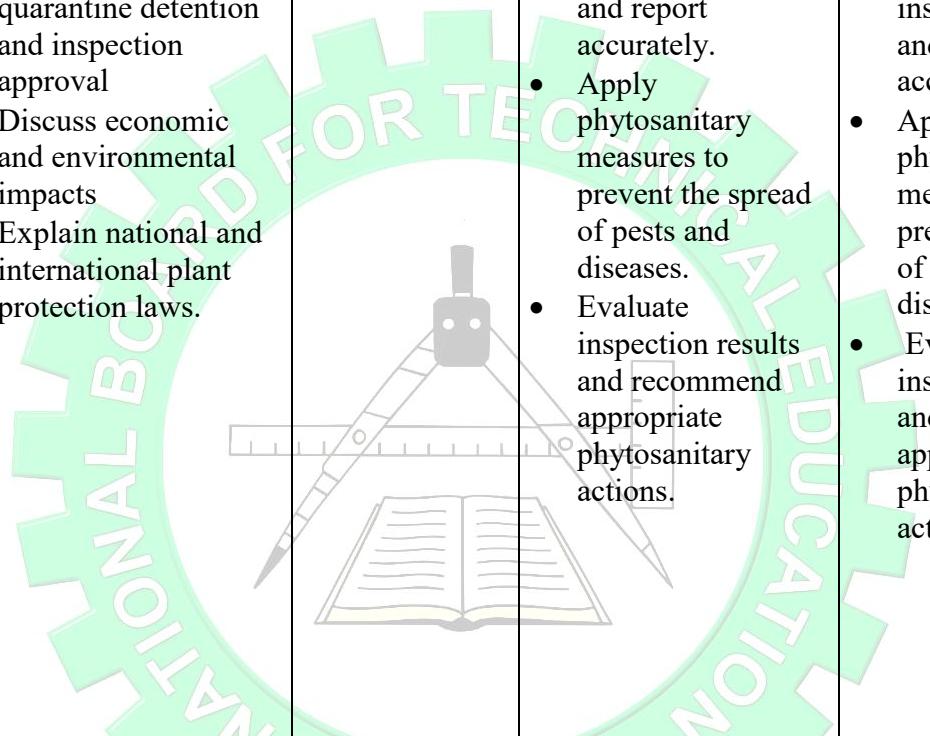
PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: POST-HARVEST AND STORAGE PEST MANAGEMENT			COURSE CODE: PMT 415		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOURS/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: NIL		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills to cover storage pest biology, storage facility management, storage pest control, phytosanitary inspection, and quarantine.						
GENERAL OBJECTIVE 1.0: Understand storage pest biology						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define post-harvest and storage Pest Management. 1.2 Describe major storage pests (insects, mites, fungi, rodents, etc.). 1.3 Explain causes of post-harvest losses. 1.4 Describe damage caused by storage pests. 1.5 Explain principles of Integrated Pest Management (IPM). 1.6 State importance of safe storage practices.	- Define post-harvest and storage Pest Management. - Describe major storage pests (insects, mites, fungi, rodents, etc.). - Explain causes of post-harvest losses. - Describe damage caused by storage pests. - Explain principles of Integrated Pest Management (IPM). - Explain importance of safe storage	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Diagrams, Specimen images Posters, Slides Samples of damaged grains	- Identify common storage pests such as Sitophilus, Tribolium, Callosobruchus, Rhyzopertha, etc. - Examine the external morphology of storage insects. - Identify trapping, collection, and preservation techniques. - Create posters to differentiate between larva, pupa, and adult	Guide students to: - Identify common storage pests such as Sitophilus, Tribolium, Callosobruchus, Rhyzopertha, etc. - Examine the external morphology of storage insects. - Identify trapping, collection, and preservation techniques. - Create posters to differentiate between larva, pupa, and adult	Specimen bottles, Live insects, Hand lenses, Charts, Dissecting kits, microscope, Insect models, Life cycle diagrams, Rearing jars, Preserved samples Infested grains, Trays, Observation sheets Insect cabinet,

	1.7 Explain phytosanitary and quarantine measures.	practices. • Explain phytosanitary and quarantine measures.	Charts on IPM pyramid Case studies, videos, Policy documents, diagrams, etc.	stages of storage insects. • Observe feeding habits and damage caused by storage pests. • Identify signs of infestation in stored products • Demonstrate methods of collecting and preserving storage pests. • Relate pest biology to control strategies in storage systems. • Record observations from practical sessions. • Link life cycle stages to control timing (IPM concept). • Write practical reports and labeling specimens.	stages of storage insects. • Observe feeding habits and damage caused by storage pests. • Identify signs of infestation in stored products • Demonstrate methods of collecting and preserving storage pests. • Relate pest biology to control strategies in storage systems. • Record observations from practical sessions. • Link life cycle stages to control timing (IPM concept). • Write practical reports and labeling specimens.	Aspirator, Insect nets, Killing bottles, Reagent, Ethanol, Practical Manual, etc.,
GENERAL OBJECTIVE 2.0: Understand storage facility management						
4-6	2.1 Define storage facility management. 2.2 Explain storage facility management	• Explain storage facility management. • Discuss storage facility management importance in	Textbooks, Journals, Internet, Articles, Projector, Computer,	• Identify different types of storage facilities used for agricultural produce (e.g. silos,	Guide students to: • Identify different types of storage facilities used for agricultural	Charts/diagrams of storage facilities; Real-life images; Cleaning tools

importance in agriculture.	agriculture.	Diagrams/chart s,	cribs, barns, warehouses, etc.).	produce (e.g., silos, cribs, barns, warehouses, etc.).	(brooms, disinfectants, brushes);
2.3 Explains different types of agricultural storage facilities and their uses.	• Discuss different types of agricultural storage facilities and their uses. • Describe the factors affecting effective storage of agricultural produce.	Marker board, Marker, Pictures, Diagrams, posters, instructional handouts, Pest identification charts, photographs, videos, Safety posters, personal protective equipment (PPE) samples, Sample record books, inventory forms, Log sheets	• Demonstrate proper cleaning and preparation of a storage facility before use. • Apply correct methods for storing agricultural produce to prevent spoilage. • Inspect storage facilities for pests, moisture, and ventilation issues. • Organise produce within a storage facility based on type and preservation needs. • Demonstrate basic pest control measures in storage facilities.	• Demonstrate proper cleaning and preparation of a storage facility before use. • Apply correct methods for storing agricultural produce to prevent spoilage. • Inspect storage facilities for pests, moisture, and ventilation issues. • Organise produce within a storage facility based on type and preservation needs. • Demonstrate basic pest control measures in storage facilities.	Sample storage room/area
2.4 Describe the factors affecting effective storage of agricultural produce.	• Explain the principles of proper storage facility management.	Charts, case studies, agricultural extension materials, etc.			Storage containers;
2.5 State the principles of proper storage facility management.	• Describe common storage pests and methods of their control.				Demonstration videos;
2.6 Describe common storage pests and methods of their control.	• Describe safety precautions observed in storage facilities. • Discuss the importance of record keeping in storage facility management.				Inspection checklist;
2.7 Describe safety precautions observed in storage facilities.	• Discuss the benefits of proper storage facility management in agricultural production.				Flashlight;
2.8 Explain the importance of record keeping in storage facility management.					Thermometers/hygrometers;
2.9 Explain the benefits of proper storage facility management in					Farms produce samples;
					Storage bins;
					Labeling materials;
					Pest control materials (non-toxic examples);
					Traps;
					Posters;
					Record sheets;
					sample logbooks,
					Practical manual, etc.

	agricultural production.					
GENERAL OBJECTIVE 3.0: Know storage pest control						
7-9	3.1 Explain storage pests and their effects on stored agricultural produce. 3.2 Outline common storage pests affecting grains, legumes, and other stored produce. 3.3 List storage pests according to their mode of infestation and damage. 3.4 Explain the factors that encourage storage pest infestation. 3.5 Describe various methods of storage pest control. 3.6 State the advantages and limitations of different storage pest control methods. 3.7 Explain safety precautions in the	• Discuss the concept of storage pests and Discuss the damage they cause to stored products. • Explain the characteristics of common storage pests using pictures and illustrations. • Explain how to group pests based on feeding habits and types of damage caused. • Discuss environmental and management factors such as moisture, poor sanitation, and inadequate storage conditions. • Explains cultural, physical, biological, and chemical methods of controlling storage pests. • Discuss effectiveness	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Board illustrations, Pest identification charts, Photographs, specimen samples Classification charts, Flashcards, instructional handouts, Comparative charts, Case studies, Agricultural reports, Extension	• Identify common storage pests found in stored agricultural produce. • Inspect stored produce and storage facilities for signs of pest infestation. • Demonstrate proper cleaning and sanitation of storage facilities. • Apply physical methods of storage pest control such as sorting, drying, and sealing. • Set up simple pest monitoring or trapping devices. • Demonstrate the safe handling and application of approved storage pest control materials. • Record observations on pest infestation and control measures	Guide students to: • Identify common storage pests found in stored agricultural produce. • Inspect stored produce and storage facilities for signs of pest infestation. • Demonstrate proper cleaning and sanitation of storage facilities. • Apply physical methods of storage pest control such as sorting, drying, and sealing. • Set up simple pest monitoring or trapping devices. • Demonstrate the safe handling and application of approved storage pest control materials. • Record observations on pest infestation	Pest specimens, Pest identification charts, Magnifying lens, Samples of stored produce, Storage facility, Inspection checklist, Brooms, brushes, Disinfectants, Waste bins, Grain samples, Drying mats, Storage bags, Airtight containers Insect traps, Sticky traps, Monitoring sheets, PPEs, Approved pest control materials, Safety manuals

	use of storage pest control measures. 3.8 Explain the importance of effective storage pest control in reducing post-harvest losses.	and challenges of each control method. • Describe safe handling and application procedures for pest control materials. • Explain the benefits of pest control in maintaining quality, quantity, and market value of produce.	materials, etc.	undertaken. • Evaluate the effectiveness of storage pest control measures.	and control measures undertaken. • Evaluate the effectiveness of storage pest control measures.	Record books, Observation sheets, Assessment checklist, Sample storage records, Practical manual, etc.
GENERAL OBJECTIVE 4.0: Know phytosanitary inspection						
10-12	4.1 Define phytosanitary inspection. 4.2 State at least 4 objectives of phytosanitary inspection (prevent pest spread, ensure safe trade, protect crops). 4.3 Explain common pests such as insects, fungi, mites, and rodents. 4.4 Describe steps in phytosanitary inspection (documentation, visual inspection,	• Explain the concept using real-life examples (imports/exports of crops). • Discuss the importance of plant health protection and trade safety. • Explain infected plant materials using pictures/specimens of • Discuss inspection steps using simulated export/import materials. • Explains certification documents and their importance in export	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Board illustrations,	• Identify plants, plant products, and materials that require phytosanitary inspection. • Demonstrate the correct procedure for conducting a phytosanitary inspection. • Examine plants and plant products for signs of pests, diseases, and contamination. • Collect samples for laboratory analysis during inspection.	Guide students to: • Identify plants, plant products, and materials that require phytosanitary inspection. • Demonstrate the correct procedure for conducting a phytosanitary inspection. • Examine plants and plant products for signs of pests, diseases, and contamination. • Collect samples for laboratory analysis	Plant samples, Seeds, Fruits, Vegetables, Inspection guide, Inspection checklist, Sample plant materials, Demonstration charts, Hand lenses, Microscope, Pests and diseased sample collection bags, Specimen

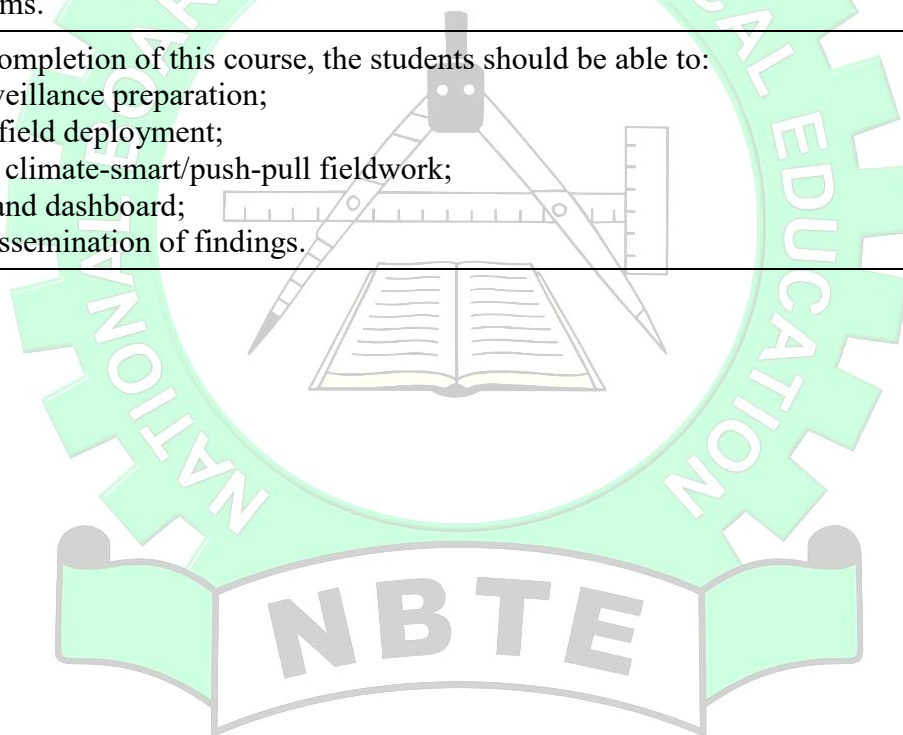
	sampling, testing, etc.). 4.5 Explain the role of phytosanitary certificates in trade regulation. 4.6 State the differences between inspection and quarantine. 4.7 Explain signs such as holes, mold, discoloration, and insect presence. 4.8 Explain its importance in food security, trade, and environmental protection. 4.9 Explain basic rules/regulations guiding phytosanitary inspection.	control. • Explain the differences quarantine detention and inspection approval • Discuss economic and environmental impacts • Explain national and international plant protection laws.		• Complete phytosanitary inspection records and report accurately. • Apply phytosanitary measures to prevent the spread of pests and diseases. • Evaluate inspection results and recommend appropriate phytosanitary actions.	during inspection. • Complete phytosanitary inspection record and reports accurately. • Apply phytosanitary measures to prevent the spread of pests and diseases. • Evaluate inspection results and recommend appropriate phytosanitary actions.	bottles, Inspection forms, Logbooks, Disinfectants, Waste disposal containers, PPEs, Sanitation materials Case studies, Inspection reports, Practical manual, etc.
GENERAL OBJECTIVE 5.0: Understand IPPC and international standards						
13-15	5.1 Define the role and objectives of the International Plant Protection Convention (IPPC). 5.2 Explain the	• Explain the purpose of IPPC in protecting plant resources and facilitating safe trade. • Discuss the	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart	• Identify key documents and guidelines of the International Plant Protection Convention (IPPC) and international	Guide students to: • Identify key documents and guidelines of the International Plant Protection Convention (IPPC)	IPPC manuals, Phytosanitary guidelines, Printed standards, projector ISPM

