



NATIONAL BOARD FOR TECHNICAL EDUCATION

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

HIGHER NATIONAL DIPLOMA

IN

PASTURE AND RANGE MANAGEMENT

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.

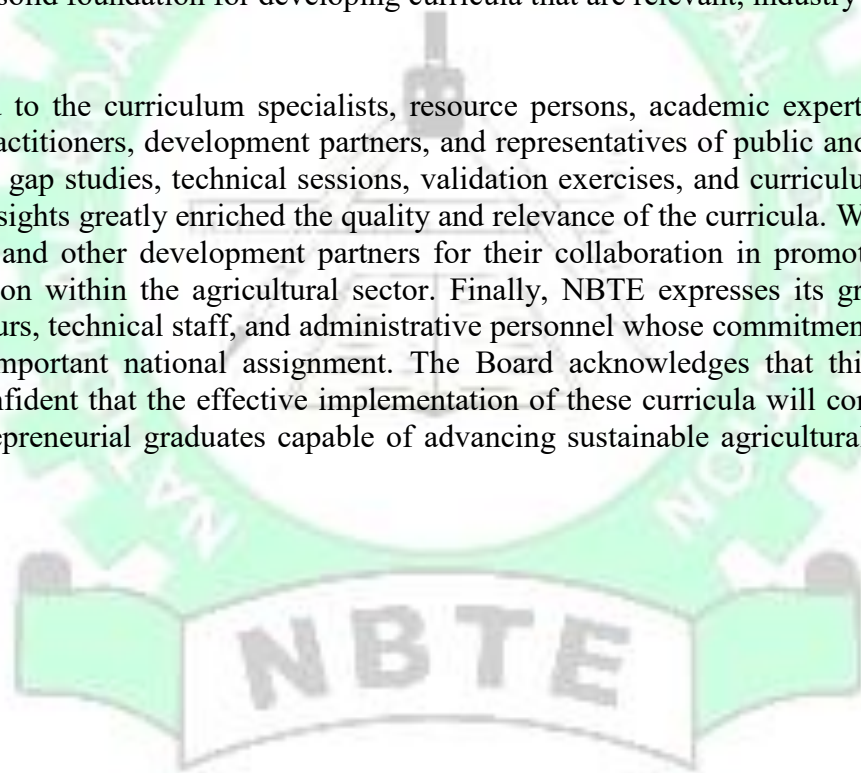
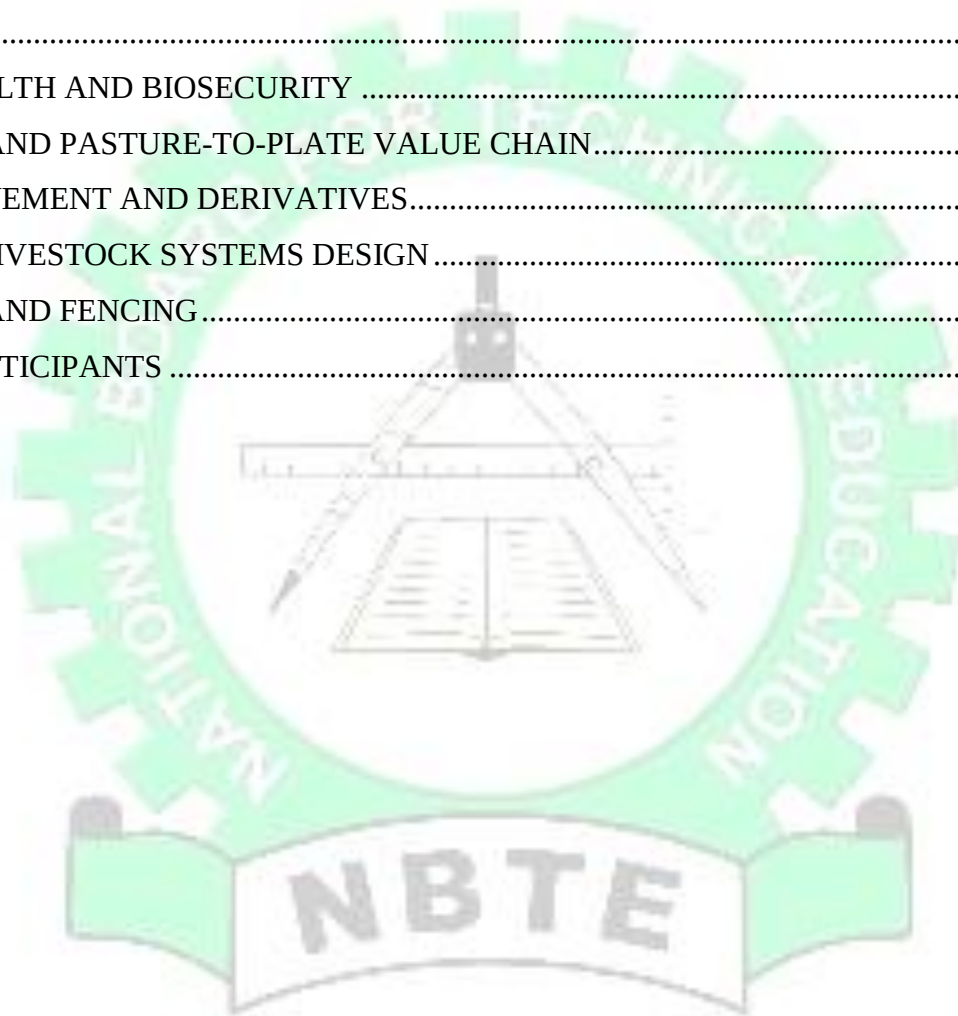


TABLE OF CONTENTS

PREFACE	i
ACKNOWLEDGEMENT	ii
GENERAL INFORMATION	v
CURRICULUM TABLE	x
YEAR I SEMESTER I.....	1
PASTURE AND RANGE PLANT TAXONOMY	2
PRINCIPLES OF RANGE ECOLOGY AND MANAGEMENT.....	7
CLIMATE-SMART PASTURE AND RANGE MANAGEMENT.....	12
RANGE ANIMAL NUTRITION AND FORAGE QUALITY.....	17
GIS, REMOTE SENSING AND DRONE FOR PASTURE MONITORING.....	23
PRINCIPLES OF PASTURE IRRIGATION	27
YEAR I - SEMESTER II.....	35
PASTURE-BASED LIVESTOCK HUSBANDRY	36
FORAGE AND FODDER CONSERVATION PRACTICES	42
RANGE APICULTURE AND POLLINATION SERVICES.....	47
SOWN PASTURES AND FORAGE CROP PRODUCTION.....	52
RANGE DEVELOPMENT, RESEEDING AND RESTORATION.....	57
REPRODUCTIVE MANAGEMENT FOR RANGE LIVESTOCK	62
FIELD PRACTICAL I (PASTURE ESTABLISHMENT AND RANGE ASSESSMENT)	67
YEAR II SEMESTER I.....	72
PRECISION FORAGE PRODUCTION	73
FARM MACHINERY AND PRECISION EQUIPMENT.....	78
ADVANCED RANGE MANAGEMENT	83

GRAZING MANAGEMENT SYSTEMS.....	88
FIELD PRACTICAL II (DIGITAL AND CLIMATE-SMART PASTURE MANAGEMENT)	93
RANGE PATROL AND DISASTER RESPONSE	98
YEAR II SEMESTER II.....	106
RANGE LIVESTOCK HEALTH AND BIOSECURITY	107
FEEDLOT OPERATIONS AND PASTURE-TO-PLATE VALUE CHAIN.....	113
CROP RESIDUES IMPROVEMENT AND DERIVATIVES.....	118
INTEGRATED FORAGE-LIVESTOCK SYSTEMS DESIGN	123
PASTURE AND RANGELAND FENCING.....	128
LIST OF WORKSHOP PARTICIPANTS	152



GENERAL INFORMATION

1.0 PROGRAMME NOMENCLATURE

Higher National Diploma in Pasture and Range Management

2.0 PROGRAMME GOAL

This programme is designed to produce technologists who will be able to apply scientific knowledge and skills in the development and management of pastures and rangelands for sustainable animal production consistent

3.0 OBJECTIVES OF THE PROGRAMME

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

- i. Plan, establish and manage sown pastures for sustainable fodder production.
- ii. Manage and improve rangelands.
- iii. Monitor pasture and rangeland utilization.
- iv. Identify different pasture and rangeland plant species.
- v. Design and implement grazing management systems.
- vi. Evaluate the carrying capacities of pasture and rangelands.
- vii. Carry out forage and fodder conservation practices
- viii. Advise livestock farmers on modern techniques in Pasture and Range Management practices.
- ix. Identify and report livestock diseases in rangeland.
- x. Manage disaster in rangeland
- xi. Identify regulatory framework in rangeland management.

4.0 ENTRY REQUIREMENTS

The minimum entry requirements into the HND Pasture and Range Management programme are:

- i) Five (5) credit passes in relevant subjects at Ordinary Level including English language and Mathematics.
- ii) Candidates with National Diploma in Agricultural Technology, National Diploma in Animal Health and Production Technology or related programmes from accredited institutions.
- iii) Must have undergone one-year mandatory post ND industrial training in an acceptable Livestock Practice Area
- iv) Candidates with National Diploma in Agricultural Technology, National Diploma in Animal Health and Production Technology or related programmes with PASS grade and two (2) or more years post-ND cognate work experience may be considered for admission.

5.0 STRUCTURE/DURATION OF THE PROGRAMME

The HND Pasture and Range Management programme is a terminal programme structured to last for two (2) years (four semesters) of classroom work, laboratory, field trip and workshop practices in relevant MDAs or Units.

Each semester shall be for 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 Pasture and Range Management programme consists of three (3) main components. These are:

- i) General studies/General education courses
- ii) Foundation courses
- iii) Professional courses

7.0 AWARD OF HIGHER NATIONAL DIPLOMA

The Higher National Diploma certificate in Pasture and Range Management shall be awarded by the authority of the Academic Board of the Institution.

The conditions for the award of Higher National Diploma Pasture and Range Management Certificate, include the following:

- i) Satisfactory performance in all prescribed course work/assignments, tests/quizzes, workshop practice, laboratory work field trip etc.
- ii) Satisfactory performance in all semester examinations.
- iii) Satisfactory completion of written project/seminar papers.
- iv) Candidate must have completed a minimum of between 120 to 130 credit units

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

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

Each programme offered at the ND or HND Levels shall be accredited by the NBTE before diplomates can be awarded either ND/HND certificates. Details about the process of accrediting a programme for the award of ND or 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 LOG BOOK:

A personal log book 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 of the programme are expected to carry out project works, either on individual or group basis (only 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 of projects. The formats should be adopted as applied to each stakeholder.

11.0 STAFFING REQUIREMENTS:

A minimum of four (4) Core teaching staff who should possess at least a HND or B.Sc. Agric., B.Agric., B.Tech Agric., or any related disciplines at good grades, not below the rank of Lecturer II.

11.1 Technical Staff

Each facility shall consist of Technologist with HND in Pasture and Range Management or any related field, and they shall be assisted by technicians with ND in Animal Health and Production Technology or ND Agricultural Technology, Workshop and Field attendants with at least SSCE or equivalent qualification.

11.2 Headship of the Department (HOD)

The Head of Department shall have at least HND or first degree and master's degrees in related field. He or she shall not be less than the rank of a Senior Lecturer and must be registered with the relevant Professional Body(s).