importance of international phytosanitary standards in agricultural trade. 5.3 Describe the major components of the International Standards for Phytosanitary Measures (ISPMs). 5.4 Describe the responsibilities of national plant protection Organisations in implementing IPPC standards. 5.5 Explain phytosanitary certification procedures and requirements for international trade. 5.6 Explain the role of quarantine measures in preventing the introduction and spread of pests. 5.7 Explain the consequences of non-compliance	significance of phytosanitary standards in preventing the spread of pests and diseases. • Explains key ISPMs and their applications in plant health management. • Explains the roles of national authorities in inspection, certification, and quarantine activities. • Discuss certification processes and documentation requirements for exporting and importing plant products. • Explain quarantine regulations and their importance using examples. • Discuss trade restrictions, pest outbreaks, and economic losses resulting from non-compliance. • Explain the	s, Marker board, Marker, Pictures, Board illustrations, IPPC handbook, , Charts, PowerPoint slides, instructional handouts ISPM documents, charts, projector Organisational charts, policy documents, textbooks Sample phytosanitary certificates, manuals, handouts Quarantine guidelines, Case studies, reports, Multimedia presentations, etc.	phytosanitary standards. • Interpret selected International Plant Protection Convention (IPPC) requirements and International Standards for Phytosanitary Measures (ISPMs) for agricultural trade. • Examine agricultural products and determine their compliance with phytosanitary requirements. • Complete phytosanitary certificates and related documentation correctly. • Apply international phytosanitary procedures during inspection and certification exercises. • Verify packaging,	and international phytosanitary standards. • Interpret selected International Plant Protection Convention (IPPC) requirements and International Standards for Phytosanitary Measures (ISPMs) for agricultural trade. • Examine agricultural products and determine their compliance with phytosanitary requirements. • Complete phytosanitary certificates and related documentation correctly. • Apply international phytosanitary procedures during inspection and certification exercises. • Verify packaging,	documents, Worksheets, Case studies, Plant products, Inspection checklist, Compliance forms, Sample phytosanitary certificates, Forms, Inspection kits, sample consignments, PPEs, Packaged agricultural products, Labels, Marking guides Inspection reports, Logbooks, Reporting templates Case studies, Compliance manuals, Standard operating procedures (SOPs),
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	with international phytosanitary standards. 5.8 State the benefits of applying IPPC and international standards in agriculture and trade.	advantages of compliance, including market access, plant health protection, and food security.		labeling, and treatment requirements according to international standards. - Record findings from phytosanitary inspections according to international standards. - Recommend corrective actions for non-compliant agricultural consignments.	labeling, and treatment requirements according to international standards. - Record findings from phytosanitary inspections according to international standards. - Recommend corrective actions for non-compliant agricultural consignments.	Practical manual, etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical 40% Examination: 40% Total: 100%						

FIELD PRACTICAL II

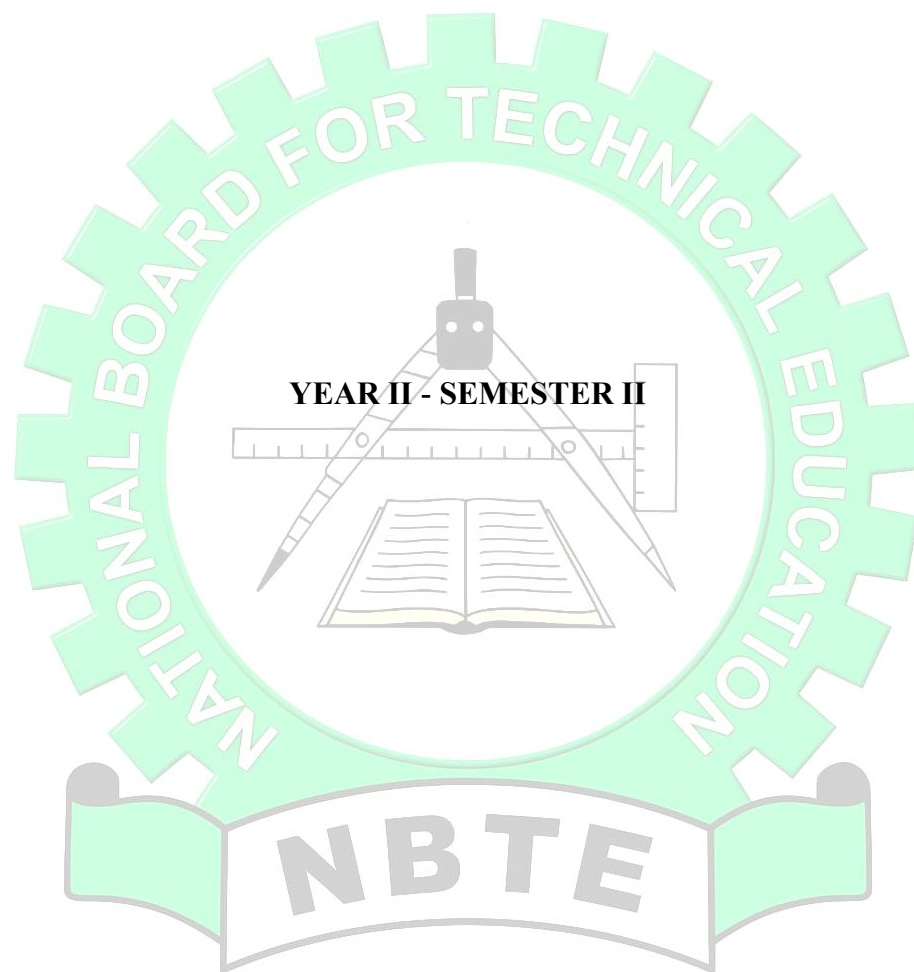
PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: FIELD PRACTICAL II	COURSE CODE: PMT 416	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 0 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 4 HOURS/WEEK
GOAL: This course is designed to equip students with hands-on skills to integrate digital pest surveillance and climate-smart / push-pull Pest Management in real cropping systems.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand digital pest surveillance preparation; 2.0 Know digital pest scouting field deployment; 3.0 Apply agroclimatology and climate-smart/push-pull fieldwork; 4.0 Comprehend data analysis and dashboard; 5.0 Appreciate reporting and dissemination of findings.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: FIELD PRACTICAL II			COURSE CODE: PMT 417		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 0 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 4 HOURS/WEEK	
COURSE SPECIFICATION: PRACTICAL						
GOAL: This course is designed to equip students with hands-on skills to integrate digital pest surveillance and climate-smart / push-pull Pest Management in real cropping systems.						
GENERAL OBJECTIVE 1.0: Understand digital pest surveillance preparation						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3				- Plan digital pest surveillance before field visit (target crops, scouts, channels). - Download Sentinel / Landsat for 1 area. - Calibrate AI, ID apps, GPS apps, Sensors, and Kobo/ODK forms. - Prepare drone/camera equipment. - Use drone and camera equipment.	Guide students to: - Plan digital pest surveillance before field visit (target crops, scouts, channels). - Download Sentinel / Landsat for 1 area. - Calibrate AI, ID apps, GPS apps, Sensors, and Kobo/ODK forms. - Prepare drone/camera equipment. - Use drone and camera equipment.	Field crops, Internet, Laptop, Smartphones, AI apps, Drone, GPS apps, Cameras, Practical Manual, etc.
GENERAL OBJECTIVE 2.0: Know digital pest scouting field deployment						
4-7				Conduct GPS-tagged	Guide students to:	Field crops,

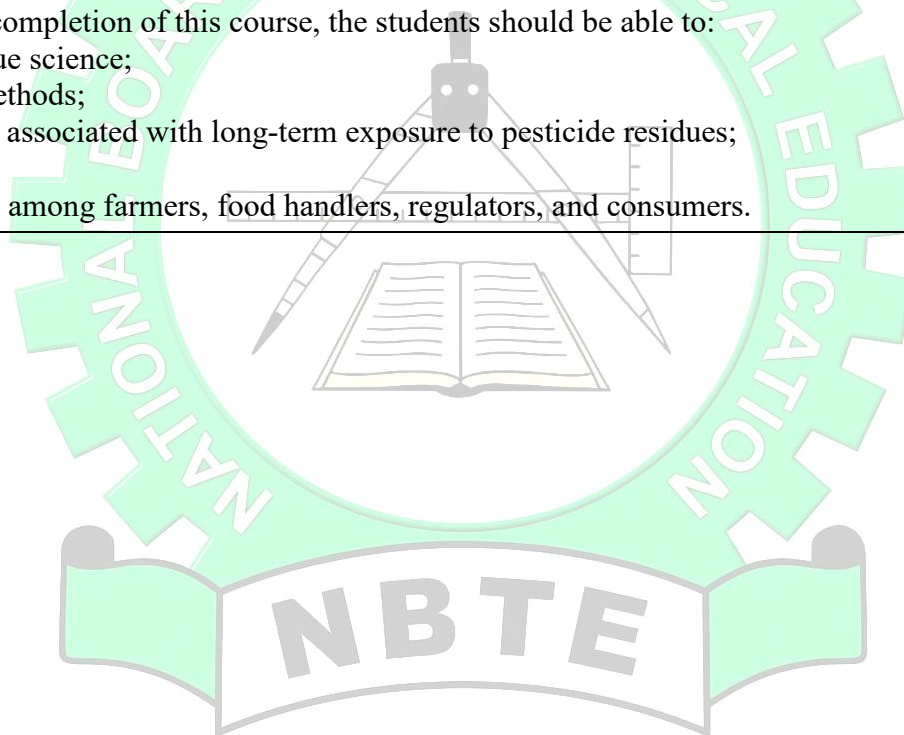
			scouting on 3 crops with AI, ID apps. • Set 10 pheromone/sticky traps with digital counters. • Conduct drone flight and pest detection (NDVI). • Build pest-occurrence map (GIS).	• Conduct GPS-tagged scouting on 3 crops with AI, ID apps. • Set 10 pheromone/sticky traps with digital counters. • Conduct drone flight and pest detection (NDVI). • Build pest-occurrence map (GIS).	Internet, Smartphones, traps, Drone, GIS app, NIMET weather data, Pest data, Practical Manual, etc.
GENERAL OBJECTIVE 3.0: Apply Agroclimatology and Climate Smart/Smart/Push-Pull Fieldwork					
8-11			• Integrate drone and satellite RS on fields. • Conduct drone flight and pest detection (NDVI). • Compute NDVI time series. • Integrate NIMET weather and pest data. • Establish climate-smart/push-pull demo plot. • Implement 3 climate-smart practices (mulching, staking, pruning etc.) • Monitor pest impact on demo plot.	Guide students to: • Integrate drone and satellite RS on fields. • Conduct drone flight and pest detection (NDVI). • Compute NDVI time series. • Integrate NIMET weather and pest data. • Establish climate-smart/push-pull demo plot. • Implement 3 climate-smart practices (mulching, staking, pruning etc.) • Monitor pest impact on demo plot.	Climate smart/push-pull plot, Inputs, Field crops, mulch materials, Scissors, poles/ropes PCs, Internet, Smartphones, Traps, Drone, GIS app, NIMET weather data, Practical Manual, etc.
GENERAL OBJECTIVE 4.0: Comprehend data analysis and dashboard					

12-13			• Integrate NIMET weather and pest data. • Analyse pest-population data. • Build pest-surveillance dashboard. • Map pest occurrence in the field using GIS app. • Compute IPM impact indicators.	Guide students to: • Integrate NIMET weather and pest data. • Analyse pest-population data. • Build pest-surveillance dashboard. • Map pest occurrence in the field using GIS app. • Compute IPM impact indicators.	Computer, Internet, Smartphones, Traps, Drone, GIS app, NIMET Weather data, Practical Manual, etc.
GENERAL OBJECTIVE 5.0: Appreciate reporting and dissemination					
14-15			• Write a technical report of at least 20 pages. • Prepare a 10-slide PowerPoint presentation. • Present the practical report to panel. • Submit corrected report.	Guide students to: • Write a technical report of at least 20 pages. • Prepare a 10-slide PowerPoint presentation. • Present the practical report to panel. • Submit corrected report.	Computer, Internet, Report and presentation templates, Projector, Panel, Practical Manual, etc.
COURSE ASSESSMENT Course Assessment (Practical Based):10% Practical: 50% Examination (Practical Based): 40% Total: 100%					



PESTICIDE RESIDUE AND FOOD SAFETY

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: PESTICIDE RESIDUE AND FOOD SAFETY	COURSE CODE: PMT 421	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
Goal: This course is designed to equip students with knowledge and skills in pesticide residue science to protect human health, ensuring safe food supply, and complying with regulatory standards.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand pesticide-residue science; 2.0 Know residue analytical methods; 3.0 Understand the health risks associated with long-term exposure to pesticide residues; 4.0 Comprehend food safety; 5.0 Know food safety practices among farmers, food handlers, regulators, and consumers.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: PESTICIDE RESIDUE AND FOOD SAFETY			COURSE CODE: PMT 421		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
Goal: This course is designed to equip students with knowledge and skills in pesticide residue science to protect human health, ensuring safe food supply, and complying with regulatory standards.						
GENERAL OBJECTIVE 1.0: Know pesticide-residue science						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define pesticide residue and explain how it occurs in food and the environment. 1.2 Describe pathways through which pesticides contaminate food, soil, and water. 1.3 Enumerate major types of pesticides (insecticides, herbicides, fungicides).	- Explain pesticide residue using familiar examples of farm produce - Explains contamination routes using diagrams and guided discussion. - Explains different pesticide classes with examples and compares their uses. - Discuss factors such as dosage, timing, environmental	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Agricultural science textbooks, Case study	- Identify common food samples that may contain pesticide residues (e.g., fruits and vegetables). - Demonstrate basic sample preparation techniques for residue analysis. - Carry out	Guide students to: - Identify common food samples that may contain pesticide residues (e.g., fruits and vegetables). - Demonstrate basic sample preparation techniques for residue analysis. - Carry out simple pesticide residue detection tests using available test kits or reagents.	Fresh fruits and vegetables, Sample trays, Food samples, knives, Cutting boards, Blender/homogenizer, Sample containers, Pesticide residue test kits, Reagents, droppers,

	1.4 Explain factors affecting pesticide residue levels in food. 1.5 Explain the concept of Maximum Residue Limits (MRLs) and their importance. 1.6 Explain health risks associated with pesticide residues in food. 1.7 Outline regulatory bodies responsible for pesticide control and monitoring. 1.8 Explain processes of pesticide degradation (photodegradation, hydrolysis, microbial breakdown, etc.).	conditions, and agricultural practices. • Discuss MRLs and relates them to food safety regulations using real-world examples. • Discuss short-term and long-term health effects and encourage students participation. • Discuss roles of national and international agencies in pesticide regulation. • Explain chemical breakdown processes in the environment using diagrams	handouts, WHO/FAO guidelines documents, Regulatory charts, Health and safety videos, case study reports Handouts on regulatory agencies, slides, internet resources Chemistry diagrams, environmental, etc.	simple pesticide residue detection tests using available test kits or reagents. • Carry out recording and interpreting observations from pesticide residue tests. • Apply safety precautions in handling chemicals and contaminated samples. • Test pesticide residue levels in different food samples • Demonstrate proper disposal of chemical waste and contaminated materials. • Present results and	• Carry out recording and interpreting observations from pesticide residue tests. • Apply safety precautions in handling chemicals and contaminated samples. • Test pesticide residue levels in different food samples • Demonstrate proper disposal of chemical waste and contaminated materials. • Present results and findings from practical pesticide residue analysis.	Observation sheets, Charts PPEs, Multiple food samples, Data tables, Waste disposal bins, labeled containers, Safety guidelines, Practical manua.
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				findings from practical pesticide residue analysis.		
GENERAL OBJECTIVE 2.0: Know residue analytical methods						
4-6	2.1 Explain the concept and importance of pesticide residue analysis in food safety. 2.2 Describe the principles of common residue analytical methods. 2.3 Explain different analytical techniques used for pesticide residue detection. 2.4 Explain sample collection, preparation, and extraction procedures for residue analysis. 2.5 Describe quality assurance and quality control (QA/QC) measures in residue analysis. 2.6 Explain safety	• Discuss residue analysis and its role in ensuring food safety and regulatory compliance. • Discuss health implications of pesticide residues. • Explain the theoretical principles of methods such as chromatography, spectroscopy, and immunoassays. Use diagrams and illustrations to demonstrate how the techniques work. • Explain various analytical techniques including GC, HPLC, LC-MS/MS, and GC-MS. Compare their applications, advantages, and limitations.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures Charts, PowerPoint slides, analytical method diagrams, textbooks on food analysis. Method manuals, Videos, Multimedia projector, Sample preparation	• Collect representative food samples for pesticide residue analysis following standard procedures. • Prepare food samples for residue analysis using standard laboratory procedures. • Perform extraction and cleanup procedures for pesticide residues. • Prepare calibration standards and reagent solutions for analysis.	Guide students to: • Collect representative food samples for pesticide residue analysis following standard procedures. • Prepare food samples for residue analysis using standard laboratory procedures. • Perform extraction and cleanup procedures for pesticide residues. • Prepare calibration standards and reagent solutions for analysis. • Analyze prepared samples using appropriate residue analytical methods. • Carry out recording, calculation, and interpretation of analytical results. • Apply quality assurance and quality control procedures during analysis.	Food samples (fruits, vegetables, grains), Sampling containers, Labels, Sampling guidelines. Weighing balance, Blender/homogenizer, Extraction solvents, SOP manuals, Chromatography systems (GC, HPLC), , Centrifuge, Vortex mixer, Extraction kits, Tubes, Filtration equipment, PPEs,

	precautions and ethical considerations in residue analysis. 2.7 Explain the applications of residue analytical methods in food safety monitoring.	• Discuss the importance of representative sampling and sample preparation. Explain extraction and cleanup procedures used before analysis. • Discuss calibration, validation, use of standards, blanks, recovery studies, and proficiency testing. Illustrate how QA/QC ensures reliable results. • Explain how analytical results are reported and compared with Maximum Residue Limits (MRLs). Provide examples for interpretation exercises. • Discuss laboratory safety rules, proper handling of chemicals, waste disposal, and professional ethics in reporting results. • Explain residue	flowcharts, laboratory manuals, standard operating procedures (SOPs), etc.	• Analyze prepared samples using appropriate residue analytical methods. • Carry out recording, calculation, and interpretation of analytical results. • Apply quality assurance and quality control procedures during analysis. • Observe laboratory safety procedures while conducting residue analysis. • Prepare a laboratory report on pesticide residue analysis.	• Observe laboratory safety procedures while conducting residue analysis. • Prepare a laboratory report on pesticide residue analysis.	Reference standards, Volumetric flasks, Laboratory reagents. GC, HPLC, LC-MS/MS, Computer with analytical software, sample extracts, Practical manual, etc.
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		monitoring programmes, regulatory inspections, and research applications with examples				
GENERAL OBJECTIVE 3.0: Understand the health risks associated with long-term exposure to pesticide residues.						
7-9	3.1 Define pesticide residues 3.2 Explain pesticide residues sources in food and the environment. 3.3 Describe the concept of long-term (chronic) exposure to pesticide residues. 3.4 Explain the health effects associated with prolonged exposure to pesticide residues. 3.5 Explain factors that influence health risks from pesticide residues. 3.6 Describe the principles of dietary exposure assessment. 3.7 Explain	• Explain the concept of pesticide residues and discuss how they enter the food chain and environment. • Discuss the difference between acute and chronic exposure and provide examples of long-term exposure scenarios. • Discuss information on potential health effects such as cancer, endocrine disruption, reproductive disorders, neurological effects, and immune system impairment. • Explain how toxicity, exposure duration, consumption patterns,	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, etc.	• Organise data on pesticide residue levels from laboratory reports • Collect data on pesticide residue levels from laboratory reports • Monitor databases. • Identify pesticide residues of concern and their potential health effects. • Calculate estimated daily intake (EDI) of pesticide residues using	Guide students to: • Organise data on pesticide residue levels from laboratory reports • Collect data on pesticide residue levels from laboratory reports • Monitor databases. • Identify pesticide residues of concern and their potential health effects. • Calculate estimated daily intake (EDI) of pesticide residues using food consumption and residue data. • Compare exposure estimates with acceptable daily intake (ADI) values. • Assess potential long-term health risks associated with pesticide exposure.	Residue monitoring datasets, computers, Worksheets Toxicology reference materials, safety data sheets (SDS), scientific publications, and regulatory guidelines, Calculators, Food consumption tables, Residue concentration data sheets. ADI reference tables, Risk assessment

	toxicological reference values used in risk assessment. 3.8 Describe the process of health risk assessment for pesticide residues. 3.9 Explain strategies for reducing health risks associated with pesticide residues. 3.10 Describe the role of regulatory agencies in monitoring and managing pesticide-related health risks.	age, body weight, and individual susceptibility affect health risks. • Explain how residue levels and food consumption data are used to estimate dietary exposure. • Discuss concepts such as Acceptable Daily Intake (ADI), Acute Reference Dose (ARfD), and No Observed Adverse Effect Level (NOAEL). • Explain the steps of hazard identification, hazard characterization, exposure assessment, and risk characterization. • Discuss the purpose of MRLs and their role in food safety regulation and risk management. • Discuss good agricultural practices, integrated Pest Management, proper		food consumption and residue data. • Compare exposure estimates with acceptable daily intake (ADI) values. • Assess potential long-term health risks associated with pesticide exposure. • Interpret risk assessment results and draw conclusions on consumer safety. • Prepare a risk assessment summary report based on analyzed data. • Present risk assessment findings with peers. • Recommend	• Interpret risk assessment results and draw conclusions on consumer safety. • Prepare a risk assessment summary report based on analyzed data. • Present risk assessment findings with peers. • Recommend measures to reduce long-term exposure to pesticide residues. • Interpret the significance of Maximum Residue Limits (MRLs) in protecting public health.	guidelines, Case studies, Risk assessment manuals, Toxicological databases, Sample risk assessment reports, MRL and ADI references, Discussion guides. Report templates, Flip charts, Food safety guidelines, Pesticide management manuals, Risk communication guides, Regulatory communication frameworks, Practical manual, etc.
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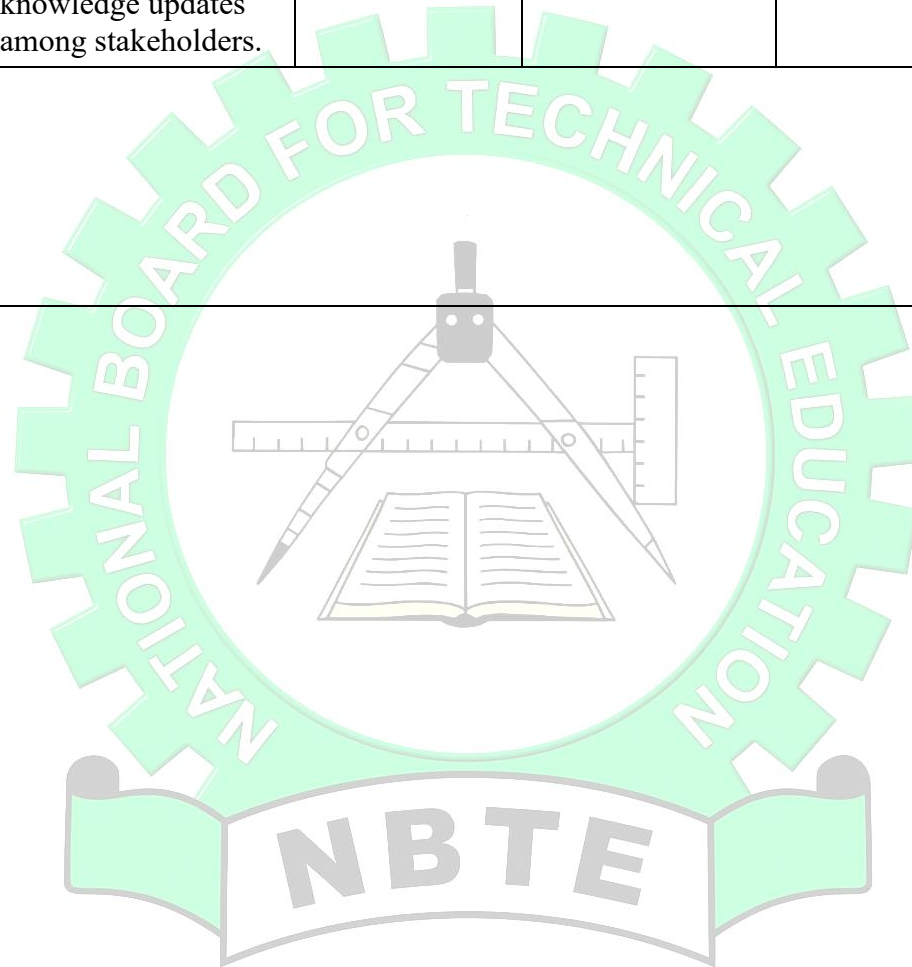
		pesticide use, and consumer food-handling practices. • Discuss the responsibilities of national and international food safety authorities in risk assessment and consumer protection.		measures to reduce long-term exposure to pesticide residues. • Interpret the significance of Maximum Residue Limits (MRLs) in protecting public health.		
GENERAL OBJECTIVE 4.0: Comprehend food safety.						
10-12	4.1 Define food safety 4.2 Explain food safety importance in protecting public health. 4.3 Describe the principles of food safety throughout the food supply chain. 4.4 Explain biological, chemical, and physical food hazards. 4.5 Explain the	• Explain the concept of food safety and discuss its role in preventing foodborne illnesses and ensuring consumer protection. • Explain food safety practices from production to consumption, highlighting potential contamination points. • Discuss different types of food hazards and provide examples of each. Facilitate class discussions and question-and-answer	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures PowerPoint slides, food supply chain diagrams. Hazard identification charts,	• Demonstrate proper personal hygiene practices required in food handling. • Identify potential food safety hazards in a food preparation environment. • Apply safe food handling procedures during food preparation. • Practice correct	Guide students to; • Demonstrate proper personal hygiene practices required in food handling. • Identify potential food safety hazards in a food preparation environment. • Apply safe food handling procedures during food preparation. • Practice correct food storage techniques to prevent contamination and spoilage. • Monitor food storage and processing temperatures. • Apply cleaning and sanitation procedures in	Food preparation area, Checklist, Inspection forms, Food samples, PPEs, Food safety guidelines, Refrigerators, storage, Containers, Thermometers, Food labeling materials. Temperature log sheets,

	causes and consequences of food contamination. 4.6 Describe Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), and Good Hygiene Practices (GHP). 4.7 Explain the principles of Hazard Analysis and Critical Control Points (HACCP). 4.8 Describe food safety regulations and standards applicable to food production and handling. 4.9 Explain proper food handling, storage, and preservation methods. 4.10 Describe the role of personal hygiene in food	sessions. • Discuss common sources of contamination and their effects on food quality and human health. • Explain the principles and importance of GAP, GMP, and GHP in maintaining food safety. • Discuss the HACCP system, its principles, and its role in preventing food safety hazards. • Explain national and international food safety standards and their significance. • Discuss best practices for handling, storing, and preserving food to prevent contamination and spoilage. • Explain personal hygiene requirements for food handlers and demonstrate proper hygiene practices.	Food safety manuals, Safety reports. Regulatory guidelines, posters, etc.	food storage techniques to prevent contamination and spoilage. • Monitor food storage and processing temperatures. • Apply cleaning and sanitation procedures in food preparation and storage areas. • Conduct a basic food safety inspection using a checklist. • Implement Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP) in a practical setting. • Record food safety observations and corrective actions. • Apply basic	food preparation and storage areas. • Conduct a basic food safety inspection using a checklist. • Implement Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP) in a practical setting. • Record food safety observations and corrective actions. • Apply basic HACCP principles to identify and control food safety risks.	GMP/GHP manuals, Report templates, HACCP worksheets, Process flow diagrams, Practical manual, etc.
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	4.11	safety. Explain the importance of food safety monitoring and inspection.	Describe food safety monitoring systems, inspections, and corrective actions used to ensure compliance.		HACCP principles to identify and control food safety risks.		
GENERAL OBJECTIVE 5.0: Understand food safety practices among farmers, food handlers, regulators and consumers.							
13-15	5.1 5.2 5.3 5.4 5.5 5.6	Define food safety awareness. Explain food safety awareness importance in public health and food quality. Explain the key stakeholders involved in food safety and their responsibilities. Describe food safety practices applicable to farmers. Explain food safety requirements for food handlers and processors. Explain the role of regulatory authorities in food safety	- Explain the concept of food safety awareness and discuss its role in preventing foodborne illnesses and ensuring a safe food supply. - Discuss the roles of farmers, food handlers, regulators, processors, retailers, and consumers in maintaining food safety. - Discuss Good Agricultural Practices (GAP), safe pesticide use, proper harvesting, and post-harvest handling procedures. - Discuss the principles of personal hygiene, sanitation, contamination	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures Organisational charts, Food supply chain diagrams, presentation slides, GAP manuals, agricultural extension materials, posters, Videos, Multimedia presentations,	- Develop food safety awareness messages for different target groups (farmers, food handlers, regulators, and consumers). - Design educational materials promoting food safety practices. - Conduct a food safety awareness presentation. - Demonstrate safe food handling and hygiene practices to an audience. - Prepare food	Guide students to: - Develop food safety awareness messages for different target groups (farmers, food handlers, regulators, and consumers). - Design educational materials promoting food safety practices. - Conduct a food safety awareness presentation. - Demonstrate safe food handling and hygiene practices to an audience. - Prepare and distribute food safety information materials. - Organise a food safety awareness campaign or outreach activity. - Conduct interviews or surveys to assess food safety awareness levels.	Food safety manuals, Flip charts, Computers, Sample awareness materials. Graphic design software, Printers, Sample posters and brochures. Projector, Presentation slides, Public address system, Presentation guides, Educational handouts, Campaign plan templates, Banners, Posters,