12.0 Guidance Notes for Teachers of the Programme:

12.1 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 wish, to transfer the units already completed in an Institution of similar standard from which he/she is transferring.

12.2 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.

12.3 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 it is clear to all the expected performance of the student 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.

12.4 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 20:80.

13.0 GUIDELINES ON MANDATORY SKILLS QUALIFICATIONS (MSQ)

Please, see the Guidelines for the Implementation of MSQ in Polytechnics in Nigeria, available on NBTE website (www.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.	CPT 313	Agro Climatology and Climate Smart Agriculture	1	0	2	3	3
4.	SST 312	Soil Fertility and Plant Nutrition	1	0	3	4	4
5.	AED 312	Agricultural Extension Methods	1	0	2	3	3
6.	PRM 311	Pasture and Range Plant Taxonomy	1	0	3	4	4
7.	PRM 312	Principles of Range Ecology and Management	1	0	3	4	4
8.	PRM 313	Climate-Smart Pasture and Range Management	1	0	1	2	2
9.	PRM 314	Range Animal Nutrition and Forage Quality	1	0	3	4	4
10.	PRM 315	GIS, Remote Sensing and Drone for Pasture Monitoring	1	0	2	3	3
11.	PRM 316	Principles of Pasture Irrigation	1	0	2	3	3
TOTAL			12	0	22	34	34

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.	AGR302	Field Experimentation and Data Analysis	1	0	1	2	2
5.	PRM 321	Pasture-Based Livestock Husbandry and Welfare	1	0	3	4	4
6.	PRM 322	Forage and Fodder Conservation Practices	1	0	2	3	3
7.	PRM 323	Range Apiculture and Pollination Services	1	0	2	3	3
8.	PRM 324	Sown Pastures and Forage Crop Production	1	0	3	4	4
9.	PRM 325	Range Development, Reseeding and Restoration	1	0	3	4	4
10.	PRM 326	Reproductive Management and AI For Range Livestock	1	0	2	3	3
11.	PRM 327	Field Practical I (Pasture Establishment and Range Assessment)	0	0	3	3	3
TOTAL			12	0	22	34	34

Year II- Semester I

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 401	Communication in English IV	2	0	0	2	2
2.	ENT 416	Practice of Entrepreneurship II	2	0	2	4	4
3.	AGR 401	Research Methodology and Scientific Writing	1	0	1	2	2
4.	PRM 411	Precision Forage Production	1	0	3	4	4
5.	PRM 412	Farm Machinery and Precision Equipment	1	0	3	4	4
6.	PRM 413	Advanced Range Management	1	0	2	3	3
7.	PRM 414	Grazing Management Systems	1	0	2	3	3
8.	PRM 415	Field Practical II (Digital and Climate-Smart Pasture Management)	0	0	3	3	3
9.	PRM 416	Range Patrol and Disaster Response	1	0	3	4	4
TOTAL			10	0	19	29	29

Year II- Semester II

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	AED 424	Rural Sociology	1	0	1	2	2
2.	PRM 421	Range Livestock Health and Biosecurity	1	0	2	3	3
3.	PRM 422	Feedlot Operations and Pasture Value Chain	1	0	1	2	2
4.	PRM 423	Crop Residues Improvement and Derivatives	1	0	3	4	4
5.	PRM 424	Integrated Forage-Livestock Systems Design	1	0	3	4	4
6.	PRM 425	Pasture and Rangeland Fencing	1	0	3	4	4
7.	PRM 426	Project	0	0	4	4	4
TOTAL			6	0	17	23	23



PASTURE AND RANGE PLANT TAXONOMY

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: PASTURE AND RANGE PLANT TAXONOMY	COURSE CODE: PRM 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 knowledge and skills in pasture and range plant taxonomy and modern digital plant-identification tools.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand plant taxonomy foundations. 2.0 Know Nigerian and exotic pasture and range grasses. 3.0 Know Nigerian and exotic pasture and range legumes. 4.0 Know Nigerian and exotic browse species. 5.0 Know digital plant identification tools.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: PASTURE AND RANGE PLANT TAXONOMY		COURSE CODE: PRM 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 knowledge and skills in pasture and range plant taxonomy and modern digital plant-identification tools.						
GENERAL OBJECTIVE 1.0: Understand plant taxonomy foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Describe plant classification (Family, Genus, Species). 1.2 Describe binomial system of nomenclature. 1.3 Describe the use of taxonomic keys (dichotomous and digital). 1.4 Describe morphological features for plant identification.	- Discuss plant classification (Family, Genus, Species) - Explain binomial nomenclature - Explain the use of taxonomic keys (dichotomous and digital) - Discuss morphological features for plant identification	Plant taxonomy texts, LCD projector, textbooks, journals, internet, whiteboard, dichotomous and digital keys	- Identify 10 plants families - Apply nomenclature to 10 plants - Use dichotomous and digital keys - Identify and record morphological features	Guide students to: - Identify 10 plants families - Apply nomenclature to 10 plants - Use dichotomous and digital keys - Identify and record morphological features	Plant specimens, hand lenses, microscopes, herbarium

GENERAL OBJECTIVE 2.0: Know Nigerian and exotic pasture and range grasses						
4-6	2.1 List major Nigerian range grasses: <i>Andropogon</i>, <i>Hyparrhenia</i>, <i>Cynodon</i>, <i>Digitaria</i>, <i>Pennisetu</i> <i>Panicum</i>, <i>Brachiaria etc</i> 2.2 Describe their morphological features 2.3 Explain their ecological zones	- List major Nigerian range grasses: ✓ <i>Andropogon</i>, ✓ <i>Hyparrhenia</i>, ✓ <i>Cynodon</i>, ✓ <i>Digitaria</i>, ✓ <i>Pennisetu</i> ✓ <i>Panicum</i>, ✓ <i>Brachiaria etc</i> - Describe their morphological features - Explain their ecological zones	Grass taxonomy texts, LCD projector, textbooks, journals, internet, whiteboard, dichotomous and digital keys	- Identify Grasses and Legumes in field - Identify 10 Nigerian range grasses - Map pasture and range distribution across Nigerian zones	Guide students to: - Identify Grasses and Legumes in field - Identify 10 Nigerian range grasses - Map pasture and range distribution across their ecological zones	Pasture album, field site, ecological zone maps
GENERAL OBJECTIVE 3.0: Know Nigerian and exotic pasture and range legumes						
7-9	2.1 Highlight major Nigerian range legumes 2.2 Describe their morphological features 2.3 Explain their ecological zones	- Explain major Nigerian range legumes - Explain their morphological features - Describe their ecological zones	Legumes taxonomy texts, LCD projector, textbooks, journals, internet, whiteboard, dichotomous and digital keys	- Identify Legumes in field - Identify 10 Nigerian range legumes - Map legumes distribution across ecological zones	Guide students to: - Identify Legumes in field - Identify 10 Nigerian range legumes - Map legumes distribution across their ecological zones	Pasture album, field site, ecological zone maps
GENERAL OBJECTIVE 4.0: Know Nigerian and exotic browse species						
10-12	4.1 List the browse plants 4.2 Describe their	- Explain the browse plants - Discuss their	Browse taxonomy texts, LCD projector,	Identify ten Nigerian browse species	Guide students to: Identify ten Nigerian browse species Score	Pasture album, field site, ecological zone

	ecology and palatability 4.3 Describe the characteristics of browse trees (Faidherbia, Acacia, Prosopis, Leucaena, Gliricidia, Ficus) 4.4 Explain browse-quality assessment 4.5 Describe silvopasture potential	ecology and palatability • Explain the characteristics of browse trees (Faidherbia, Acacia, Prosopis, Leucaena, Gliricidia, Ficus) • Discuss browse-quality assessment • Explain silvopasture potential	textbooks, journals, internet, whiteboard, dichotomous and digital keys	• Score browse palatability • Assess browse quality (CP, tannin) • Map silvopasture opportunities	browse palatability • Assess browse quality (CP, tannin) • Map silvopasture opportunities	maps
GENERAL OBJECTIVE 5.0: Know digital plant identification tools						
13-15	5.1 Explain Artificial Intelligence (AI)-based plant ID apps (PlantNet, iNaturalist, Seek) 5.2 List herbarium specimens 5.3 Outline different digitization software. 5.4 Explain Global Bio-diversity Information Facility (GBIF) and online plant databases	• Discuss Artificial Intelligence (AI)-based plant ID apps (PlantNet, iNaturalist, Seek) • Explain herbarium specimens and digitization software • Discuss Global Bio-diversity Information Facility (GBIF) and online plant databases	Digital tools texts, LCD projector, textbooks, journals, internet, whiteboard,	• Use PlantNet / iNaturalist on 30 plants • Prepare herbarium specimens • Digitize herbarium specimens • Search GBIF for 10 range species	Guide students to: • Use AI based plants identification software • Prepare herbarium specimens • Digitize herbarium specimens • Search GBIF for 10 range species	Smartphones, herbarium press, lab PCs, digitization Software

COURSE ASSESSMENT:

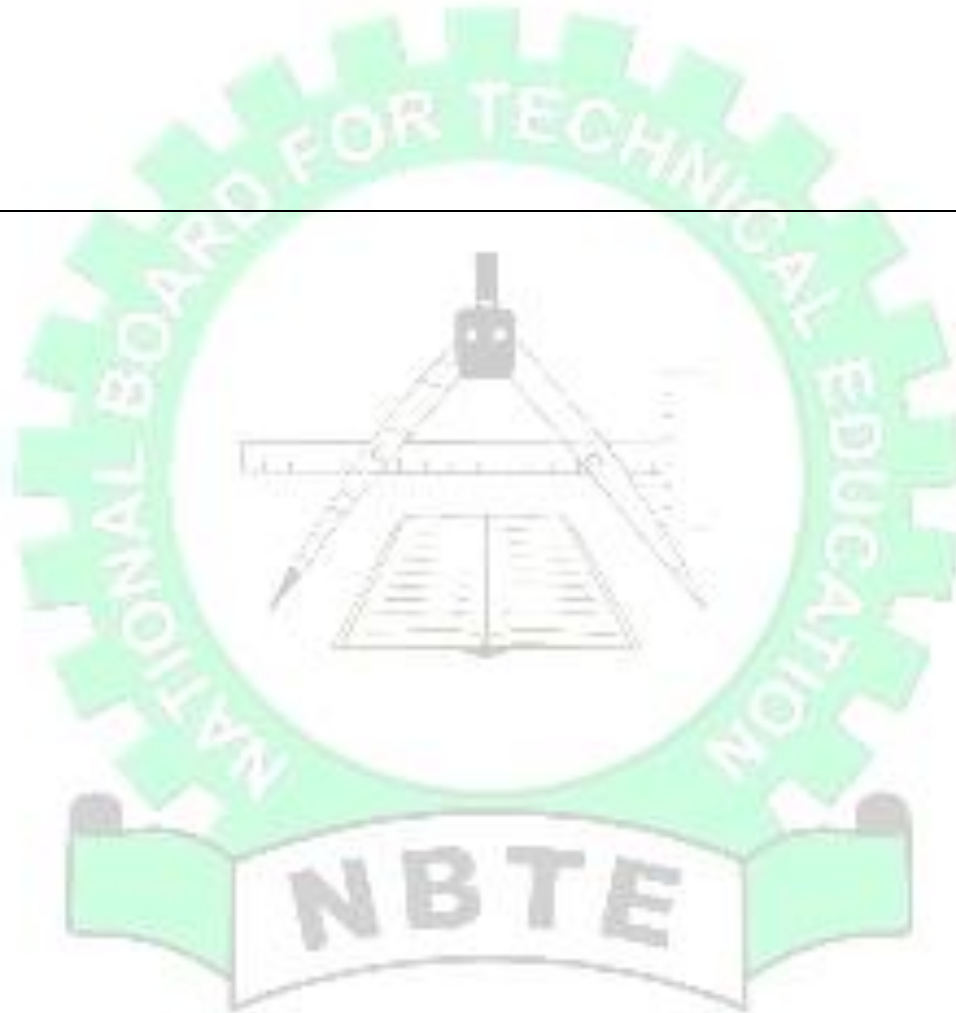
Course work: 10%

Test/Assignments: 10%

Practical: 40%

Examination: 40%

Total: 100%



PRINCIPLES OF RANGE ECOLOGY AND MANAGEMENT

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: PRINCIPLES OF RANGE ECOLOGY AND MANAGEMENT	COURSE CODE: PRM 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 range ecology, range condition assessment, and management of Nigerian rangelands.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know range-ecology foundations. 2.0 Understand range succession and dynamics. 3.0 Know range condition and trend assessment. 4.0 Know rangeland degradation and restoration. 5.0 Understand rangeland policy and Legislation.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: PRINCIPLES OF RANGE ECOLOGY & MANAGEMENT			COURSE CODE: PRM 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 skills in range ecology, range condition assessment, and management of Nigerian rangelands.						
GENERAL OBJECTIVE 1.0: Know range-ecology 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 ecosystem concepts (range as ecosystem) 1.2 List biotic and abiotic components of rangelands 1.3 Describe nutrient and water cycles 1.4 Explain Nigerian rangeland ecological zones (Sahel, Sudan, Guinea, Derived savannas)	- Discuss ecosystem concepts (range as ecosystem) - Explain biotic and abiotic components of rangelands - Explain nutrient and water cycles - Discuss Nigerian rangeland ecological zones (Sahel, Sudan, Guinea, Derived savannas)	Range ecology texts, LCD projector, textbooks, journals, internet, whiteboard	- Demonstrate ecosystem framework to rangeland - Map biotic/abiotic factors - Trace nutrient/water flow - Profile 4 Nigerian rangeland zones	Guide students to: - Develop ecosystem framework to rangeland - Map biotic/abiotic factors - Trace nutrient/water flow - Profile 4 Nigerian rangeland zones	Field site, ecological maps, charts
GENERAL OBJECTIVE 2.0: Understand range succession and dynamics						
4-6	2.1 Explain plant	Discuss plant	Range	Illustrate survey	Guide students to:	Field sites,

	succession (primary, secondary) 2.2 Explain range vegetation dynamics 2.3 Explain climax community concept 2.4 Explain state and transition (S&T) models	succession (primary, secondary) - Describe range vegetation dynamics - Discuss climax community concept - Explain Explain-and-transition (S&T) models	dynamics texts, LCD projector, textbooks, journals, internet, white board	succession on disturbed site - Track vegetation dynamics - Identify climax communities - Build Explain-and-transition (S&T) model	- Survey succession on disturbed site - Track vegetation dynamics - Identify climax communities - Build Explain-and-transition (S&T) model	survey tools, trackers, modeling equipment
GENERAL OBJECTIVE 3.0: Know range condition and trend assessment						
7-9	3.1 Explain range condition criteria 3.2 Explain species composition 3.3 Describe health indicators 3.4 Explain trend analysis (improvement/degradation)	- Discuss range condition criteria - Describe species composition - Explain health indicators - Discuss trend analysis (improvement/degradation)	Assessment texts, LCD projector, textbooks, journals, internet, white board	- Conduct range condition score - Analyze species composition (quadrats) - Identify health indicators - Assess range trend	Guide students to: - Conduct range condition score - Analyze species composition (quadrats) - Identify health indicator - Assess range trend	Quadrats, transect lines, datasheets, health indicators

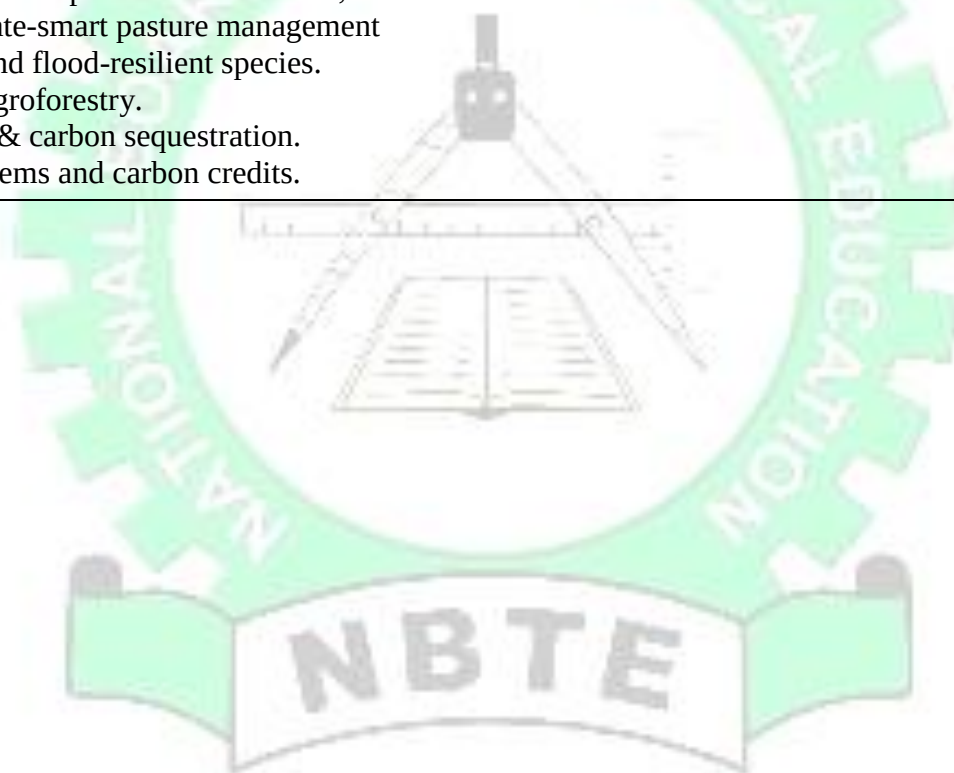
GENERAL OBJECTIVE 4.0: Know rangeland degradation and restoration						
10-12	4.1 Outline causes of degradation (overgrazing, burning, invasive species) 4.2 Explain soil-erosion and gully formation 4.3 Describe restoration techniques 4.4 Explain invasive species control (Striga, Eupatorium)	• Discuss degradation causes (overgrazing, burning, invasive species) • Describe soil-erosion and gully formation • Explain restoration techniques • Describe invasive species control (Striga, Eupatorium)	Degradation texts, LCD projector, textbooks, journals, internet, white board	• Survey degradation indicators • Map erosion/gully sites • Identify restoration techniques • Identify invasive species control	Guide students to: • Survey degradation indicators • Map erosion/gully sites • Identify restoration techniques • Identify invasive species control	Survey tools, restoration materials, maps
GENERAL OBJECTIVE 5.0: Understand rangeland policy and Legislation						
13-15	5.1 Outline Nigerian rangeland policy and Legislation 5.2 Describe pastoralist communities and rangeland tenure 5.3 Explain National Livestock Growth Acceleration Strategy (NL-GAS) 5.4 Explain community-based	• Discuss Nigerian rangeland policy • Explain pastoralist communities and rangeland tenure • Describe NL-GAS • Discuss community-based range management	Policy texts, LCD projector, textbooks, journals, internet, white board			

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



CLIMATE-SMART PASTURE AND RANGE MANAGEMENT

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: CLIMATE-SMART PASTURE AND RANGE MANAGEMENT	COURSE CODE: PRM 313	CONTACT HOURS: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is designed to equip students with the knowledge and skills of climate-smart pasture and range management		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know Principles of climate-smart pasture management 2.0 Know drought-tolerant and flood-resilient species. 3.0 Know silvopasture and agroforestry. 4.0 Know rotational grazing & carbon sequestration. 5.0 Know early-warning systems and carbon credits.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: CLIMATE-SMART PASTURE AND RANGE MANAGEMENT			COURSE CODE: PRM 313		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE: NIL		PRACTICAL: 1 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and skills of climate-smart pasture and range management.						
GENERAL OBJECTIVE 1.0: Know Principles of climate-smart pasture management						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 List Climate-Smart Agriculture (CSA) pillars for pasture 1.2 Describe climate change impacts on rangelands 1.3 Explain Nigerian climate variability and pasture vulnerability 1.4 Explain the Nigerian Climate framework 1.5 Explain Inter-governmental Panel on Climate Change (IPCC)	• Explain CSA pillars • Discuss climate impacts • Explain Nigerian climate variability and pasture • Discuss National Council on Climate change (NCCC) • Explain Nationally Determined Contribution (NDC) • Discuss National Adaptation Plan	CSA texts, LCD projector, textbooks			

	scenarios for Nigerian rangelands	(NAP) • Explain IPCC				
GENERAL OBJECTIVE 2.0: Know drought-tolerant and flood-resilient species						
4-6	2.1 List drought-tolerant pasture species 2.2 Explain flood-resilient fodder) 2.3 Describe species selection by ecological zone 2.4 Explain seed sourcing for climate-resilient varieties	- Enumerate drought-tolerant pasture species (Cenchrus ciliaris, Andropogon gayanus, Stylosanthes hamata) - Discuss flood-resilient fodder (Echinochloa, Brachiaria, Humidicola) - Explain species selection by ecological zone - Discuss seed sourcing for climate-resilient varieties	Species texts, LCD projector	- Establish drought-tolerant plots - Establish flood-resilient plots - Match species to ecological zones - Source climate-resilient seeds	Guide students to: - Establish drought-tolerant plots - Establish flood-resilient plots - Match species to ecological zones - Source climate-resilient seeds	Seeds, field plots, seed catalogues, genebank herbarium
GENERAL OBJECTIVE 3.0: Know silvopasture and agro-forestry						
7-9	3.1 Explain silvopasture principles 3.2 Describe Nigerian silvopasture species (Faidherbia,	- Discuss silvopasture principles - Discuss Nigerian silvopasture species	Silvopasture texts, LCD projector, textbooks, journals, internet	- Establish silvopasture demonstration plots - Plant Faidherbia/Le	Guide students to: - Establish silvopasture demonstration plots - Plant Faidherbia/Leucaena/Gliricidia	Tree seedlings, field plots, charts, herbarium, genebank