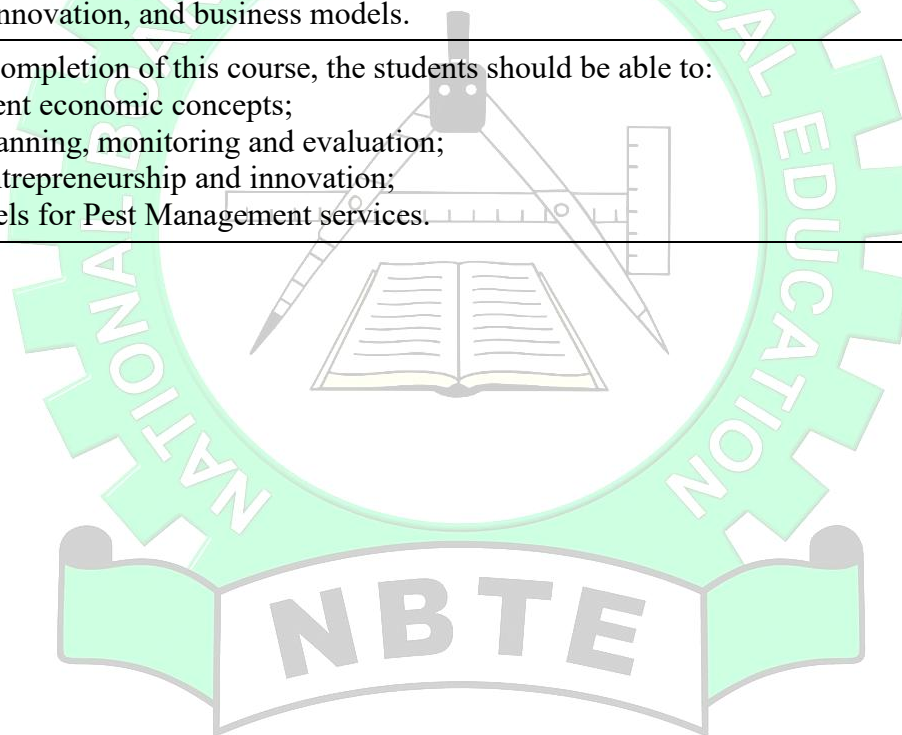
	management. 5.7 Describe the responsibilities of consumers in ensuring food safety. 5.8 Explain effective methods of communicating food safety information. 5.9 State the consequences of poor food safety practices on health, trade, and the economy. 5.10 Explain strategies for promoting food safety awareness among different target groups. 5.11 Describe the importance of continuous education and training in food safety.	prevention, and safe food handling. • Explain food safety laws, inspections, monitoring systems, and enforcement activities carried out by regulatory agencies. • Discuss safe food purchasing, storage, preparation, and consumption practices. • Explain communication tools such as training, workshops, media campaigns, posters, and community outreach programmes. • Discuss case studies of foodborne disease outbreaks and their impacts using examples • Discuss educational programmes, stakeholder engagement, and public awareness initiatives.	Case studies, reports, documentaries, news articles, etc.	safety information materials. • Organise a food safety awareness campaign or outreach activity. • Conduct interviews or surveys to assess food safety awareness levels. • Analyze feedback from food safety awareness activities. • Demonstrate effective communication skills when educating stakeholders on food safety. • Present a report on food safety awareness activities and outcomes.	• Analyze feedback from food safety awareness activities. • Demonstrate effective communication skills when educating stakeholders on food safety. • Present a report on food safety awareness activities and outcomes.	Educational materials, Stationery, Questionnaires, Interview guides, clipboards, pens, mobile data collection tools, Practical manual, etc.
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		• Discuss the need for ongoing capacity building and knowledge updates among stakeholders.				
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical 40% Examination: 40% Total: 100%						



PEST MANAGEMENT ECONOMICS, ENTREPRENEURSHIP AND INNOVATION

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: PEST MANAGEMENT ECONOMICS, ENTREPRENEURSHIP AND INNOVATION	COURSE CODE: PMT 422	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOURS/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in Pest Management economic concepts, planning, monitoring and evaluation, entrepreneurship, innovation, and business models.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand Pest Management economic concepts; 2.0 Know Pest Management planning, monitoring and evaluation; 3.0 Apply Pest Management entrepreneurship and innovation; 4.0 Comprehend business models for Pest Management services.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: PEST MANAGEMENT ECONOMICS, ENTREPRENEURSHIP AND INNOVATION			COURSE CODE: PMT 422		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOURS/WEEK	
YEAR: II SEMESTER: II			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 Pest Management economic concepts, planning, monitoring and evaluation, entrepreneurship, innovation, and business models.						
GENERAL OBJECTIVE 1.0: Understand Pest Management economic concepts						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-4	1.1 Explain economic concepts in Pest Management. 1.2 Explain yield loss and economic returns. 1.3 Explain cost - benefit analysis (CBA) in Pest Management. 1.4 Describe willingness-to-pay (WTP) studies.	• Discuss economic concepts in Pest Management (economic threshold, economic injury level, etc). • Discuss yield loss and economic returns. • Discuss cost-benefit analysis (CBA) in Pest Management. • Describe willingness-to-pay (WTP) studies.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Board illustrations, PM economics texts, Magnetics s, etc. erasers	• Establish crop (vegetable) demo field for practice • Compute ET / EIL for 3 pests • Compute yield loss and returns • Analyse CBA • Carry out WTP study	Guide students to: • Establish crop (vegetable) demo field for practice • Compute ET / EIL for 3 pests • Compute yield loss and returns • Analyse CBA • Carry out WTP study	Crop demo field data, Computer, Projector, Excel templates, Practical manual, etc.
GENERAL OBJECTIVE 2.0: Know Pest Management planning, monitoring and evaluation						

5-8	2.1 Define Pest Management planning. 2.2 Explain log frame/theory of change. 2.3 Explain budgeting and resource allocation. 2.4 Describe Pest Management schedules/framework/work plan. 2.5 Discuss data collection, analysis and report.	• Discuss Pest Management planning • Discuss log frame/theory of change • Explain budgeting/resource allocation • Explain how to build PM schedules/framework/work plan • Explain data collection, analysis and report	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Board illustrations, Magnetics, etc.	• Build Pest Management plan • Develop a log frame • Derive PM budget • Illustrate Pest Management schedules/framework/work plan • Demonstrate data collection tools, analysis and report	Guide students to: • Build Pest Management plan • Develop a log frame • Derive PM budget • Illustrate Pest Management schedules/framework/work plan • Demonstrate data collection tools, analysis and report	Computer, Internet, Smartphones Kobo collect apps, Log frame templates, Budget templates, Schedules/framework/work plan templates, Report templates, Projector, Practical manual, etc.
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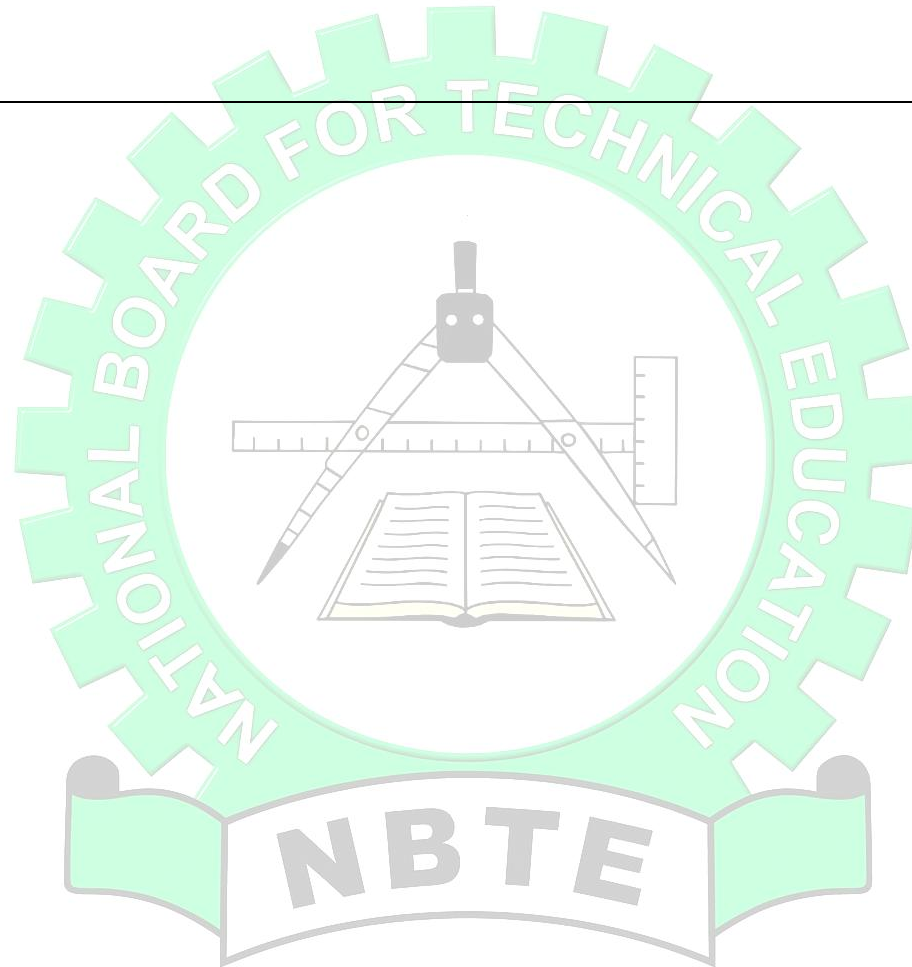
GENERAL OBJECTIVE 3.0: Apply Pest Management entrepreneurship and innovation

8-12	3.1 Explain the concepts of entrepreneurship and innovation 3.2 Explain the qualities of an entrepreneur and innovator. 3.3 Outline business opportunities in PMT 3.4 Explain PM Product development	• Describe the concepts of entrepreneurship and innovation • Describe qualities of an entrepreneur and innovator. • Outline business opportunities in PMT • Explain PM Product development (sourcing, processing, packaging/labeling, marketing, etc.) • Explain the steps in	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Board illustrations, Magnetics, etc.	• Build PM schedule/framework/work plan, M&E for consultancy services • Build PM microencapsulation • Develop PM Products (grasshoppers, rodents, worms, bio-pesticides, etc.) • Write business plan or proposal • Carry out step-by-	Guide students to: • Build PM schedule/framework/work plan, M&E for consultancy services • Build PM microencapsulation • Develop PM Products (grasshoppers, rodents, worms, bio-pesticides, etc.) • Write business plan or proposal • Carry out step-by-step	Computer, Internet, Smartphones, Schedules/framework/work plan, M&E templates, Business plan/proposal templates, Business plan/company registration
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	(sourcing, processing, packaging/labeling, marketing, etc.) 3.5 List steps in business plan/proposal writing. 3.6 Enumerate guidelines for Business/company registration.	business plan/proposal writing. • Enumerate guidelines for Business/company registration.	etc.	step business/company registration	business/company registration	templates, Traps for pests, Sprayers, PPEs, Fumigation equipment, Practical manual, etc.
GENERAL OBJECTIVE 4.0: Comprehend business models for Pest Management services						
13-15	4.1 Define pest control business models. 4.2 Describe bio-pesticides/agro-input enterprises. 4.3 Explain the application of drone- service models (spraying and data) 4.4 Explain the application of pest advisory subscription models	• Explain pest control business models. • State bio-pesticides/agro-input enterprises. • Explain the application of drone- service models (spraying and data) • Explain the application of pest advisory subscription models	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Board illustrations, Magnetics s, etc.	• Develop pest control business model • Plan biopesticide/ agro-input services • Apply drone- service models (spraying and data) • Design pest advisory subscription model	Guide students to: • Develop pest control business model • Plan biopesticide/ agro-input services • Apply drone- service models (spraying and data) • Design pest advisory subscription model	Business model templates, Agro-inputs, Traps for pests, Sprayers, PPEs, Fumigation equipment, Drone, Practical manual, etc.

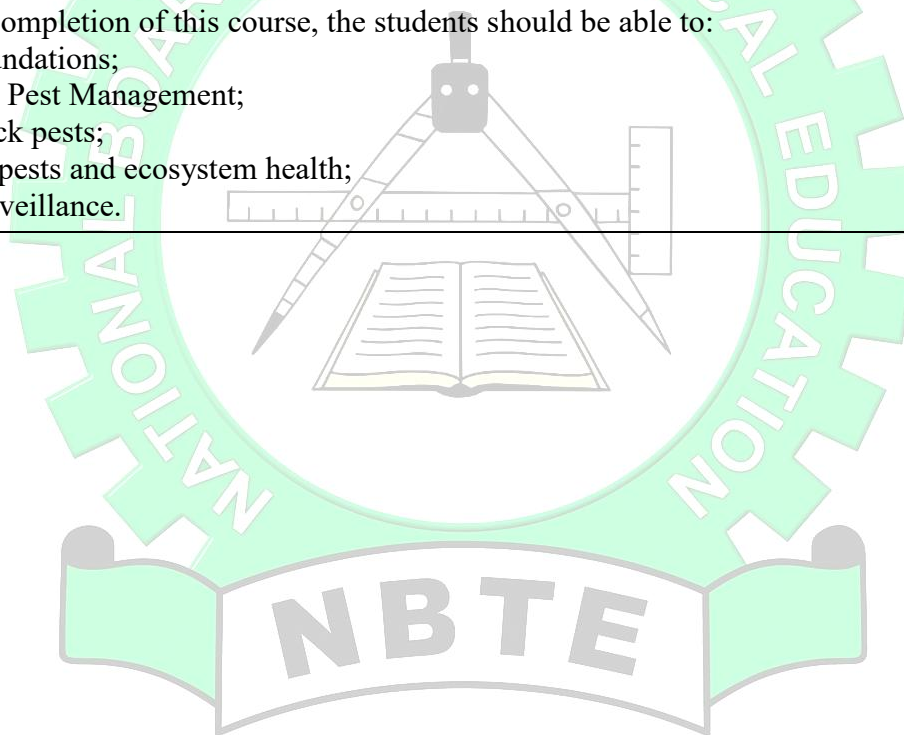
COURSE ASSESSMENT:

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



ONE HEALTH: HUMAN, ANIMAL AND ENVIRONMENTAL PESTS

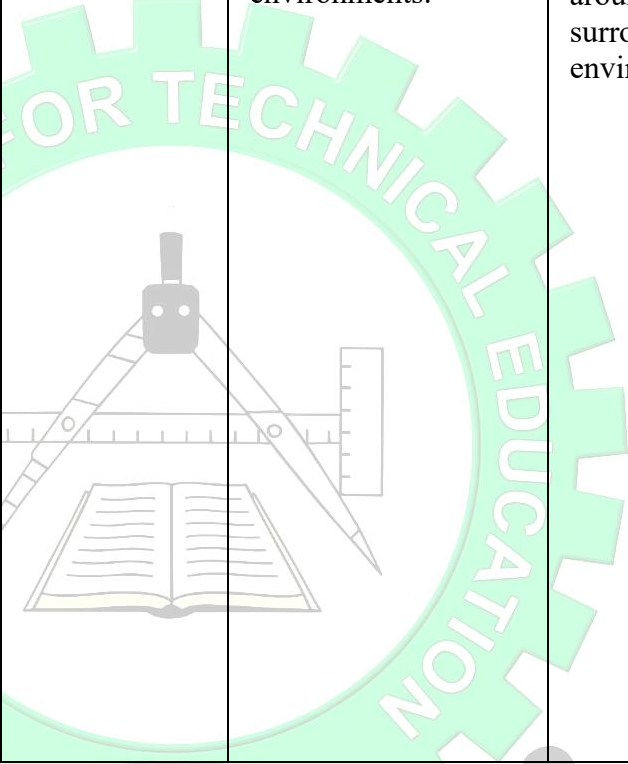
PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: ONE HEALTH: HUMAN, ANIMAL AND ENVIRONMENTAL PESTS	COURSE CODE: PMT 423	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills of One Health framework integrating human, animal and environmental health addressing the interconnected nature of pests across ecosystems.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand One Health foundations; 2.0 Know vector-borne disease Pest Management; 3.0 Know zoonotic and livestock pests; 4.0 Understand environmental pests and ecosystem health; 5.0 Understand One Health surveillance.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: ONE HEALTH: HUMAN, ANIMAL AND ENVIRONMENTAL PESTS			COURSE CODE: PMT 423		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			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 One Health framework integrating human, animal and environmental pest health - addressing the interconnected nature of pests across ecosystems.						
GENERAL OBJECTIVE 1.0: Understand One Health foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define One Health. 1.2 Explain the concept of One Health. 1.3 Explain the importance of One Health in sustainable Pest Management. 1.4 Explain the relationship between human, animal and environmental health. 1.5 State the interconnections among humans, livestock, wildlife, pests, vectors and	• Explain One Health. • Explain the concept of One Health and its importance in sustainable Pest Management • Discuss the relationship between human, animal and environmental health. • State the interconnections among humans,	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Board illustrations, etc.	• Prepare integrated Pest Management recommendations that protect human, animal and environmental health. • Assess pest and vector risks around livestock farms and surrounding communities. • Develop One Health Pest Management plan • Observe pest–host–environment	Guide students to • Organise field visits to observe relationships among pests, livestock, humans and environmental conditions. • Prepare integrated Pest Management recommendations that protect human, animal and environmental health. • Assess pest and vector risks around	One Health frameworks, Assessment template, Practical manual, etc.