	Leucaena, Gliricidia) 3.3 Explain tree-pasture-livestock integration 3.4 Describe alley farming/alley cropping with fodder trees	(Faidherbia, Leucaena, Gliricidia) • Discuss tree-pasture-livestock integration • Discuss alley farming/alley cropping with fodder trees		ucaena/Gliricidia • Design integrated layout • Set up alley-farming plots	• Design integrated layout • Set up alley-farming plots	
GENERAL OBJECTIVE 4.0: Know rotational grazing & carbon sequestration						
10-12	4.1 Explain rotational grazing for carbon benefits 4.2 Describe soil carbon measurement 4.3 Explain holistic-planned grazing for carbon 4.4 Describe pasture-soil carbon stocks 4.5 Describe biochar 4.6 Explain the benefits of biochar for carbon sequestration 4.7 Describe biogas	• Discuss rotational grazing for carbon benefits • Explain soil carbon measurement • Discuss holistic-planned grazing for carbon • Explain pasture-soil carbon stocks • Explain biochar • Discuss the benefits of biochar for carbon sequestration • Explain biogas	Carbon texts, LCD projector	• Design rotational grazing for C • Sample soil for C analysis • Apply holistic grazing demo • Compute pasture-soil Carbon stocks • Demonstrate the production of biochar • Demonstrate biogas production	Guide students to: Design rotational grazing for C • Sample soil for C analysis • Apply holistic grazing demo • Compute pasture-soil Carbon stocks • Demonstrate the production of biochar • Demonstrate biogas production	Grazing plots, soil augers, Carbon analysis access, biogas chamber and pit
GENERAL OBJECTIVE 5.0: Know early-warning systems and carbon credits						

13-15	5.1 Describe pasture early-warning systems (NDVI, drought monitor) 5.2 Explain carbon-credit/Verra/Gold Standard for rangelands 5.3 Describe Measurement, Reporting, Verification (MRV) for carbon (IPCC) 5.4 Explain climate finance for pastoralists	• Explain pasture early-warning systems (NDVI, drought monitor) • Discuss carbon-credit / Verra / Gold Standard for rangelands • Explain Measurement, Reporting, Verification (MRV) for carbon (IPCC) • Discuss climate finance for pastoralists	EWS / climate finance texts, LCD projector	• Apply pasture EWS • Profile Verra carbon-credit standards • Apply MRV for rangeland Carbon measurement • Identify climate finance windows	• Apply pasture EWS • Profile Verra carbon-credit standards • Apply MRV for rangeland Carbon measurement • Identify climate finance windows	NDVI data, Verra docs, finance windows
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

RANGE ANIMAL NUTRITION AND FORAGE QUALITY

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: RANGE ANIMAL NUTRITION AND FORAGE QUALITY	COURSE CODE: PRM 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 students with knowledge and skills of range animal nutrition with emphasis on forage quality under Nigerian pastoral conditions.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know ruminant nutrition foundations. 2.0 Know forage quality analysis. 3.0 Know forage and pasture preference. 4.0 Know supplementation and feed evaluation. 5.0 Know nutrition based on physiological needs 6.0 Know feed formulations 7.0 Know ration evaluation and economic analysis		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: RANGE ANIMAL NUTRITION AND FORAGE QUALITY			COURSE CODE: PRM 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 students with knowledge and skills of range animal nutrition with emphasis on forage quality under Nigerian pastoral conditions.						
GENERAL OBJECTIVE 1.0: Know ruminant nutrition foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-2	1.1 Describe ruminant digestive anatomy 1.2 Explain nutrient classes. 1.3 Describe Rumen microbes 1.4 Explain feed intake and palatability 1.5 Describe nutrient requirements: maintenance, growth, lactation, pregnancy	• Discuss ruminant digestive anatomy • Discuss classes of nutrients, • Explain rumen microbes • Discuss feed intake and palatability. • Explain nutrient requirements of various range animals	Nutrition texts, LCD projector, marker board, charts	• Dissect ruminant gut (in lab or abattoir visit) • Identify nutrient sources • Measure intake under pasture conditions • Compute nutrient requirements (NRC tables)	Guide students to: • Dissect ruminant gut. • Identify nutrient sources. • Measure intake under pasture conditions • Compute nutrient requirements (NRC tables)	Ruminant gut specimens, National Research Council (NRC) tables, intake tools Farmland Plant samples Field visits/ trips
GENERAL OBJECTIVE 2.0: Know forage quality analysis						

3-4	2.1 Describe proximate analysis 2.2 Describe detergent fibre analysis. 2.3 Explain in-vitro and in-vivo digestibility 2.4 Explain rapid quality assessment	• Explain proximate analysis • Discuss detergent fibres analysis • Discuss digestibility • Discuss rapid quality assessment (Near-infrared spectroscopy-NIRS)	Forage quality texts, LCD projector, marker board, Charts.	• Conduct proximate analysis • Conduct detergent fibre analysis • Conduct digestibility • Browse NIRS for rapid quality assessment	Guide students to: • Conduct proximate analysis • Conduct detergent fibre analysis • Conduct digestibility • Browse NIRS for rapid quality assessment	Proximate lab kit, NDF / ADF kit, NIRS access
GENERAL OBJECTIVE 3.0: Know forage and pasture preference						
5-6	3.1 Explain grazing behavior and selection 3.2 Describe intake measurement on pasture (n-alkanes, fistula) 3.3 Explain diet selection by livestock species 3.4 Describe seasonal variation in pasture intake	• Discuss grazing behavior and selection • Explain intake measurement • Discuss species selection on pasture • Explain seasonal variation in pasture intake	Pasture intake texts, LCD projector, marker board, Charts.	• Observe grazing behaviour • Access Intake-measurement methods • Identify selection by cattle vs goats vs sheep • Track seasonal intake variation	Guide students to: • Observe grazing behavior • Access Intake-measurement methods • Identify selection by cattle vs goats vs sheep • Track seasonal intake variation	Field site, observation tools, intake markers
GENERAL OBJECTIVE 4.0: Know supplementation and feed evaluation						
7-8	4.1 Explain protein supplementation 4.2 Explain energy supplementation	• Discuss protein supplementation on pasture • Discuss energy	Supplementation texts, LCD projector Whiteboard,	• Identify protein supplements • Identify energy supplements	Guide students to: • Identify protein supplements • Identify energy	Supplements, lick blocks, livestock pens, Concentrate

	4.3 Explain vitamin-mineral supplementation 4.4 Describe concentrate-pasture integration (Total Mixed Ration-TMR)	• supplementation • Explain mineral supplementation. • Explain concentrate-pasture integration	Marker, Charts	• Identify mineral blocks and salt licks • Integrate concentrate with pasture	supplements • Identify mineral blocks and salt licks • Integrate concentrate with pasture application	
GENERAL OBJECTIVE 5.0: Know nutrition based on physiological needs						
9-10	5.1 Explain nutrition for lactation (dairy cattle) 5.2 Describe nutrition for growth and finishing (beef) 5.3 Describe nutrition for small ruminants on pasture 5.4 Explain nutrition for camels and equine	• Discuss nutrition for lactation. • Discuss nutrition for growth and finishing. • Explain nutrition for small ruminants on pasture • Discuss nutrition for camels and equine	Special nutrition texts, Feedipedia LCD projector, marker board, Charts.	• Prepare dairy lactation ration • Prepare beef finishing ration • Prepare small-ruminant pasture diet • Prepare camel and equine ration	Guide students to: • Prepare dairy lactation ration • Prepare beef finishing ration • Prepare small-ruminant pasture diet • Prepare camel and equine ration	Ration templates, NRC tables, Feeds
General Objective 6.0: Know feed formulations						
11-12	6.1 Explain various ration formulation 6.2 Describe animal nutrient requirement 6.3 Describe nutrient composition of Nigerian feed-ingredient	• Discuss various ration balancing (Pearson square, trial-and-error) • Explain animal nutrient requirement	Feed formulation texts, LCD projector, Food and Agricultural Organization (FAO, Feedipedia)	• Apply Pearson square to 5-ingredient • Browse Feedipedia / NRC for 20 ingredients • Profile 10 Nigerian feed	Guide students to: • Apply Pearson square to 5-ingredient • Profile 10 Nigerian feed ingredients • Apply linear-programming concept	Calculators, lab PCs, internet, feed nutrient composition table, nutrient requirement table, least-cost software

	composition 6.4 Explain least-cost ration formulation method	(NRC), Feedipedia) • Discuss Nigerian feed-ingredient composition • Explain least-cost ration formulation method: ✓ Concept5 / Format International ✓ BFM (Best Feed Management) ✓ Brill / Adifo Bestmix ✓ Excel solver		ingredients • Apply linear-programming concept	• Carryout least-cost ration formulation Method using: ✓ Concept5 / Format International ✓ BFM (Best Feed Management) ✓ Brill / Adifo Bestmix ✓ Excel solver	
General Objective 7.0: Know ration evaluation and economic analysis						
13-15	7.1 Describe ration cost analysis 7.2 Describe ration nutrient adequacy check 7.3 Explain software-output interpretation 7.4 Describe farm-level ration commercialization	• Discuss ration cost analysis • Discuss ration nutrient adequacy check • Discuss software-output interpretation • Explain farm-level ration commercialization	Ration evaluation texts, LCD projector	• Compute ration cost / kg gain • Check nutrient adequacy • Interpret software outputs • Build farm-level commercial ration plan	Guide students to • Compute ration cost / kg gain • Check nutrient adequacy • Interpret software outputs • Build farm-level commercial ration plan	Cost data, software outputs, commercial templates

COURSE ASSESSMENT:

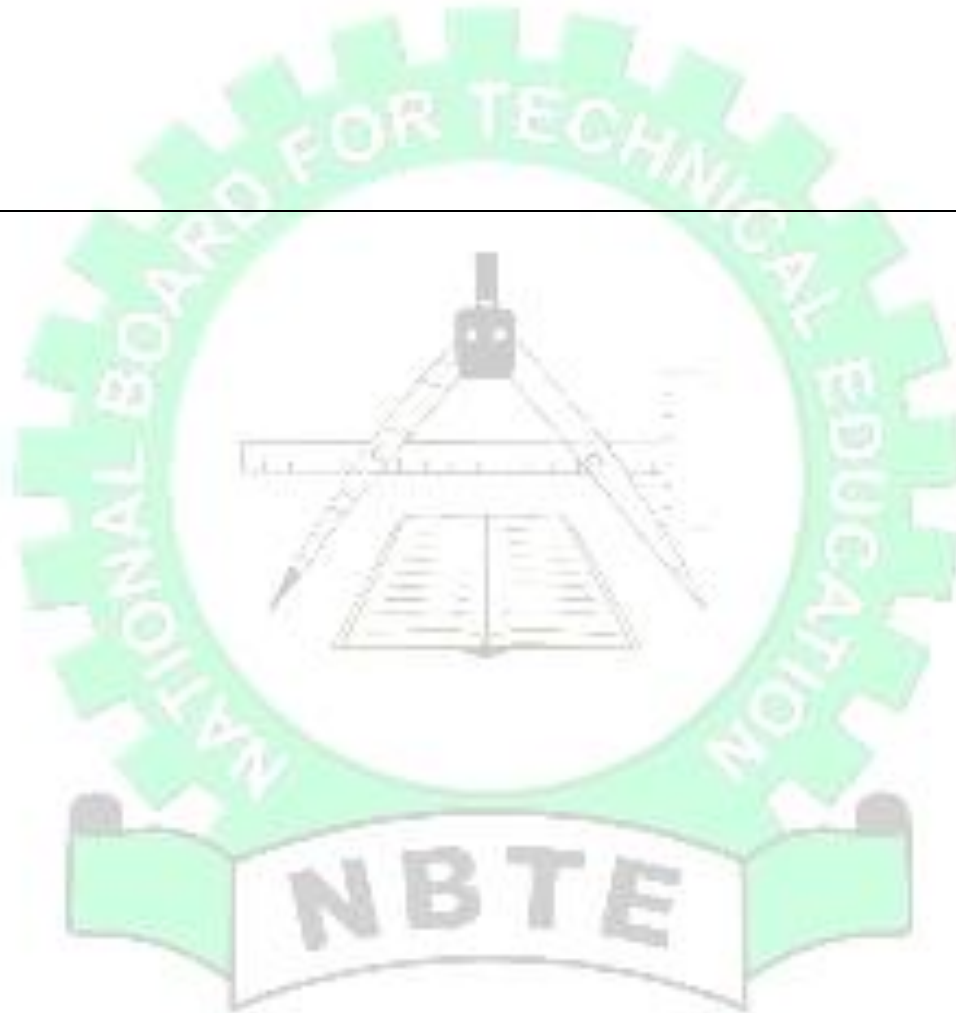
Course work: 10%

Test/Assignments: 10%

Practical: 40%

Examination: 40%

Total: 100%



GIS, REMOTE SENSING AND DRONE FOR PASTURE MONITORING

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: GIS, REMOTE SENSING AND DRONE FOR PASTURE MONITORING	COURSE CODE: PRM 315	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 2 HOURS/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is designed to equip students with knowledge and skills of Geographic Information System (GIS), remote sensing (RS) and drone for digital pasture and range monitoring.		
GENERAL OBJECTIVES: On completion of this course, the students should: 1.0 Know Geographic Information System (GIS) foundations for pasture. 2.0 Know how to use Normalized Difference Vegetation Index (NDVI) 3.0 Know drone-based range monitoring. 4.0 Know Geographical Positioning System (GPS) in livestock virtual fencing 5.0 Know pasture-and-range dashboards and decision support.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: GIS, REMOTE SENSING AND DRONE FOR PASTURE MONITORING			COURSE CODE: PRM 315		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills on Geographic Information System (GIS), remote sensing and drone for digital pasture and range monitoring.						
GENERAL OBJECTIVE 1.0: Know Geographic Information System (GIS) foundations for pasture						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Describe GIS concepts and components 1.2 Differentiate vector and raster data 1.3 Describe coordinate systems and projections for Nigeria 1.4 Describe Nigerian rangeland-mapping data sources	● Explain GIS concepts ● Explain data types ● Explain coordinate system and projections ● Explain data sources	GIS texts, LCD projector, textbooks, journals, internet, whiteboard,	● Install QGIS ● Conduct vector and raster operations ● Apply Nigerian projection systems ● Use Nigerian rangeland datasets	Guides students to: ● Install QGIS Software ● Perform operations with QGIS software operations ● Coach projections ● Coach browsing	Lab PCs, QGIS Software, Nigerian datasets
GENERAL OBJECTIVE 2.0: Know the use of Normalized Difference Vegetation Index (NDVI)						
4-6	2.1 Describe satellite imagery (Sentinel, Landsat, MODIS) 2.2 Explain NDVI and	● Explain satellite imagery ● Discuss NDVI	Remote sensing texts, LCD projector, textbooks,	● Download and process Sentinel/Landsat imagery	Guide Students to ● Download/process ● Perform NDVI and VDV	Lab PCs, satellite data, processing software

	VDMI for pasture biomass estimation 2.3 Describe pasture-condition mapping with NDVI and VDMI 2.4 Describe forage availability forecasting	and VDMI • Explain condition mapping • Discuss forecasting	journals, internet, whiteboard,	• Compute NDVI and VDMI for pasture • Build pasture-condition maps from NDVI and VDMI • Forecast forage availability	• map • forecast	
GENERAL OBJECTIVE 3.0: Know drone-based range monitoring						
7-9	3.1 List drone/UAV components and flight planning 3.2 Describe drone-based pasture biomass assessment 3.3 Explain drone-based livestock counting 3.4 Describe drone-based range condition/degradation assessment	• Explain drone components and flight planning • Explain biomass assessment • Discuss livestock counting • Explain condition assessment	Drone texts, LCD projector, textbooks, journals, internet, whiteboard,	• Inspect drone and plan flight • Conduct drone biomass assessment • Conduct drone livestock count • Conduct drone range assessment	Guides students to: • Inspect drone and plan flight • Conduct drone biomass assessment • Conduct drone livestock count • Conduct drone collars and range assessment	Drone, multispectral sensor, flight-planning software
GENERAL OBJECTIVE 4.0: Know Global Positioning System (GPS) in livestock virtual fencing						
10-12	4.1 Describe GPS/Global Navigation Satellite System (GNSS) livestock tracking collars and bands 4.2 Describe livestock movement analytics	• Explain GPS collars and bands • Explain livestock movement analytics	GPS / VF texts, LCD projector, journals, internet, whiteboard	• Install GPS collar (demo) • Analyze livestock movement data • Browse virtual-fencing platforms • Demonstrate solar	Guides students to: • Install GPS collar • Perform analytics • Browse virtual fencing platforms • Demonstrate solar monitoring	GPS collars, lab PCs, virtual-fencing docs

	4.3 Explain virtual fencing concepts (NoFence, Vence, Halter) 4.4 Explain solar-powered remote livestock monitoring	- Describe virtual fencing - Discuss solar monitoring		monitoring		
GENERAL OBJECTIVE 5.0: Know pasture-and-range dashboards and decision support						
13-15	5.1 List pasture-monitoring dashboards 5.2 Highlight Web-GIS/online pasture portals 5.3 Outline pasture decision-support applications 5.4 Explain integration of GIS/RS/drone/GPS data	- Explain Pasture – monitoring dashboards - Explain Web-GIS - Enumerate pasture decision - support applications - Discuss integration of GIS/RS/drone/ GPS data	Decision support texts, LCD projector, journals, internet, whiteboard	- Build pasture-monitoring dashboard - Build web-GIS portal - Apply decision-support apps - Integrate GIS/RS/ drone/GPS data	Guide students to; - Build pasture-monitoring dashboard - Build web-GIS portal - Use decision-support applications - Integrate GIS/RS/drone/GPS data	Lab PCs, dashboard tools, integrated datasets
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

PRINCIPLES OF PASTURE IRRIGATION

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: PRINCIPLES OF PASTURE IRRIGATION	COURSE CODE: PRM 316	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with practical skills and knowledge to integrate the principles, practices of producing forage under irrigated conditions.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the fundamentals of pasture irrigation in Nigeria 2.0 Know the classification of irrigation methods 3.0 Understand the agronomy of major Fodder crops under irrigation 4.0 Know appropriate field establishment practices under irrigated conditions 5.0 Understand pasture and soil management under irrigation 6.0 Understand the production economics of major Fodder crops grown under irrigation in Nigeria		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: PRINCIPLES OF PASTURE IRRIGATION			COURSE CODE: PRM 316		CONTACT HOURS: 3HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with practical skills and knowledge to integrate the principles, practices of producing forage under irrigated conditions.						
General Objective 1.0: Understand the fundamentals of irrigation agronomy in Nigerian agriculture						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define pasture, forage, and pasture irrigation. 1.2 Explain the historical development of irrigation worldwide. 1.3 Describe the historical development of irrigation in Nigeria. 1.4 Explain the importance of irrigation to sustainable pasture	•Explain the scope of pasture irrigation using local examples. •Discuss the history with case studies (e.g Egyptian civilization, Nigerian river basins). •Discuss the importance of irrigation using statistics from FAO and NBS. •Compare rain-fed vs	Textbooks, LCD projector, Whiteboard, Slides FAO and NBS statistics, Drought-impact report Etc.	•Visit one irrigation scheme •Document scheme history, command area, and water source on a field sheet. •Interview scheme operators on operations and benefits. •Compile field report with photographs.	Guide students to; •Visit one irrigation scheme •Document scheme history, command area, and water source on a field sheet. •Interview scheme operators on operations and benefits. •Compile field report with photographs.	Field notebooks, Cameras, Scheme map, Report templates Case studies, Calculators, Scheme records Etc.

	production, (year-round production, drought escape, intensification) 1.5 Differentiate between rain-fed and irrigated pasture. 1.6 Explain the limitations of irrigation (soil salinity, sodicity waterlogging, capital cost, equipment maintenance). 1.7 Describe irrigation as a tool for climate adaptation.	irrigated pasture using data. • Discuss benefits with examples of year-round pasture production. • Discuss limitations with case examples (e.g., salinization in Jigawa, waterlogging in Kebbi etc). ▪ Link irrigation to climate resilience (e.g., drought escape during dry spells).				
GENERAL OBJECTIVE 2.0: Know the classification of irrigation methods						
4-6	2.1 Classify irrigation methods: - surface (basin, border, furrow), - pressurized (sprinkler, drip) - sub-surface. 2.2 Explain factors influencing choice of irrigation method (, soil, topography, water source, capital, labour). 2.3 Describe water-use	• Explain irrigation methods: surface (basin, border, furrow), pressurized (sprinkler, drip) sub-surface. • Explain factors influencing choice of irrigation method (, soil, topography,	LCD projector, PowerPoint slides, Whiteboard, Markers, Hydrological maps, FAO-56 efficiency tables, Water quality guidelines, Textbooks Etc.	• Inspect samples or models of each irrigation method on the demonstration plot. • Conduct a comparison matrix scoring methods against five chosen factors. • Measure water flow rate from	Guide students to: • Inspect samples or models of each irrigation method on the demonstration plot. • Conduct a comparison matrix scoring methods against five chosen factors. • Measure water	Demo plot with surface, Sprinkler, Drip kits, Pipes, Stopwatch, Bucket, Smart controller kit, Solenoid valve, GPS device, EC meter, PH meter, Sample bottles, Borehole site

	efficiency across methods. 2.4 Describe surface water sources (rivers, lakes, reservoirs, dams). 2.5 Explain groundwater sources (shallow wells, tube wells, boreholes). 2.6 Explain alternative sources (rainwater harvesting, treated wastewater). 2.7 Explain water quality parameters for irrigation (EC, pH, SAR). 2.8 Explain smart-irrigation methods as modern evolution.	water source, capital, labour). • Discuss water-use efficiency across methods. • Discuss surface water sources (rivers, lakes, reservoirs, dams). • Discuss groundwater sources (shallow wells, tube wells, boreholes). • Discuss alternative sources (rainwater harvesting, treated wastewater). • Explain water quality parameters for irrigation (EC, pH, SAR). • Discuss smart-irrigation methods as modern evolution.		each method using a stopwatch and bucket. • Demonstrate a basic smart-irrigation controller turning a solenoid valve. • Map all water sources within 5 km radius of the institution using GPS. • Visit a borehole and document depth, yield, and pump capacity. • Collect three water samples and test EC and pH using portable meters. • Inspect and test EC and pH meters; record and interpret water quality results.	flow rate from each method using a stopwatch and bucket. • Demonstrate a basic smart-irrigation controller turning a solenoid valve. • Map all water sources within 5 km radius of the institution using GPS. • Visit a borehole and document depth, yield, and pump capacity. • Collect three water samples and test EC and pH using portable meters. • Inspect and test EC and pH meters; record and interpret water quality results.	Etc.
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GENERAL OBJECTIVE 3.0: Understand the agronomy of major Fodder crops under irrigation