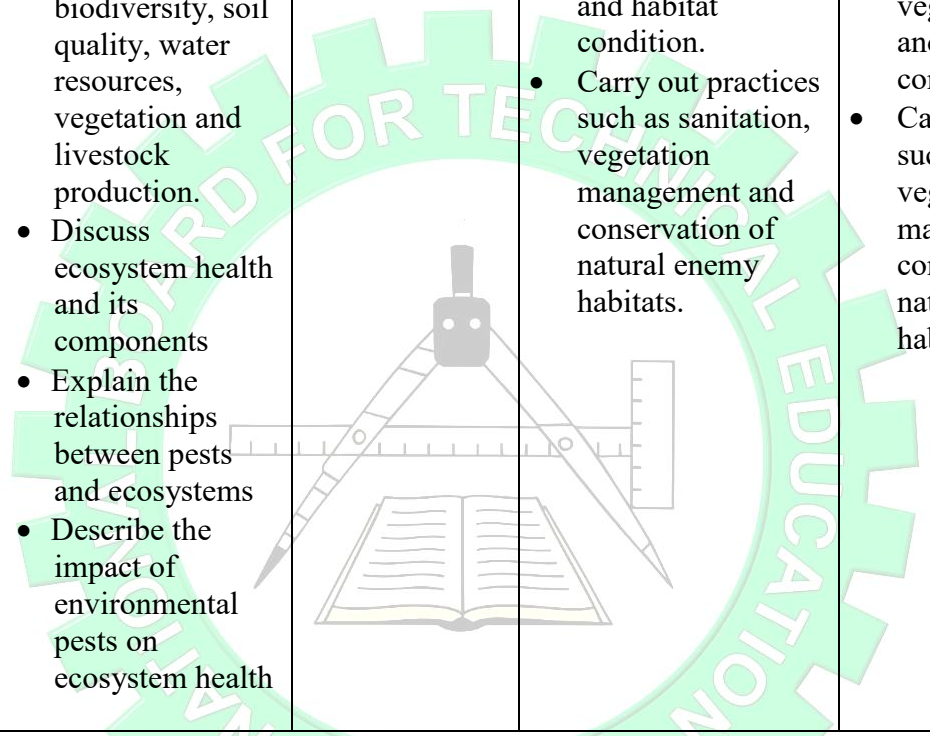
	the environment. 1.6 Describe the role of pests and vectors in disease transmission 1.7 Explain One Health approach to pest and vector management. 1.8 Describe common zoonotic diseases and their transmission pathways. 1.9 Describe Zoonotic diseases associated with pests and vectors 1.10 Explain multidisciplinary approaches involving agriculture, veterinary, public health and environmental sectors in Pest Management.	livestock, wildlife, pests, vectors and the environment. • Discuss the role of pests and vectors in disease transmission. • Explain One Health approach to pest and vector management. • Describe common zoonotic diseases and their transmission pathways. • State Zoonotic diseases associated with pests and vectors • Explain multidisciplinary approaches involving agriculture, veterinary, public health and environmental sectors in Pest Management.		interactions • Interpret real-life outbreak scenarios using the One Health framework. • Analyse Case study of zoonotic disease outbreaks	livestock farms and surrounding communities. • Develop One Health Pest Management plan • Observe pest–host–environment interactions • Interpret real-life outbreak scenarios using the One Health framework. • Analyse Case study of zoonotic disease outbreaks	
GENERAL OBJECTIVE 2.0: Know vector-borne disease Pest Management						
4-6	2.1 State major vectors	• Explain major	Textbooks,	• Identify common	Guide students to:	Vector

such as ticks, mosquitoes, tsetse flies, sand flies, fleas, mites, etc. 2.2 Outline major vectors of importance to public health. 2.3 Explain important diseases such as: - Trypanosomiasis; - Babesiosis; - Anaplasmosis; - Theileriosis; - Rift Valley fever. 2.4 Explain major vector-borne diseases of livestock. 2.5 Describe disease transmission mechanisms. 2.6 Explain the life cycles, habitats, feeding behaviour and population dynamics of vectors. 2.7 Explain how pathogens are transmitted between vectors, animals and humans using diagrams and case studies.	vectors such as ticks, mosquitoes, tsetse flies, sand flies, fleas, mites, etc. • Discuss major vectors of importance to public health • Discuss important diseases such as: Trypanosomiasis, Babesiosis, Anaplasmosis, Theileriosis Rift Valley fever. • Explain major vector-borne diseases of livestock • Discuss disease transmission mechanisms • Explain the life cycles, habitats, feeding behaviour and population dynamics of vectors. • Illustrate how pathogens are transmitted between vectors,	Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Board illustrations, etc.	vectors such as: Anopheles species, Tsetse species, Simulium species, etc. • Demonstrate the identification of eggs, larvae, nymphs, pupae and adults where applicable. • Carry out surveillance of vector breeding sites • Use vector collection techniques • Demonstrate vector control methods. • Demonstrate the use of traps, sweep nets, aspirators and other collection methods. • Assess factors that favor vector proliferation and disease transmission. • Demonstrate cultural, biological, mechanical and chemical control techniques. • Write technical report on a visit to locate	• Identify common vectors such as: ✓ Anopheles species, ✓ Tsetse species, ✓ Simulium species, etc. • Demonstrate the identification of eggs, larvae, nymphs, pupae and adults where applicable. • Carry out surveillance of vector breeding sites • Use vector collection techniques • Demonstrate vector control methods • Demonstrate the use of traps, sweep nets, aspirators and other collection methods. • Assess factors that favor vector proliferation and disease transmission. • Demonstrate cultural, biological, mechanical and chemical control techniques.	specimens, Microscopes, Slides, Photographs, Sampling kits Farm Sprayers, Practical manual, etc.
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	2.8 Explain the effects of vector-borne diseases on livestock productivity, food security and human health. 2.9 Explain the components of vector surveillance, prevention and control within an integrated management framework. 2.10 Explain principles of Integrated Vector Management (IVM).	animals and humans using diagrams and case studies. • Explain the effects of vector-borne diseases on livestock productivity, food security and human health. • Explain the components of vector surveillance, prevention and control within an integrated management framework. • Explain Principles of Integrated Vector Management (IVM)		and assess breeding habitats around farms and surrounding environments. • Lead students in locating and assessing breeding habitats around farms and surrounding environments.	
GENERAL OBJECTIVE 3.0: Understand zoonotic and livestock pests					
7-9	3.1 Describe major groups of pests according to family (e.g. arthropods, rodents, arachnids, insects, etc.) and whether they are	• Discuss major groups of pests according to family (e.g. arthropods, rodents, arachnids, insects) and whether they are	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart	• Assess livestock housing and surrounding environments for pest presence. • Demonstrate methods	Guide students to: • Assess livestock housing and surrounding environments for pest presence. • Demonstrate methods Livestock parasite specimens, Traps Sprayer, Practical manual, etc.

	ectoparasites (ticks, mites, flies) or endoparasites (worms).	ectoparasites (ticks, mites, flies) or endoparasites (worms)	s, Marker board, Marker, Pictures, Board illustrations, etc.	for evaluating pest infestation and associated risks.	for evaluating pest infestation and associated risks.	
3.2	Explain common zoonotic pests such.	• Discuss common zoonotic pests such as mosquitoes, ticks, fleas, mites, rodents and tsetse flies.		• Demonstrate sanitation, habitat management, trapping and safe pesticide application techniques.	• Demonstrate sanitation, habitat management, trapping and safe pesticide application techniques.	
3.3	Explain the biology and economic importance of ticks, lice, mites, biting flies, fleas and other livestock pests.	• Explain the biology and economic importance of ticks, lice, mites, biting flies, fleas and other livestock pests.		• Evaluate farm hygiene, waste disposal and pest exclusion practices.	• Evaluate farm hygiene, waste disposal and pest exclusion practices.	
3.4	Explain how pests transmit pathogens between animals and humans.	• Discuss how pests transmit pathogens between animals and humans		• Prepare simple integrated Pest Management plans based on field observations.	• Prepare simple integrated Pest Management plans based on field observations.	
3.5	Explain the impacts of pests on livestock production, food security and public health.	• Discuss the impacts of pests on livestock production, food security and public health.				
3.6	Explain integrated approaches involving animal, human and environmental health sectors.	• Discuss integrated approaches involving animal, human and environmental health sectors				
3.7	Explain the classification of zoonotic and livestock pests.					
3.8	Explain One Health approach to					

	management of zoonotic pests	• Discuss the classification of zoonotic and livestock pests. • Describe One Health approach to management of zoonotic pests				
GENERAL OBJECTIVE 4.0: Understand environmental pests and ecosystem health						
10-12	4.1 Describe common environmental pests such as: - Rodents; - Invasive insects; - Nuisance birds; - Termites - Snails and other pest organisms. 4.2 Explain the concept of ecosystem health, including biodiversity, ecological balance and ecosystem services. 4.3 Explain interactions between pests, hosts, predators, parasites and the environment 4.4 Explain the effects of pest outbreaks on biodiversity, soil	• Discuss common environmental pests such as: ✓ Rodents; ✓ Invasive insects; ✓ Nuisance birds; ✓ Termites ✓ Snails and other, • Explain the concept of ecosystem health, including biodiversity, ecological balance and ecosystem services. • Discuss interactions between pests, hosts, predators, parasites and the environment	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Board illustrations, etc.	• Identify pests and beneficial species using field observations, specimens and pictorial guides. • Observe vegetation, soil conditions, water sources and biodiversity within selected sites. • Conduct simple counts of plant and animal species within a study area. • Identify signs of pest damage on plants, soil and surrounding habitats. • Evaluate indicators such as	Guide students to: • Identify pests and beneficial species using field observations, specimens and pictorial guides. • Observe vegetation, soil conditions, water sources and biodiversity within selected sites. • Conduct simple counts of plant and animal species within a study area. • Identify signs of pest damage on plants, soil and surrounding habitats. • Evaluate indicators	Environmental pest specimens, Assessment tools, Pictorials, Sprayers, Practical manual, etc.

	quality, water resources, vegetation and livestock production. 4.5 Explain ecosystem health and its components 4.6 Explain the relationships between pests and ecosystems 4.7 Describe the impact of environmental pests on ecosystem health	• Discuss the effects of pest outbreaks on biodiversity, soil quality, water resources, vegetation and livestock production. • Discuss ecosystem health and its components • Explain the relationships between pests and ecosystems • Describe the impact of environmental pests on ecosystem health		biodiversity, pest abundance, vegetation cover and habitat condition. • Carry out practices such as sanitation, vegetation management and conservation of natural enemy habitats.	such as biodiversity, pest abundance, vegetation cover and habitat condition. • Carry out practices such as sanitation, vegetation management and conservation of natural enemy habitats.	
GENERAL OBJECTIVE 5.0: Understand One Health surveillance						
13-15	5.1 Explain the concept, objectives, and importance of One Health Surveillance in pest and disease management. 5.2 Describe the human, animal,	• Explain the concept, objectives, and importance of One Health Surveillance in pest and disease management. • Describe the	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/chart s,	• Develop simple surveillance plans including objectives, locations, indicators, and schedules. • Carry out sampling, trapping, counting, and observation	Guide student to: • Develop simple surveillance plans including objectives, locations, indicators, and schedules. • Carry out sampling, trapping, counting,	Surveillance templates, Maps, Sampling kits, Traps, Practical manual, etc.

	environmental, and pest/vector surveillance components 5.3 Outline the methods for monitoring livestock pests, vectors, zoonotic diseases, and environmental conditions that influence pest and disease occurrence.	human, animal, environmental, and pest/vector surveillance components • Explain the methods for monitoring livestock pests, vectors, zoonotic diseases, and environmental conditions that influence pest and disease occurrence.	Marker board, Marker, Pictures, Board illustrations, etc.	techniques for pests and vectors. • Assess environmental conditions that favor pest proliferation and disease transmission. • Carry out simple methods of plotting surveillance data on maps or field sketches.	and observation techniques for pests and vectors. • Assess environmental conditions that favour pest proliferation and disease transmission. • Carry out simple methods of plotting surveillance data on maps or field sketches.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical 40% Examination: 40% Total: 100%						

Urban, Household and Public Health Pest Management

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: URBAN, HOUSEHOLD AND PUBLIC HEALTH PEST MANAGEMENT	COURSE CODE: PMT 424	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in urban and household pest identification, prevention, control, environmental sanitation, public health protection, and integrated Pest Management within urban and residential environments.		
GENERAL OBJECTIVES On completion of this course, the students should be able to: 1.0 Understand the concepts of urban, household, and public health Pest Management; 2.0 Know urban and household pests of public health importance; 3.0 Understand public health risks associated with urban and household pests; 4.0 Know urban and household pest monitoring, prevention strategies, and management; 5.0 Comprehend Integrated Vector Management (IVM).		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: URBAN, HOUSEHOLD, AND PUBLIC HEALTH PEST MANAGEMENT			COURSE CODE: PMT 424		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			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 urban and household pest identification, prevention, control, environmental sanitation, public health protection, and integrated Pest Management within urban and residential environments.						
GENERAL OBJECTIVE 1.0: Understand the concepts of urban, household, and public health Pest Management						
1-3	1.1 Discuss the concepts of urban, household and public health Pest Management. 1.2 Discuss the socio-economic importance and public health significance of urban and household pests. 1.3 Describe the relationship between pests, vectors, environment, and human health. 1.4 Describe the principles of	• Explain the concepts of urban, household and public health Pest Management. • State the socio-economic importance and public health significance of urban and household pests. • Explain the relationship between pests, vectors, environment, and human health. • Explain the principles of Integrated Pest Management (IPM) in urban and household	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Board illustrations, etc.	• Identify different urban and household pests • Categorize 5 types of urban and household pests (termites, rodents, flies, bacteria, fungi, Nematodes, etc.) • Use traps, pitfalls, bio-pesticides for urban and household pests • Identify different agrochemicals	Guide Students to: • Identify different urban and household pests • Categorize 5 types of urban and household pests (termites, rodents, flies, bacteria, fungi, Nematodes, etc.) • Use traps, pitfalls, bio-pesticides for urban and household pests • Identify different agrochemicals and their active ingredients for the control of urban and household pest	Scouting kits (sweep nets, traps, sample bottles etc.), Logbook, Smartphones, AI apps, Sensors, Lucid digital keys, PPEs, Sprayers, Demonstration plots, Practical manual etc.

	Integrated Pest Management (IPM) in urban and household environments.			and their active ingredients for the control of urban and household pest		
GENERAL OBJECTIVE 2.0: Know urban and household pests of public health importance						
4-6	2.1 Explain common urban and household pests of public health importance (rodents, cockroaches, mosquitoes, flies, bedbugs, termites, ants, fleas, ticks, mites etc.). 2.2 Describe the biology (life cycle, ecology, behaviour, etc.) of major urban and household pests. 2.3 Explain anatomy and morphology of urban and household pests. 2.4 Discuss feeding habits and mode of transmission urban and household pests.	- Explain common urban and household pests of public health importance (rodents, cockroaches, mosquitoes, flies, bedbugs, termites, ants, fleas, ticks, mites etc.). - Describe the biology (life cycle, ecology, behaviour, etc.) of major urban and household pests. - Discuss anatomy and morphology of urban and household pests. - Discuss feeding habits and mode of transmission urban and household pests.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Board illustrations, etc.	- Identify urban and household pests of public health importance using morphological keys and activities (droppings, feeding habits, body parts, etc.) - Group urban and household pests according to habitat, feeding behavior, and mode of transmission. - Categorize structural pests (powder post beetles, carpenter ants, termites etc.).	Guide students to: - Identify urban and household pests of public health importance using morphological keys and activities (droppings, feeding habits, body parts, etc.) - Group urban and household pests according to habitat, feeding behavior, and mode of transmission. - Categorize structural pests (powder post beetles, carpenter ants, termites etc.).	Termite kits, Scouting kits (sweep nets, traps, sample bottles etc.), Logbook, Smartphones, AI apps, Sensors, Lucid digital keys, PPEs, Sprayers, Demonstration plots, Practical manual etc.

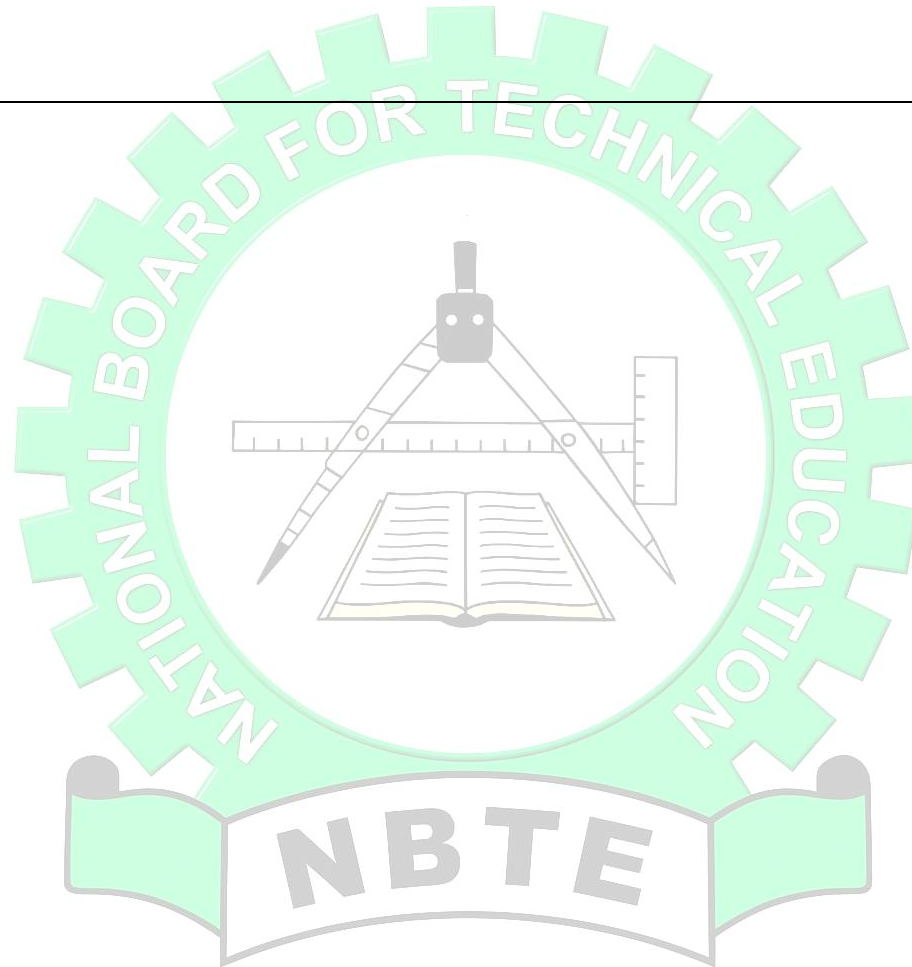
	2.5 Discuss other structural pests (powder post beetles, carpenter ants, termites, etc.)	Explain other structural pests (powder post beetles, carpenter ants, termites, etc.)				
GENERAL OBJECTIVE 3.0: Know public health risks associated with urban and household pests						
7-9	3.1 Describe disease transmitted by pests and vectors. 3.2 Explain disease and pest infestations associated with public health risks and control methods. 3.3 Explain environmental conditions that promote pest breeding and survival. 3.4 Discuss the impact of disease and pest infestations on public health, household, food safety, sanitation, etc.	- Describe disease transmitted by pests and vectors. - Explain disease and pest infestations associated with public health risks and control methods. - Discuss environmental conditions that promote pest breeding and survival. - Explain the impact of disease and pest infestations on public health, household, food safety, sanitation, etc.	Textbooks, Journals, Charts, Projector, White board, Erasable markers, Magnetics s erasers	- Identify urban and household pest breeding sites (rodents, cockroaches, mosquitoes, flies, bedbugs, termites, ants, fleas, ticks, mites, etc.). - Apply various control methods on urban and household pests (rodents, cockroaches, mosquitoes, flies, bedbugs, termites, ants, fleas, ticks, mites, etc.). - Lead urban and household pest sensitization and awareness in a	Guide students to: - Identify urban and household pest breeding sites (rodents, cockroaches, mosquitoes, flies, bedbugs, termites, ants, fleas, ticks, mites, etc.). - Apply various control methods on urban and household pests (rodents, cockroaches, mosquitoes, flies, bedbugs, termites, ants, fleas, ticks, mites, etc.). - Lead urban and household pest sensitization and awareness in a community	Termite kits, Scouting kits (sweep nets, traps, sample bottles etc.), Logbook, Smartphones, AI apps, Sensors, Lucid digital keys, PPEs, Sprayers, Demonstration plots, Practical manual etc.

				community		
GENERAL OBJECTIVE 4.0: Apply urban and household pest monitoring, prevention strategies, and management						
10-12	4.1 Explain environmental sanitation practices for urban and household pest prevention. 4.2 Discuss waste management strategies that reduce urban and household pest breeding sites. 4.3 Describe drainage systems and water management practices. 4.4 Discuss IPM techniques (cultural, biological, mechanical, chemical control methods etc.) in urban and household Pest Management. 4.5 Explain pest surveillance programmes for residential areas.	• Explain environmental sanitation practices for urban and household pest prevention. • Discuss waste management strategies that reduce urban and household pest breeding sites. • Describe drainage systems and water management practices. • Discuss IPM techniques (cultural, biological, mechanical, chemical control methods etc.) in urban and household Pest Management. • Explain pest surveillance programmes for residential areas. • Describe traps, monitoring devices, and inspection	Textbooks, Journals, Charts, Projector, White board, Erasable markers, Magnetics s erasers, etc.	• Develop monitoring framework/sch edules for urban and household prevention • Conduct routine urban and household pest inspection • Apply IPM protocols in urban and household pest prevention • Collect pest data • Record pest data • Interpret pest data • Prepare pest reports and recommendatio ns for households.	Guide students to: • Develop monitoring framework/schedules for urban and household prevention • Conduct routine urban and household pest inspection • Apply IPM protocols in urban and household pest prevention • Collect pest data • Record pest data • Interpret pest data • Prepare pest reports and recommendations for households.	Termite kits, Scouting kits Logbook, Smartphones, AI apps, Sensors, Lucid digital keys, PPEs, Sprayers, Demonstration plots, Practical manual etc.

	4.6 Describe traps, monitoring devices, and inspection techniques for pest detection. 4.7 Describe S steps in collection, recording, and interpretation of pest surveillance data. 4.8 Explain pest monitoring reports and recommendations.	techniques for pest detection. • Explain steps in collection, recording, and interpretation of pest surveillance data. • Explain pest monitoring reports and recommendations.				
GENERAL OBJECTIVE 5.0: Comprehend Integrated Vector Management (IVM)						
13-15	5.1 Explain WHO IVM framework. 5.2 Describe IVM for malaria, dengue, and schistosomiasis. 5.3 Discuss the application of IVM in Nigerian urban / household contexts. 5.4 Explain community-based IVM.	• Explain WHO IVM framework • Describe IVM for malaria, dengue, schistosomiasis • Discuss the application of IVM in Nigerian urban / household contexts • Explain community-based IVM	Textbooks, Journals, Charts, Projector, White board, Erasable markers, Magnetics s erasers, etc.	• Apply WHO IVM framework for households • Design IVM for 2 diseases • Apply IVM in urban/household • Lead community-based IVM sensitization and awareness	Guide students to: • Apply WHO IVM framework for household. • Design IVM for 2 diseases • Apply IVM in urban/household • Lead community-based IVM sensitization and awareness	Termite kits, Scouting kits Logbook, Smartphones, AI apps, Sensors, Lucid digital keys, PPEs, Sprayers, Demonstration plots, Practical manual etc.

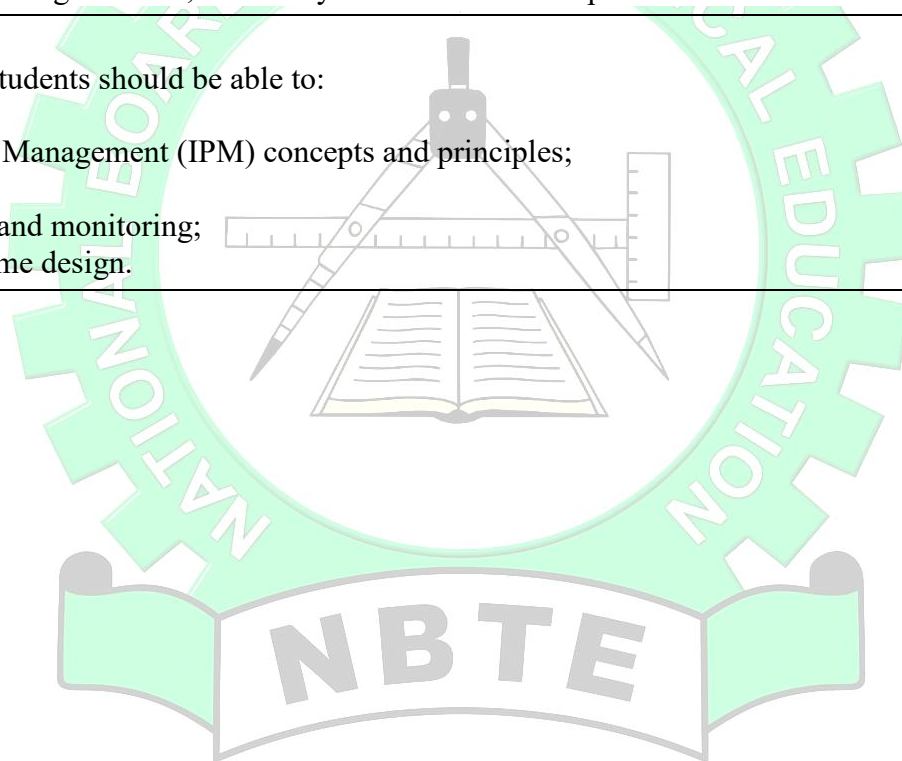
COURSE ASSESSMENT:

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



Integrated Pest Management (IPM)

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY		
COURSE TITLE: INTEGRATED PEST MANAGEMENT (IPM)	COURSE CODE: PMT 425	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills to understand, select, and apply Integrated Pest Management (IPM) for sustainable management of agricultural, veterinary and environmental pests.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand Integrated Pest Management (IPM) concepts and principles; 2.0 Know IPM tactics; 3.0 Comprehend pest scouting and monitoring; 4.0 Comprehend IPM programme design.		



PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) PEST MANAGEMENT TECHNOLOGY						
COURSE TITLE: INTEGRATED PEST MANAGEMENT (IPM)			COURSE CODE: PMT 425		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills to understand, select, and apply Integrated Pest Management (IPM) for sustainable management of agricultural, veterinary and environmental pests.						
GENERAL OBJECTIVE 1.0: Understand Integrated Pest Management (IPM) concepts and principles.						
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, history, and importance of Integrated Pest Management (IPM). 1.2 Describe the key principles of IPM. 1.3 Discuss pests, natural enemies, and beneficial organisms in agroecosystems. 1.5 Discuss IPM global frameworks (FAO, WHO, etc.). 1.6 Explain cultural control measures in	• Explain the evolution, principles, and benefits of IPM. • Explain prevention, monitoring, economic thresholds, and integrated control measures. • Explain identification techniques and ecological relationships. • Explain IPM, history and global frameworks (FAO, WHO, etc.). • Discuss crop rotation,	Textbooks, Internet, Articles, Projector, Computer, Diagrams/chart s, Marker board, Marker, Pictures, Integrated Pest Management textbooks. FAO IPM training manuals, etc. Scientific journals and	• Identify major pests and their natural enemies. • Conduct pest scouting and surveillance in farms and communities • Demonstrate trap installation • Use monitoring tools such as pheromone traps and sticky traps. • Carry out calculation and interpretation of economic threshold levels.	Guide students to: • Organise field visits to farms implementing IPM programmes. • Identify major pests and their natural enemies. • Conduct pest scouting and surveillance in farms and communities • Demonstrate trap installation • Use monitoring tools such as pheromone traps and sticky	Demonstration farms and field plots, Pest and beneficial organism specimens, Microscopes Hand lenses, Sweep nets, Aspirators, Collection jars. Sticky traps, Light traps, Pheromone traps. PPEs, Sprayers.