7-9	3.1 Classify major Fodder crops (cereals, legume). 3.2 Describe the origin, history, and adaptation of key Fodder crops to Nigerian conditions 3.3 Outline the producing areas of major Fodder crops in Nigeria. 3.4 Explain the principles of fertilizer application under irrigation.	• Explain major Fodder crops (cereals, legume). • Discuss the origin, history, and adaptation of key Fodder crops to Nigerian conditions. • Explain the producing areas of major Fodder crops in Nigeria. • Discuss the principles of fertilizer application under irrigation.	Projector, Fodder crops classification charts, Maps of Nigeria (agricultural zones), Fertilizer calculation tables, , Textbooks E-books.	• Identify seeds, seedlings, and mature plant structures of Fodder crops • Calculate fertilizer application rate for a 0.5-ha plot of a chosen plant. • Inspect a fertigation injector and identify all parts. • Design a 3-crop annual rotation plan for a 1-ha irrigated plot. • Apply NPK fertilizer to a demonstration plot following calculated rate.	• Identify seeds, seedlings, and mature plant structures of Fodder crops • Calculate fertilizer application rate for a 0.5-ha plot of a chosen plant. • Inspect a fertigation injector and identify all parts. • Design a 3-crop annual rotation plan for a 1-ha irrigated plot. • Apply NPK fertilizer to a demonstration plot following calculated rate.	Seed samples Seedlings, Hand lenses, Fertiliser (NPK), Fertigation injector, Measuring scale, Demo plot, Paper for rotation plans, Calculators Etc.
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GENERAL OBJECTIVE 4.0: Know appropriate field establishment practices under irrigated conditions

10-12	4.1 Explain the principles of primary and secondary tillage for irrigated plots.	• Discuss tillage operations and their effect on soil tilth. • Explain land levelling for uniform water	Projector, Tillage diagrams, Seed rate calculation	• Carry out primary and secondary tillage on a 0.25-ha plot. • Level a plot using	Guide students to: • Supervise field tillage operations. • Demonstrate hand tool and tractor-	Tractor Disc plough, Harrow, Hand hoes, Rakes, levelling
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	4.2 Explain the importance of land levelling for surface irrigation. 4.3 Explain correct seed rate, spacing, and planting depth for major irrigated grasses and legumes. 4.4 Describe direct seeding and transplanting. 4.5 Explain common weeds in irrigated farms and their effects on yield. 4.6 Explain the methods of weed control (cultural, mechanical, biological, chemical).	distribution. - Describe seed rate calculations with worked examples. - Discuss the advantages and disadvantages of direct seeding and transplanting - Explain weed identification using a weed album. - Discuss Integrated Weed Management (IWM) principles.	tables, Crop spacing charts, Weed album, IWM charts, textbooks E-book Etc.	simple methods (spirit level/water tube) and form ridges/beds. - Calculate seed rate for a 0.25-ha plot. - Prepare a nursery bed and transplant seedlings. - Identify and collect common weeds from the field to start a weed album. - Carry out mechanical weed control (hand hoeing) on the demo plot.	drawn implement - Calculate seeds - Demonstrate nursery bed preparation and transplanting. - Collect weed collection and identify it. - Supervise manual weeding.	tools, Measuring tape, Pegs, String, Seeds, Nursery site, Watering cans, Weed album materials, Demo plot (0.25 ha) Etc.
GENERAL OBJECTIVE 5.0: Understand Pasture and soil management under irrigation.						
11-13	5.1 Explain rotational grazing principles and benefits in irrigated systems. 5.2 Describe the effects of	- Describe rotational grazing benefits (pest break, soil health, nitrogen fixation). - Discuss soil health challenges under irrigation (salinity,	Projector, Slides, IPM charts, Fertilizer calculation tables, Crop rotation	- Design a 3-year rotational grazing plan for a 1-ha irrigated farm. - Compare soil structure in a well-managed	Guide students to: - Design a 3-year rotational grazing plan for a 1-ha irrigated farm. - Compare soil	Hand hoes, Weed album materials (paper, glue, samples), Knapsack sprayer, PPEs Pesticides

	irrigation on soil health (salinity, waterlogging, and compaction). 5.3 Explain the principles of Integrated Pest Management (IPM). 5.4 Explain the principles of fertilizer application under irrigation (basal vs. top-dressing). 5.5 Identify the problems associated with fertilizer use (e.g., salinity, leaching).	waterlogging, compaction). ● Explain the IPM concept (cultural, biological, chemical, physical controls). ● Explain nutrient management, fertilizer types (NPK, urea), and application methods. ● Discuss fertigation and problems like salinity and leaching.	diagrams, Textbooks, Whiteboard markers Etc.	plot versus a degraded or waterlogged area. ● Demonstrate the safe mixing and application of a pesticide using a knapsack sprayer. ● Calculate and apply basal fertilizer (NPK) to the demo plot based on recommended rate. ● Demonstrate the operation of a fertigation injector.	structure in a well-managed plot versus a degraded or waterlogged area. ● Demonstrate the safe mixing and application of a pesticide using a knapsack sprayer. ● Calculate and apply basal fertilizer (NPK) to the demo plot based on recommended rate. ● Demonstrate the operation of a fertigation injector.	(sample/demonstration), NPK fertilizer, Measuring scale, Demo plot, Fertigation injector Drip kit Etc.
GENERAL OBJECTIVE 6.0: Understand the production economics of major Fodder crops grown under irrigation						
14-15	6.1 Describe the life cycle of a key Fodder crops from planting to harvest. 6.2 Describe the yield capacity, profitability, and	Describe the life cycle of a key Fodder crops from planting to harvest. Describe the yield capacity, profitability, and economic importance of Fodder crops. Discuss challenges facing	Projector, Slides, Fodder crops life cycle diagrams, Value chain charts, Yield and cost	● Prepare a flow chart or short presentation summarizing the production cycle, inputs, and major costs/revenues for a chosen Fodder	Guide students to: ● Prepare a flow chart or short presentation summarizing the production cycle, inputs, and major	Guest speaker Internet access, Library, Chart paper, Markers, Laptops, Presentation software,

	economic importance of Fodder crops. 6.3Discuss challenges facing Pasture production under irrigation	Pasture production under irrigation	data tables.	crops ● Present findings to the class and participate in a group Discussion on the economic importance of Fodder crops.	costs/revenues for a chosen Fodder crop. ● Present findings to the class and participate in a group Discussion on the economic importance of Fodder crops.	Whiteboard Etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



PASTURE-BASED LIVESTOCK HUSBANDRY

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: PASTURE-BASED LIVESTOCK HUSBANDRY	COURSE CODE: PRM 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 on modern pasture-based livestock husbandry, five-domain welfare standards, low-stress handling and identification of tropically-adapted Nigerian breeds.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know Nigerian tropical livestock breeds. 2.0 Know animal welfare framework. 3.0 Know livestock handling and restraint. 4.0 Know selection and breeding indices. 5.0 Understand housing and pasture-based husbandry.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: PASTURE-BASED LIVESTOCK HUSBANDRY			COURSE CODE: PRM 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 of on modern pasture-based livestock husbandry, five-domains welfare standards, low-stress handling and identification of tropically-adapted Nigerian breeds.						
GENERAL OBJECTIVE 1.0: Know Nigerian tropical livestock breeds						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain Nigerian cattle breeds 1.2 Explain Nigerian sheep breeds 1.3 Explain Nigerian goat breeds 1.4 Describe the features of camels and donkeys 1.5 Describe Nigerian Micro- livestock	• Illustrate Nigerian cattle breeds with charts and local examples. • Clarify Nigerian sheep breeds through guided questioning. • Relate Nigerian goat breeds to pasture and range field situations. • Explain the features of camels and donkeys. • Review responses on Nigerian Micro-	Breed texts, LCD projector, marker board, Charts	• Identify 7 Nigerian cattle breeds • Identify 4 Nigerian sheep breeds • Identify 4 Nigerian goat breeds • Identify camels and donkey breeds	• Demonstrate 7 Nigerian cattle breeds with relevant tools and field examples. • Supervise guided practice on 4 Nigerian sheep breeds. • Provide checklists or templates for 4 Nigerian goat breeds. • Monitor performance and correct errors on camels and donkey	Live animal demo, breed images, breed cards

		livestock and correct misconceptions.			breeds.	
GENERAL OBJECTIVE 2.0: Know animal welfare framework						
4-6	2.1 Explain five domains of welfare (nutrition, environment, health, behaviour, mental Explain) 2.2 Describe welfare assessment tools (Welfare Quality protocol) 2.3 Explain Nigerian welfare context 2.4 Explain international welfare standards (OIE/WOAH)	• Illustrate five domains of welfare (nutrition, environment, health, behaviour, mental Explain) with charts and local examples. • Clarify welfare assessment tools (Welfare Quality protocol) through guided questioning. • Relate Nigerian welfare context to pasture and range field situations. • Discuss international welfare standards (OIE/WOAH).	Welfare texts, LCD projector, marker board, Charts.	• Identify 5 domains to 1 herd • Perform Welfare Quality assessment • Identify Nigerian welfare context • Browse OIE / WOAHP welfare standards	• Demonstrate 5 domains to 1 herd with relevant tools and field examples. • Supervise guided practice on Welfare Quality assessment. • Provide checklists or templates for Nigerian welfare context. • Monitor performance and correct errors on OIE / WOAHP welfare standards.	Welfare assessment forms, herds, OIE docs
GENERAL OBJECTIVE 3.0: Know livestock handling and restraint						
7-9	3.1 -	• Illustrate animal-behavior and stress responses with charts and local	Handling texts, LCD projector, marker board, Charts.	• Examine behavior and stress signs • Identify low-stress handling	• Demonstrate behavior and stress signs with relevant tools and field	Live animals, handling facilities

		examples. • Clarify low-stress handling principles through guided questioning. • Relate handling-facility design (chutes, races, crowding pens) to pasture and range field situations. • Discuss handling for Artificial Insemination (AI), vaccination, dehorning.		• Inspect handling facilities • Identify handling procedures	examples. • Supervise guided practice on low-stress handling. • Provide checklists or templates for handling facilities. • Monitor performance and correct errors on handling procedures.	
GENERAL OBJECTIVE 4.0: Know selection and breeding indices						
10-12	4.1 Describe selection criteria (growth, milk, reproduction) 4.2 Explain selection indices and Estimated Breeding Value (EBVs) 4.3 Explain Nigerian breeding programmes 4.4 Describe community-based breeding 4.5 Explain breeding	• Illustrate selection criteria (growth, milk, reproduction) with charts and local examples. • Clarify selection indices and Estimated Breeding Value (EBVs) through guided questioning. • Relate Nigerian breeding programmes to	Breeding texts, LCD projector, marker board, Charts.	• Identify selection criteria • Compute simple selection index • Inspect breeding programmes • Identify community-based breeding	Demonstrate selection criteria with relevant tools and field examples. • Supervise guided practice on simple selection index. • Provide checklists or templates for breeding programmes. • Monitor performance and correct errors on	Performance data, indices templates