	IPM programmes. 1.7 Explain biological control methods in IPM systems. 1.8 Discuss mechanical and physical pest control techniques. 1.9 Describe safe and judicious use of pesticides as part of IPM. 1.10 Explain integrated Pest Management strategies for specific pest problems. 1.11 Discuss environmental sustainability and biodiversity conservation through IPM.	sanitation, resistant varieties, and planting practices. • Explain the use of predators, parasitoids, pathogens, parasites, and microbial agents • Discuss trapping, exclusion, hand-picking and environmental manipulation. • Explain pesticide selection, application timing, resistance management, and safety measures. • Explain how to develop IPM plans using case studies • Explain how to analyze pest control results and economic outcomes • Discuss environmental impacts and ecosystem-based Pest Management approach.	publications, Multimedia presentations and educational videos, Extension bulletins and fact sheets, Pest identification keys, etc.	• Implement cultural Pest Management practices. • Observe biological control agents. • Demonstrate mechanical and physical pest control methods. • Demonstrate calibration and safe operation of pesticide application equipment. • Carry out development and implementation of IPM plan for a selected crop or pest. • Assess the effectiveness of integrated Pest Management interventions. • Write a technical report on study visit to farm.	traps. • Carry out calculation and interpretation of economic threshold levels. • Implement cultural Pest Management practices. • Observe biological control agents. • Demonstrate mechanical and physical pest control methods. • Demonstrate calibration and safe operation of pesticide application equipment. • Carry out development and implementation of IPM plan for a selected crop or pest. • Assess the effectiveness of integrated Pest Management interventions.	Biopesticides, Biological control agents. Computers, Pest surveillance data analysis software. GPS-enabled devices and mobile pest identification applications, Practical manual, etc.
GENERAL OBJECTIVE 2.0: Know IPM tactics						

4-6	2.1 State IPM tactics into preventive and curative measures. 2.2 Explain preventive and intervention-based approaches with examples. 2.3 Describe cultural control tactics used in Pest Management. 2.4 Discuss crop rotation, sanitation, intercropping, planting dates, resistant varieties, and habitat management. 2.5 Discuss cultural control tactics to reduce pest infestations. 2.6 Explain biological control tactics and their importance in IPM.	• Discuss IPM tactics, preventive and curative measures. • Explain preventive and intervention-based approaches with examples. • Describe cultural control tactics used in Pest Management. • Discuss crop rotation, sanitation, intercropping, planting dates, resistant varieties, and habitat management. • Discuss cultural control tactics to reduce pest infestations. • Explain biological control tactics and their importance in IPM.	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Integrated Pest Management manuals, Crop protection textbooks, Scientific journals and publications, Extension bulletins and fact sheets, Pest identification guides, National pesticide and quarantine regulations, Multimedia teaching aids, IPM textbooks, lecture notes,	• Identify suitable IPM tactics for different pest species. • Implement cultural control measures such as crop rotation and field sanitation. • Conduct biological control demonstrations • Demonstrate installation and monitoring of pheromone, sticky, and light traps for pest surveillance and control. • Identify beneficial organisms. • Perform hand-picking, pruning, and exclusion techniques. • Apply physical control measures such as solarization and barriers. • Use pesticide application equipment safely. • Select pesticides based on pest biology and economic	Guide students to: • Organise field visits to farms practicing IPM. • Identify suitable IPM tactics for different pest species. • Implement cultural control measures such as crop rotation and field sanitation. • Conduct biological control demonstrations • Demonstrate installation and monitoring of pheromone, sticky, and light traps for pest surveillance and control. • Identify beneficial organisms. • Demonstrate hand-picking, pruning, and exclusion techniques. • Apply physical control measures such as solarization and barriers. • Use pesticide	Demonstration farms and field plots, Pest and beneficial insect collections, Microscopes, Hand lenses. Sweep nets, Aspirators. Traps, Solarization materials, Exclusion screens. Biological control agents, Microbial pesticides. PPEs, Sprayers. Pest monitoring forms, Data sheets. Computers, Pest Management software, Practical manual, etc.
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			PowerPoint slides, scientific journals. Pest specimens, charts, demonstration materials, etc.	thresholds. • Develop integrated Pest Management programmes combining multiple tactics. • Carry out monitoring and evaluation of IPM tactics using field data. • Write technical reports on field visits to farms practicing IPM.	application equipment safely. • Select pesticides based on pest biology and economic thresholds. • Develop integrated Pest Management programmes combining multiple tactics. • Carry out monitoring and evaluation of IPM tactics using field data.	
GENERAL OBJECTIVE 3.0: Comprehend pest scouting and monitoring						
7-9	3.1 Define pest scouting and monitoring in IPM. 3.2 Explain the importance of pest scouting and monitoring in crop protection. 3.3 Differentiate between scouting, surveillance, and monitoring. 3.4 Explain common pests, beneficial organisms, and pest damage	• Explain the concepts and principles of pest scouting and monitoring. • Explain the objectives and benefits of regular field scouting. • Discuss different pest sampling methods using charts and multimedia. • Demonstrate identification of pests, natural enemies, and pest	Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Instructional Materials, IPM manuals and textbooks, Pest	• Conduct field scouting using standard procedures. • Identify pests, beneficial insects, and symptoms of pest damage. • Collect pest population data from the field. • Establish sampling units and sampling patterns. • Install insect traps • Monitor insect traps.	Guide students to: • Organise students into scouting teams • Conduct field scouting using standard procedures. • Identify pests, beneficial insects, and symptoms of pest damage. • Collect pest population data from the field. • Establish sampling units and sampling	Sweep nets, Insect collection jars, Hand lenses, Data recording sheets, Mobile phones for digital data collection, GPS devices, Sampling quadrats, Measuring tapes, Monitoring Tools,

symptoms. 3.5 Describe various pest sampling and monitoring methods. 3.6 Explain economic injury level (EIL) and economic threshold level (ETL). 3.7 Discuss the role of scouting records in Pest Management decisions. 3.8 Explain factors influencing pest population dynamics. 3.9 Explain the use of monitoring tools such as traps and field observation techniques.	damage symptoms. • Explain economic thresholds and decision-making processes. • Discuss various monitoring tools and their applications. • Explain how to interpret scouting records and pest population data. • Illustrate successful pest monitoring programmes using case studies • Discuss pest outbreak prediction. • Assign exercises on pest monitoring data analysis.	identification guides, Charts, Multimedia presentations and videos, Pest monitoring record sheets, Reference Materials, Agricultural extension publications, Research articles on IPM, Pest surveillance reports, etc.	• Record scouting observations accurately. • Interpret pest monitoring data for IPM decision-making. • Calculate pest incidence and pest severity. • Compare pest populations with economic threshold levels. • Prepare pest scouting reports and recommend management actions. • Perform installation and maintenance of sticky traps, pheromone traps, and light traps.	patterns. • Install insect traps • Monitor insect traps • Record scouting observations accurately. • Interpret pest monitoring data for IPM decision-making. • Calculate pest incidence and pest severity. • Compare pest populations with economic threshold levels. • Prepare pest scouting reports and recommend management actions. • Demonstrate installation and maintenance of sticky traps, pheromone traps, and light traps.	Traps, Biological Specimens, Live or preserved insect specimens, Beneficial insects (predators and parasitoids), Pest-damaged plant samples, Healthy crop samples for comparison, Digital Resources, Pest identification, mobile applications, Digital cameras, Pest surveillance software, Internet-enabled devices for pest reporting, Practical manual, etc.
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GENERAL OBJECTIVE 4.0: Comprehend IPM programme design						
10-12	4.1 Explain IPM programme design and its importance in Pest Management. 4.2 Explain the principles and components of an IPM programme. 4.3 Discuss key steps involved in designing an IPM programme. 4.4 Explain the role of pest identification, monitoring, and economic thresholds in programme design. 4.5 Describe various IPM control strategies and their integration. 4.6 Explain environmental, economic, and social factors influencing IPM programme design. 4.7 Discuss Pest Management	• Explain the concept and principles of IPM programme design. • Explain the stages involved in programme development. • Discuss case studies of successful IPM programmes. • Explain how to conduct pest problem analysis. • Discuss different Pest Management options and their integration. • Explain how to set programme goals and objectives. • Discuss stakeholder involvement and community participation. • Explain monitoring and evaluation procedures. • Illustrate programme planning processes using multimedia presentations. • Explain how to	Instructional Materials IPM manuals and guidelines. Pest Management textbooks. Projector and computer. Whiteboard and markers Charts and diagrams of IPM planning processes Case study reports Pest surveillance data sheets Reference Materials Extension publications Scientific journals Government Pest Management policies National and	• Conduct pest situation assessments in the field. • Identify key pests and natural enemies affecting a target enterprise. • Collect pest monitoring data. • Analyze pest monitoring data. • Determine economic threshold levels for decision-making. • Develop realistic IPM goals and objectives. • Select appropriate cultural, biological, mechanical, physical, and chemical control measures. • Prepare an IPM programme work plan. • Design pest monitoring and evaluation schedules. • Develop budgets and resource requirements for an	Guide students to: • Conduct pest situation assessments in the field. • Identify key pests and natural enemies affecting a target enterprise. • Collect pest monitoring data. • Analyze pest monitoring data. • Determine economic threshold levels for decision-making. • Develop realistic IPM goals and objectives. • Select appropriate cultural, biological, mechanical, physical, and chemical control measures. • Prepare an IPM programme work plan. • Design pest monitoring and evaluation schedules. • Develop budgets and resource	Pest scouting equipment, Insect traps, Sampling tools, Hand lenses, Microscopes, Pest identification keys, Weather monitoring equipment, Planning and Documentation materials, IPM programme templates, Monitoring and evaluation forms, Pest surveillance records, Budget worksheets, Computers and printers, Project planning software,

	objectives and action plans. 4.8 Explain stakeholder participation in IPM programme development. 4.9 Discuss methods for monitoring and evaluating IPM programme effectiveness. 4.10 Discuss challenges associated with implementing IPM programmes. 4.11 Explain the importance of sustainability and environmental protection in IPM planning.	design IPM programmes for selected crops or pests.	international IPM guidelines, etc	IPM programme. • Carry out preparation and presentation of a complete IPM programme proposal. • Evaluate existing IPM programmes and recommend improvements. • Develop contingency plans for pest outbreaks.	requirements for an IPM programme. • Carry out preparation and presentation of a complete IPM programme proposal. • Evaluate existing IPM programmes and recommend improvements. • Develop contingency plans for pest outbreaks.	Flip charts and stationery, Digital Resources, Mobile pest identification applications, Geographic Information Systems(GIS), Pest forecasting tools, Digital data collection platforms, Internet-enabled devices, Practical manual, etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical 40% Examination: 40% Total: 100%						

LIST OF MINIMUM RESOURCES/PHYSICAL FACILITIES

A. ENTOMOLOGY LABORATORY

S/N	DESCRIPTION OF ITEMS	MINIMUM QUANTITY
1.	Insect Rearing Cages (small, medium, large; mesh, glass, etc.)	10 each
2.	Cockroach, Ant, Bedbug Reference Collections	40
3.	Termite Detection Tools (Sounding Tools, Monitoring Stations)	40
4.	Termite Bait Stations and Treatment Demonstration Kit	40
5.	Mosquito Larvae / Adult Sampling Equipment (dippers, aspirators, traps)	40
6.	Insecticide-Treated Nets (ITNs) for Demonstration	40
7.	Indoor Residual Spray (IRS) Equipment	5
8.	Personal Protective Equipment (PPEs): Coveralls, Goggles, Respirators, Gloves, Boots etc.	40
9.	Pest-Inspection Kits (flashlights, magnifiers, sample bottles)	40 each
10.	Vector Identification Keys (Anopheles, Aedes, Culex)	10
11.	Bait Stations and Snap / Glue / Live Traps for Rodents	10 each
12.	Demonstration House / Storage Mock-up for Inspection Training	1
13.	Insect Box and stainless steel pins	40
14.	Insect Spreading Boards	40
15.	Insect Cabinets	2
16.	Insect trays	40
17.	Insect counters	40
18.	Petri dishes	100
19.	Desktop / Laptop Workstations (i5 / i7, 16 GB RAM, SSD, internet-enabled)	1
20.	UPS (1.5 kVA) for each Workstation	1
21.	Stereo Dissecting Microscopes (Zoom, with LED illumination)	20
22.	Compound Microscopes (binocular, with phase-contrast option)	20
23.	Insect Reference Collection (50+ orders / families, properly mounted)	5 collection
24.	Insect Dissecting Kits (forceps, scalpels, needles, scissors, syringes etc.)	20 kits
25.	Environmental/Climatic Chambers (temperature & humidity controlled)	1
26.	Purdue Improved Crop Storage (PICS) Hermetic Bags	10

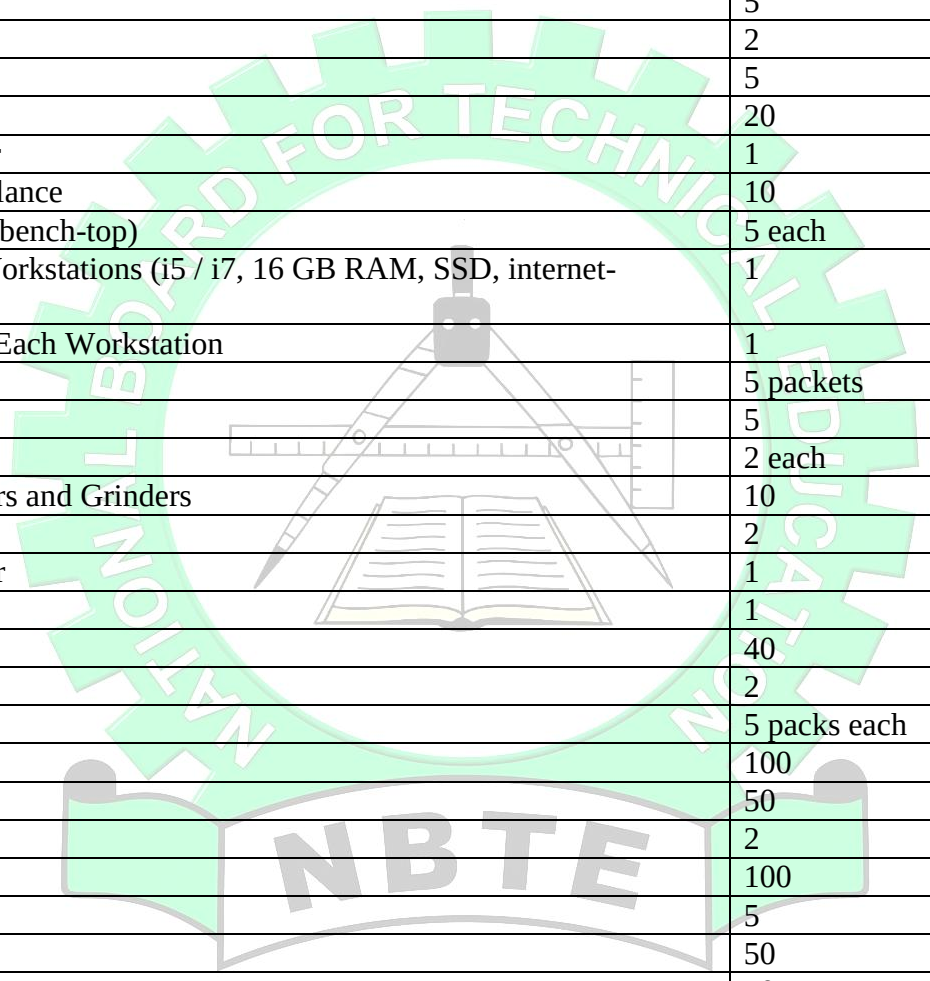
27.	Small-Scale Silo (1 ton capacity, demonstration scale)	2
28.	Storage Warehouse (with traditional & modern features for demonstration)	1
29.	Fumigation Chamber (vacuum, sealed, with phosphine handling provisions, fumigants, etc.)	1
30.	Phosphine (Aluminum Phosphide)	2
31.	Refrigerator non-functional	1
32.	Storage Insecticides/Pesticides	20 each
33.	Grain samples	1kg each
34.	Transparent buckets and bottles for culture	10 each
35.	Storage Pest Sampling Equipment (sieves, probe samplers, sticky traps)	20 each
36.	Mycotoxin Rapid Test Kits (aflatoxin, ochratoxin)	1
37.	Hermetic Storage Demonstration (drums, jerricans, calabashes)	5 each
38.	Moisture Meters for Stored Grain	5
39.	Traditional Storage Demonstration (granaries, calabashes, ash etc.)	1 each
40.	Pheromone Storage Refrigerator and Lure Stations	2
41.	Quality-Control Equipment (viability counters, haemocytometers)	2 each
42.	NAFDAC Biopesticide Registration Documentation	2
43.	Sprayers (Knapsack, Motorized, ULB, micro ULB, hand sprayer, etc.)	5
44.	Incubators	5
45.	Inoculating chamber	1
46.	Deep freezer	1
47.	Refrigerator	1
48.	Microscopes	40
49.	Humidifiers	2
50.	Feathers	20
51.	Filter papers	10 packets
52.	Bunsen Burners	40
53.	Centrifuge	1
54.	Test tubes	100
55.	pH meter	5
56.	Wire loops	40
57.	Insect box	20