	records	pasture and range field situations. • Discuss community-based breeding. • Review responses on breeding records and correct misconceptions.			community-based breeding.	
GENERAL OBJECTIVE 5.0: Understand housing and pasture-based husbandry						
13-15	5.1 Explain housing for pasture-based systems (shade, kraal, milking parlour) 5.2 Explain sources of portable water provision (boreholes, troughs, dams) 5.3 Describe identification (ear tags, RFID, branding) 5.4 Explain record keeping (digital and manual)	• Illustrate housing for pasture-based systems (shade, kraal, milking parlour) with charts and local examples. • Clarify sources of portable water provision (boreholes, troughs, dams) through guided questioning. • Relate identification (ear tags, RFID, branding) to pasture and range field situations. • Discuss record keeping (digital	Husbandry texts, LCD projector, marker board, Charts.	• Design pasture-based housing • Set up water provision • Identify identification methods • Maintain herd records (digital app + manual)	• Demonstrate pasture-based housing with relevant tools and field examples. • Supervise guided practice on up water provision. • Provide checklists or templates for identification methods. • Monitor performance and correct errors on herd records (digital app + manual).	Housing materials, ID tools, recording app

		and manual).				
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



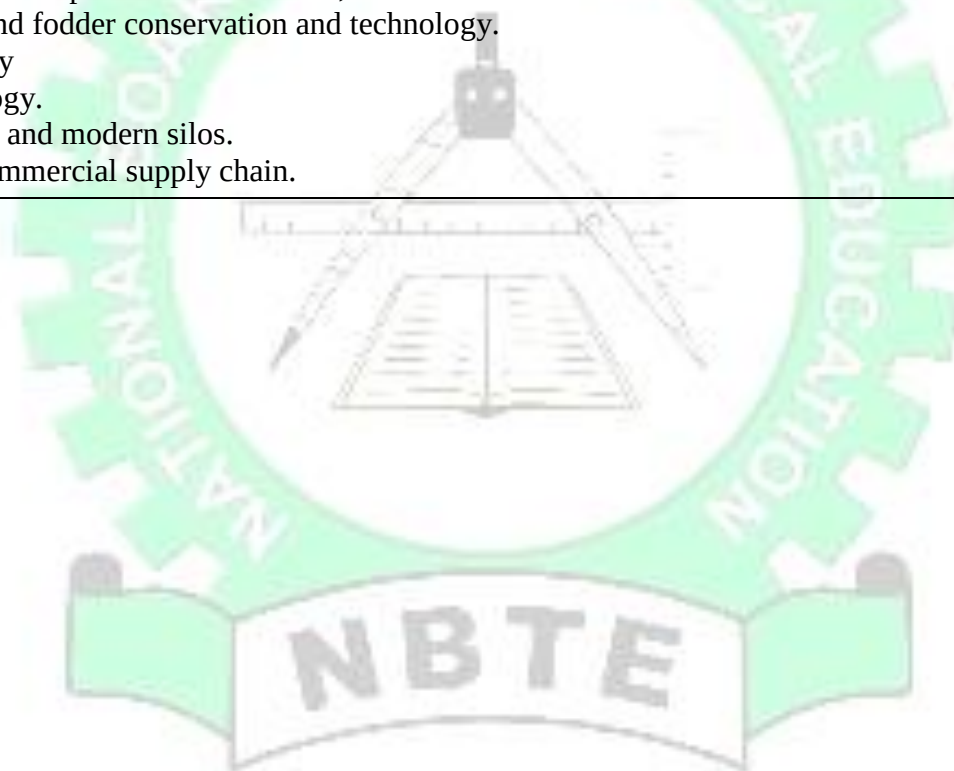
FORAGE AND FODDER CONSERVATION PRACTICES**PROGRAMME: HND PASTURE AND RANGE MANAGEMENT**

COURSE TITLE: FORAGE AND FODDER CONSERVATION PRACTICES	COURSE CODE: PRM 322	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK

GOAL: This course is designed to equip students with knowledge and skills on hay and silage technology.

GENERAL OBJECTIVES: On completion of this course, the students should be able to:

- 1.0 Understand modern forage and fodder conservation and technology.
- 2.0 Know hay making technology
- 3.0 know silage making technology.
- 4.0 Know vacuum-packed silage and modern silos.
- 5.0 Know pelleted forage and commercial supply chain.



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: FORAGE AND FODDER CONSERVATION PRACTICES			COURSE CODE: PRM 322		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills on hay and silage technology						
GENERAL OBJECTIVE 1.0: Understand modern forage and fodder conservation and technology						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Describe Nigerian climate and hay-making windows 1.2 Explain hay-making principles (mowing, conditioning, drying, storage) 1.3 Explain moisture content for safe hay storage 1.4 Explain hay equipment (mowers, conditioners, rakes, tedders)	• Illustrate Nigerian climate and hay-making windows with charts and local examples. • Clarify hay-making principles (mowing, conditioning, drying, storage) through guided questioning. • Relate moisture content for safe hay storage to pasture and range field situations.	Hay texts, LCD projector, marker board, Charts.	• Perform hay-making (mow, dry, store) • Measure hay moisture (probe meter) • Operate hay equipment • Plan hay-making by zone / season	• Demonstrate hay-making (mow, dry, store) with relevant tools and field examples. • Supervise guided practice on hay moisture (probe meter). • Provide checklists or templates for hay equipment. • Monitor performance and correct errors on hay-making by zone / season.	Field site, mowers, moisture meters, hay equipment

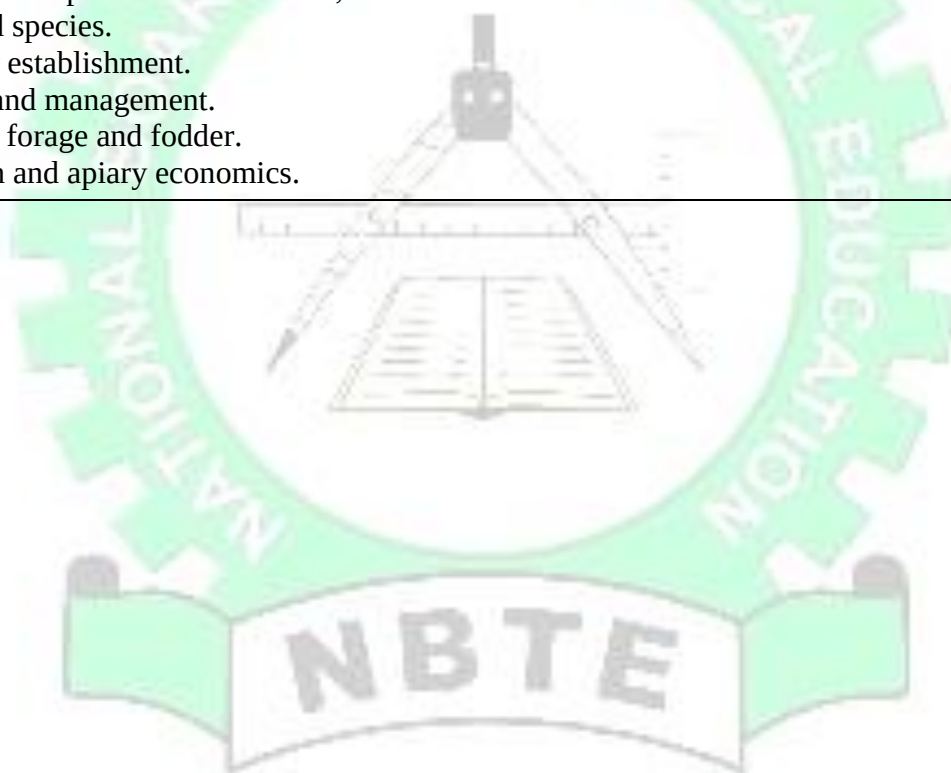
		Discuss hay equipment (mowers, conditioners, rakes, tedders).				
GENERAL OBJECTIVE 2.0: Know hay making technology						
4-6	2.1 Describe baler types (round, square, mini-bale) 2.2 Explain baled hay quality monitoring 2.3 Describe commercial packaging (plastic film, mesh, twine) and labeling	- Illustrate baler types (round, square, mini-bale) with charts and local examples. - Clarify baled hay quality monitoring through guided questioning. - Relate commercial packaging (plastic film, mesh, twine) and labeling to pasture and range field situations.	Baling texts, LCD projector, marker board, Charts.	- Identify round and square baler - Wrap bales with plastic/mesh/twine - Monitor bale quality. - Identify commercial packaging/labeling	- Demonstrate round and square baler with relevant tools and field examples. - Supervise guided practice on bales with plastic/mesh/twine. - Provide checklists or templates for bale quality. - Monitor performance and correct errors on commercial packaging/labeling.	Balers, wrappers, packaging materials
GENERAL OBJECTIVE 3.0: Know silage making technology						
7-9	3.1 Describe silage moisture and chop length 3.2 Explain silage additives (lactic acid bacteria, molasses, urea) 3.3 Explain silage	- Illustrate silage moisture and chop length with charts and local examples. - Clarify silage additives (lactic acid bacteria,	Silage texts, LCD projector, marker board, Charts.	- Perform silage fermentation trial - Measure moisture and chop length - Identify silage additives - Assess silage	- Demonstrate silage fermentation trial with relevant tools and field examples. - Supervise guided practice on moisture and chop length.	Silage materials, additives, quality tools

	fermentation principles 3.4 Describe silage quality assessment (pH, smell, colour)	molasses, urea) through guided questioning. • Relate silage fermentation principles to pasture and range field situations. • Discuss silage quality assessment (pH, smell, colour).		quality	• Provide checklists or templates for silage additives. • Monitor performance and correct errors on silage quality.	
GENERAL OBJECTIVE 4.0: Know vacuum-packed silage & modern silos						
10-12	4.1 Describe bag and bunker silos (modern design) 4.2 Describe vacuum-packed silage (plastic bag, drum) 4.3 Describe tower silos and silage piles 4.4 Describe hermetic silage (PICS-like for forage)	• Illustrate bag and bunker silos (modern design) with charts and local examples. • Clarify vacuum-packed silage (plastic bag, drum) through guided questioning. • Relate tower silos and silage piles to pasture and range field situations. • Discuss hermetic silage (PICS-like for forage).	Modern silo texts, LCD projector, marker board, Charts.	• Build bag/bunker silo • Identify vacuum-packed silage • Visit tower silos • Identify hermetic silage	• Demonstrate bag/bunker silo with relevant tools and field examples. • Supervise guided practice on vacuum-packed silage. • Provide checklists or templates for tower silos. • Monitor performance and correct errors on hermetic silage.	Silo materials, vacuum-pack equipment
GENERAL OBJECTIVE 5.0: Know pelleted forage and commercial supply chain						

13-15	5.1 Describe forage pelleting (mill, binder, pellet press) 5.2 Describe pellet storage and packaging 5.3 Explain cold-chain and Business to Business (B2B) forage delivery to dairies/feedlots 5.4 Explain forage marketing and contract supply	• Illustrate forage pelleting (mill, binder, pellet press) with charts and local examples. • Clarify pellet storage and packaging through guided questioning. • Relate cold-chain and Business to Business (B2B) forage delivery to dairies/feedlots to pasture and range field situations. • Discuss forage marketing and contract supply.	Supply chain texts, LCD projector, marker board, Charts.	• Demonstrate forage pelleting • Identify pellet packaging/storage • Design B2B cold-chain delivery • Build commercial forage contract	• Demonstrate forage pelleting with relevant tools and field examples. • Supervise guided practice on pellet packaging/storage. • Provide checklists or templates for B2B cold-chain delivery. • Monitor performance and correct errors on commercial forage contract.	Pellet mill, packaging, contract templates
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