58.	Shelves	10
59.	Insect album	20
60.	Baits	10
61.	Clock timer	20
62.	Insect preservatives (70-80% Ethanol, 7-10% Formalin, 3% Glycerol etc.)	20 sets
63.	Insect Killing agents (Jars, Cyanide, Ethyl Acetate Supplies, etc.)	20 sets
64.	Insect clearing agents (Xylene, Potassium hydroxide)	10
65.	Respirators	10
66.	Mortar pestle	20
67.	Sweep Nets, Beating Trays, Pitfall Traps, Light Traps, Malaise Traps, Sticky traps,	20 each
68.	Berlese Funnel Apparatus	4 units
69.	Tullgren Funnel Apparatus	4 units
70.	Glassware Set (beakers, flasks, petri dishes, watch glasses, McCartney bottles, etc.)	20 sets
71.	Half-Face and Full-Face Respirators (with appropriate cartridges)	20 each
72.	Decontamination Shower / Eye-Wash Station	2 each
73.	Spill-Response Kit (absorbent, neutraliser, containment)	2 each
74.	First-Aid Kits (with atropine, pralidoxime, vitamin K1 references)	2 sets
75.	Cholinesterase Monitoring Field Kit (for applicator surveillance)	5 sets
76.	Safety Data Sheets (MSDS) Library for All Pesticides on Site	2
77.	Safety Signage (warning, no-entry, REI markers)	5
78.	Slides and cover slips	20 sets
79.	Mounting Media (Hoyer's Solution e.g. Gum Arabic, Resin base e.g. Canada balsam etc.)	5 each
80.	Culture Media	20 sets
81.	Ovens	2
82.	Climatic chamber	1
83.	Thermo-hygrometer	1
84.	Digital weighing balance and non-digital weighing balance	4
85.	Aluminum foil	10 rolls
86.	Insect Taxonomic Keys and Identification Manuals (Hardcopy + Digital)	20 sets

87.	Hand Lenses (10x, 20x triplet)	40
88.	Cabinets for Reference Collection Storage	6
89.	Personal Protective Equipment (PPEs): Coveralls, Goggles, Respirators, Gloves, Boots etc.	40 sets
90.	Working tables	10
91.	Logbooks and Datasheet Templates (Hardcopy + Digital)	4
92.	Report and Presentation Templates (Hardcopy + Digital)	4
93.	Practical Manual	

B. PATHOLOGY/PARASITOLOGY DIAGNOSTICS LABORATORY

S/N	DESCRIPTION OF ITEMS	MINIMUM QUANTITY
1.	Baermann Funnels (15 cm) with Stands	20 units
2.	Soil Sieves (set of 5: 200, 100, 60, 38, 25 μ m)	5 each
3.	Laboratory Centrifuge (bench-top, 4000 rpm)	2
4.	Digital weighing balance	10
5.	Hot-Air Oven (digital, up to 250 °C)	2
6.	Autoclave (vertical, 20 L)	2
7.	Refrigerator and Deep-Freezer (-20 °C)	1 each
8.	Laminar Flow Hood (Class II)	1
9.	Mite Slides, Nematode Slides, Mounting Media (Hoyer's, lactophenol)	50 each
10.	Glassware Set (beakers, flasks, petri dishes, watch glasses, McCartney bottles)	40 each
11.	ELISA Reader / Microplate Reader and Washer	1 each
12.	ELISA Kits (commonly used Nigerian plant pathogens: cassava mosaic virus, banana streak virus, etc.)	5 kit types
13.	Thermal Cycler (PCR machine, 96-well) - access or onsite	1 (or formal access)
14.	Gel Electrophoresis Apparatus and Power Pack	2 sets
15.	UV Transilluminator and Gel Documentation System	1
16.	LAMP Detection Kits (Loop-Mediated Isothermal Amplification)	5 kit types
17.	Rapid Field Test Strips (lateral-flow immunoassay)	50 strips
18.	Pipette Set (micropipettes, 0.5-1000 μ L, single and multichannel)	10 sets
19.	Distilled / Deionised Water Apparatus	1
20.	Reagents	20



21.	Colony counter	2
22.	Hot-air ovens	2
23.	Climatic chamber	1
24.	Water bath	5
25.	Pressure pot	2
26.	Hot plates	5
27.	Cotton wool	20
28.	Thermo-hygrometer	1
29.	Digital weighing balance	10
30.	pH and EC Meters (bench-top)	5 each
31.	Desktop / Laptop Workstations (i5 / i7, 16 GB RAM, SSD, internet-enabled)	1
32.	UPS (1.5 kVA) for Each Workstation	1
33.	Slides	5 packets
34.	Mounting media	5
35.	Culture media	2 each
36.	Tissue Homogenisers and Grinders	10
37.	Incubators	2
38.	Inoculating chamber	1
39.	Colony counter	1
40.	Microscopes	40
41.	Humidifiers	2
42.	Filter papers	5 packs each
43.	Tripod stands	100
44.	Bunsen Burners	50
45.	Centrifuge	2
46.	Test tubes	100
47.	pH meter	5
48.	Wire loops	50
49.	Clock timer	10
50.	Analytical Balance (0.0001 g) and Top-Loading Balance	2 each
51.	Reference Plant Pathology and Parasitology Diagnostic Manuals (CABI,	20 sets

	AVRDC, IITA, etc.)	
52.	Personal Protective Equipment (PPEs): Coveralls, Goggles, Respirators, Gloves, Boots etc.	40 sets
53.	Logbooks and Datasheet Templates (Hardcopy + Digital)	4
54.	Report and Presentation Templates (Hardcopy + Digital)	4
55.	Practical Manual	40

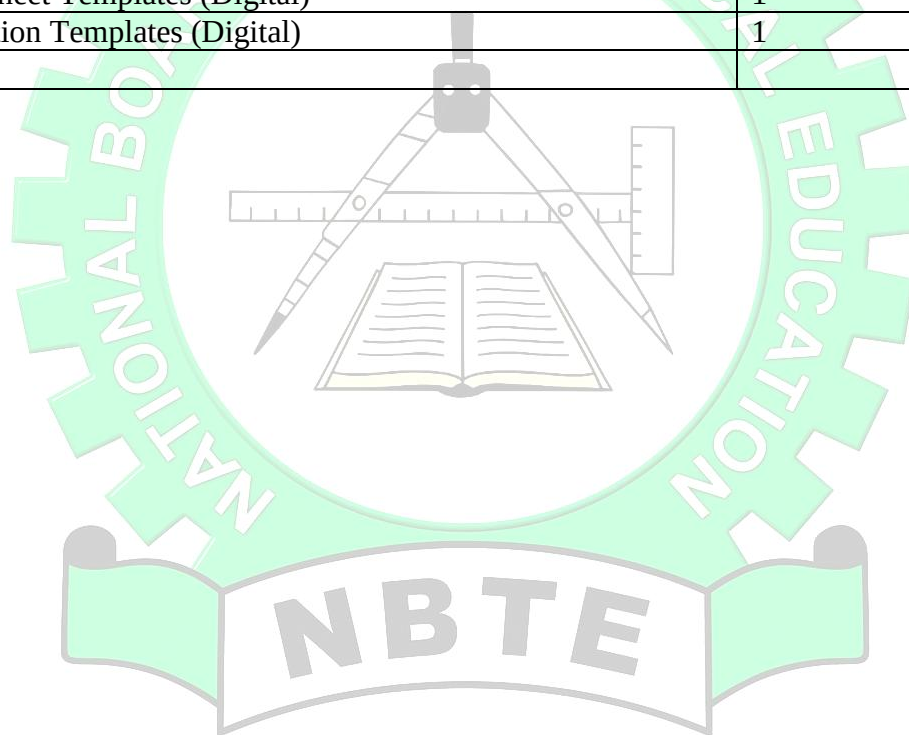
C. IPM DEMONSTRATION FIELD

S/N	DESCRIPTION OF ITEMS	MINIMUM QUANTITY
1.	Demonstration Field Plots (push-pull, intercropping, trap-crop, field-margin strips, etc.)	0.25 ha
2.	Push-Pull Plot with <i>Desmodium uncinatum</i> / <i>Brachiaria</i> / Napier Grass	0.25 ha
3.	Trap-Crop Plots (sunflower, okra, marigold, etc.)	0.25 ha
4.	Field-Margin Biodiversity Strips with Flowering Plants	500 m
5.	Irrigation System (drip / sprinkler) for Demonstration Plots	1 set
6.	Field Sampling Tools (sweep nets, pheromone traps, sticky traps, pitfall traps, etc.)	40 sets
7.	Field Scouting Logbooks and Datasheet Templates	40 each
8.	GPS-Tagged Pest Monitoring Stations	10 stations
9.	Automated Weather Station for Microclimate Monitoring	1
10.	Pheromone Lures for Major Nigerian Pests (FAW, <i>Helicoverpa</i> , fruit flies)	50 lures
11.	Molasses for Sticky traps	50 liters
12.	Cover-Crop / Mulch Demonstration Plots	0.25 ha
13.	Personal Protective Equipment (PPEs): Coveralls, Goggles, Respirators, Gloves, Boots etc.	40 sets
14.	Reference Texts on IPM (Hardcopy + Digital)	15 copies
15.	Report and Presentation Templates (Hardcopy + Digital)	20 copies
16.	Logbooks and Datasheet Templates (Hardcopy + Digital)	20 copies
17.	Practical Manual	

D. DIGITAL PEST SURVEILLANCE COMPUTER LABORATORY

S/N	DESCRIPTION OF ITEMS	MINIMUM QUANTITY
1.	Desktop / Laptop Workstations (i5 / i7, 16 GB RAM, SSD, internet-enabled)	40
2.	UPS (1.5 kVA) for Each Workstation	40
3.	Smartphones (high-spec, GPS-enabled, with cameras for AI pest ID)	40
4.	Tablets (for mobile field surveys with Kobo / ODK)	20
5.	High-Speed Internet (≥ 100 Mbps fibre, with redundancy)	1 line
6.	Network Switch, Wi-Fi Access Points (enterprise-grade)	4 + 4
7.	Multi-Rotor Survey Drones (with high-resolution RGB camera)	4
8.	Multi-Rotor Drones with Multispectral Sensor (NDVI capable)	2
9.	Agricultural Spray Drone (≥ 10 L tank, with calibration setup)	1 (or formal access)
10.	Spare Batteries	20 sets
11.	Chargers	20 sets
12.	Propellers	20 sets
13.	Drone Flight-Planning Software (Pix4D, DroneDeploy, DJI Terra trial)	1 lab license
14.	Drone Image Processing Software (Pix4D, Agisoft Metashape, OpenDroneMap)	1 lab license
15.	NCAA Drone Registration / Licensing Documentation	1 set
16.	Drone Pre-Flight Checklist and Safety Equipment (helmets, vests, cones)	5 sets
17.	Water-Sensitive Paper for Spray Drone Calibration	50 sheets
18.	Drone Storage Cabinets and Transport Cases	4 sets
19.	Kobo / ODK Server Access (with form library)	1 server
20.	QGIS (Free / Open Source) and ArcGIS Desktop / Online Lab Licence	1 lab licensed
21.	GIS Workstations (i7, 32 GB RAM, 4 GB GPU, dual-monitor)	20
22.	QGIS (Free / Open Source) and ArcGIS Desktop / Online Lab Licence	1 lab license
23.	MaxEnt Species-Distribution Modelling Software (open source)	1 lab license
24.	Satellite Imagery Access (Sentinel, Landsat, Planet Labs trial)	1 lab account
25.	R/R studio for Statistical Analyses	1 lab installation
26.	Handheld GPS Receivers (sub-metre accuracy)	20
27.	RTK / DGPS Receivers for Precision Pest Mapping	2 sets
28.	Plotters / Large-Format Printers (A0)	1
29.	Topographic and Agro-Ecological Maps of Nigeria	≥ 50 sheets

30	SMS / USSD Gateway Subscription (for pest alerts)	1 account
31	AI Pest-ID Apps Licensed Lab Accounts (Plantix Pro, etc.)	1 lab account
32	Pest-Surveillance Dashboard Software (Power BI / Tableau / open-source)	1 lab licensed
33	Multimedia Projector, Smart-Board and Document Camera	2 sets
34	Personal Protective Equipment (PPEs): Coveralls, Goggles, Respirators, Gloves, Boots etc.	40 sets
35	Reference Texts on Agricultural Spray Drone, Multi-Rotor Survey Drones, Drones with Multispectral Sensor etc.	40
36	Reference Texts on GIS, Remote Sensing, Spatial Pest Surveillance	40 sets
37	Logbooks and Datasheet Templates (Digital)	1
38	Report and Presentation Templates (Digital)	1
39	Practical Manual	



E. PESTICIDES AND MICROENCAPSULATION LABORATORY

S/N	DESCRIPTION OF ITEMS	Minimum Quantity
1.	Trichogramma Mass-Rearing Containers (with Sitotroga / Corcyra eggs)	10
2.	Bt (<i>Bacillus thuringiensis</i>) Culture Media	2
3.	Metarhizium / Beauveria Production (substrate, autoclave, incubator, etc.)	2 each
4.	NPV Production Apparatus (with biosafety provisions)	2
5.	Entomopathogenic Nematode Production (with monoxenic culture)	2
6.	Predator / Parasitoid Reference Cultures (Chrysoperla, Coccinella, etc.)	2 each
7.	Botanical Pesticide Extraction Apparatus (Soxhlet Extractor, Clavenger, Blenders, Filters, etc.)	4 each
8.	Knapsack Sprayers (Manual, Lever-Operated, 16 L etc.)	20
9.	Motorised Knapsack Sprayers	5
10.	Mistblowers (Backpack)	5
11.	ULV (Ultra-Low Volume) Sprayers	5
12.	Boom Sprayers (Tractor / Vehicle-Mounted) - access	1
13.	Spray Nozzles (Hollow Cone, Flat Fan, Air-Induction; assorted sizes)	50 nozzles
14.	Calibration Equipment (Measuring Cylinders, Stopwatches, Flow Meters)	20 sets
15.	Water-Sensitive Paper for Spray Coverage Assessment	50 sheets
16.	Sprayer Repair / Maintenance Tool Kit	4 kits
17.	Personal Protective Equipment (PPEs): Coveralls, Goggles, Respirators, Gloves, Boots etc.	40 sets
18.	Spill Containment / Decontamination Kit	4 kits
19.	Gas Chromatograph (GC) with FID / ECD / NPD - access or onsite	1

20.	High-Performance Liquid Chromatograph (HPLC) - access or onsite	1
21.	Quenchers Extraction Reagent Kits (acetonitrile, MgSO ₄ , NaCl, PSA, C18)	1
22.	Solid-Phase Extraction (SPE) Cartridges and Manifold	1
23.	Rotary Evaporator (with vacuum pump)	1
24.	Vortex Mixers and Bench-Top Centrifuges	1
25.	Rapid Pesticide-Residue Test Kits (acetylcholinesterase-based)	1
26.	Volumetric Glassware (pipettes, burettes, flasks; Class A)	100 each
27.	Pesticide Standards (Reference Materials) and MRL Database Access (Codex)	1
28.	Fume Hood / Chemical Cabinet for Solvent Handling	1
29.	Locked Pesticide Storage Cabinet (ventilated, with inventory)	1
30.	Triple-Rinse and Container Disposal Equipment	1 set
31.	Reference Texts on Biopesticide Production, Pesticide application and calibration, Pesticide Residue and MRL Analysis	15 sets
32.	Logbooks and Datasheet Templates (Hardcopy + Digital)	4
33.	Report and Presentation Templates (Hardcopy + Digital)	4
34.	Practical Manual	

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