RANGE APICULTURE AND POLLINATION SERVICES

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: RANGE APICULTURE AND POLLINATION SERVICES	COURSE CODE: PRM 323	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills of apiculture on rangelands		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know honey-bee biology and species. 2.0 Know hive design and apiary establishment. 3.0 Know colony establishment and management. 4.0 know pollination services for forage and fodder. 5.0 Understand honey production and apiary economics.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: RANGE APICULTURE & POLLINATION SERVICES			COURSE CODE: PRM 323		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of apiculture on rangelands						
GENERAL OBJECTIVE 1.0: Know honey-bee biology and species						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Describe Nigerian honey-bee species (<i>Apis mellifera adansonii</i> , A.m. <i>scutellata</i>) 1.2 Explain bee colony biology (queen, drones, workers) 1.3 Explain bee life cycle and seasonality 1.4 Describe pollinator role in rangeland ecology	• Illustrate Nigerian honey-bee species (<i>Apis mellifera adansonii</i>, A.m. <i>scutellata</i>) with charts and local examples. • Clarify bee colony biology (queen, drones, workers) through guided questioning. • Relate bee life cycle and seasonality to pasture and range field situations. • Discuss pollinator role in rangeland	Apiculture texts, LCD projector, marker board, Charts.	• Identify Nigerian honey-bee species • Examine colony composition • Track life-cycle stages • Survey pollinators on rangeland flora	• Demonstrate Nigerian honey-bee species with relevant tools and field examples. • Supervise guided practice on colony composition. • Provide checklists or templates for life-cycle stages. • Monitor performance and correct errors on pollinators on rangeland flora.	Live bees, microscopes, observation hives

		ecology.				
GENERAL OBJECTIVE 2.0: Know hive design and apiary establishment						
4-6	2.1 Describe hive types and design 2.2 Describe apiary site selection 2.3 Describe hive placement on rangelands 2.4 Explain apiary protection (predators, theft, fire)	• Illustrate hive types and design with charts and local examples. • Clarify apiary site selection through guided questioning. • Relate hive placement on rangelands to pasture and range field situations. • Discuss apiary protection (predators, theft, fire).	Hive design texts, LCD projector, marker board, Charts.	• Inspect hive types. • Select apiary site on rangeland • Place hives on forage stands • Identify apiary protection	• Demonstrate hive types with relevant tools and field examples. • Supervise guided practice on apiary site on rangeland. • Provide checklists or templates for hives on forage stands. • Monitor performance and correct errors on apiary protection.	Hives, apiary site, protection materials
GENERAL OBJECTIVE 3.0: Know colony establishment and management						
7-9	3.1 Explain colony catching and baiting 3.2 Describe queen rearing and splitting 3.3 Describe seasonal colony management 3.4 Explain pest and disease management	• Illustrate colony catching and baiting with charts and local examples. • Clarify queen rearing and splitting through guided questioning. • Relate seasonal colony management to pasture and range field situations. • Discuss pest and	Colony management texts, LCD projector, marker board, Charts.	• Catch and bait colony • Perform queen rearing and split • Identify seasonal management • Identify pest and disease control	• Demonstrate and bait colony with relevant tools and field examples. • Supervise guided practice on queen rearing and split. • Provide checklists or templates for seasonal management. • Monitor	Beekeeping kit, queen cells, pest and diseases tools, bee hives

	(Varroa, wax moth, ants, hive beetle)	disease management (Varroa, wax moth, ants, hive beetle).			performance and correct errors on pest and disease control.	
GENERAL OBJECTIVE 4.0: Know pollination services for forage and fodder						
10-12	4.1 Describe pollination ecology of forage legumes (Stylosanthes, Mucuna, Lablab) 4.2 Explain pollination service contracts 4.3 Describe bee-foraging timing for fodder legume seed production 4.4 Describe integration with seed enterprises	• Illustrate pollination ecology of forage legumes (Stylosanthes, Mucuna, Lablab) with charts and local examples. • Clarify pollination service contracts through guided questioning. • Relate bee-foraging timing for fodder legume seed production to pasture and range field situations. • Discuss integration with seed enterprises.	Pollination texts, LCD projector, marker board, Charts.	• Survey pollination on fodder legumes • Design pollination contract • Time bees for legume seed production • Integrate with seed enterprise	• Demonstrate pollination on fodder legumes with relevant tools and field examples. • Supervise guided practice on pollination contract. • Provide checklists or templates for bees for legume seed production. • Monitor performance and correct errors on with seed enterprise.	Forage legume plots, contract templates
GENERAL OBJECTIVE 5.0: Understand honey production and apiary economics						
13-15	5.1 Describe honey harvesting and processing 5.2 Explain beeswax, propolis, royal	• Illustrate honey harvesting and processing with charts and local examples.	Apiary economics texts, LCD projector, marker board,	• Harvest and process honey • Produce beeswax/propolis/pollen	• Demonstrate and process honey with relevant tools and field examples. • Supervise guided	Harvesting kit, processing tools, statutory registration docs

	jelly, pollen 5.3 Explain honey packaging, branding, statutory registration 5.4 Describe apiary economics and integration with range-livestock enterprise	- Clarify beeswax, propolis, royal jelly, pollen through guided questioning. - Relate honey packaging, branding, statutory registration to pasture and range field situations. - Discuss apiary economics and integration with range-livestock enterprise.	Charts.	- Identify statutory registration and branding - Compute apiary-livestock integration economics	practice on beeswax/propolis/pollen. - Provide checklists or templates for statutory registration and branding. - Monitor performance and correct errors on apiary-livestock integration economics.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

SOWN PASTURES AND FORAGE CROP PRODUCTION

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: SOWN PASTURES AND FORAGE CROP PRODUCTION	COURSE CODE: PRM 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 knowledge and skills on sown-pasture establishment, forage-crop production and pasture-renovation techniques for Nigerian ecological zones.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know principles of pasture-production. 2.0 Know sown-pasture species combinations. 3.0 Know forage crop production. 4.0 Know pasture fertilization and irrigation. 5.0 Understand pasture renovation and weed management.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: PRINCIPLES SOWN PASTURES AND FORAGE CROP PRODUCTION			COURSE CODE: PRM 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 knowledge and skills on sown-pasture establishment, forage-crop production and pasture-renovation techniques for Nigerian ecological zones.						
GENERAL OBJECTIVE 1.0: Know principles of pasture- production						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain site selection and land preparation 1.2 Describe species choice by ecological zone 1.3 Explain planting methods (broadcast, drill, vegetative) 1.4 Describe establishment timing and rainfall	• Illustrate site selection and land preparation with charts and local examples. • Clarify species choice by ecological zone through guided questioning. • Relate planting methods (broadcast, drill, vegetative) to pasture and range field situations. • Discuss	Establishment texts, LCD projector, marker board, Charts.	• Select site • prepare site • Choose species for ecological zone • Identify planting methods • Time establishment with rainfall	• Demonstrate and prepare site with relevant tools and field examples. • Supervise guided practice on species for ecological zone. • Provide checklists or templates for planting methods. • Monitor performance and correct errors on establishment with rainfall.	Field site, seeds, seeders, vegetative cutting

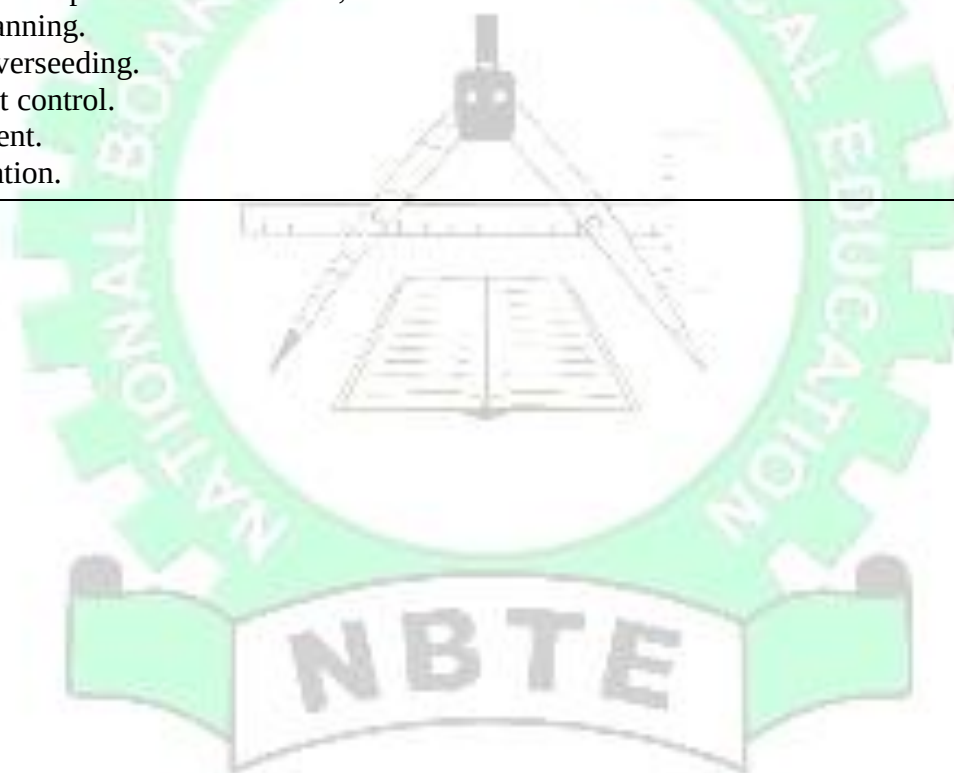
		establishment timing and rainfall.				
GENERAL OBJECTIVE 2.0: Know sown-pasture species combinations						
4-6	2.1 Explain grass-legume mixtures 2.2 Explain mixed swards (Andropogon-Stylosanthes, Panicum-Centrosema) 2.3 Describe pure swards 2.4 Explain species compatibility	• Illustrate grass-legume mixtures with charts and local examples. • Clarify mixed swards (Andropogon-Stylosanthes, Panicum-Centrosema) through guided questioning. • Relate pure swards to pasture and range field situations. • Discuss species compatibility.	Sward texts, LCD projector, marker board, Charts.	• Establish grass-legume mixtures • Establish mixed swards • Establish pure swards • Assess compatibility	• Demonstrate grass-legume mixtures with relevant tools and field examples. • Supervise guided practice on mixed swards. • Provide checklists or templates for pure swards. • Monitor performance and correct errors on compatibility.	Field plots, seeds
GENERAL OBJECTIVE 3.0: Know forage crop production						
7-9	3.1 Explain cereal forages 3.2 Describe forage legumes 3.3 Explain multi-purpose trees 3.4 Describe forage cropping calendar	• Illustrate cereal forages with charts and local examples. • Clarify forage legumes through guided questioning. • Relate multi-	Forage crop texts, LCD projector, marker board, Charts.	• Establish cereal forage • Establish legume fodder • Establish multi-purpose trees • Build forage cropping calendar	• Demonstrate cereal forage with relevant tools and field examples. • Supervise guided practice on legume fodder. • Provide checklists or templates for	Field plots, seeds, seedlings

		purpose trees to pasture and range field situations. • Discuss forage cropping calendar.			multi-purpose trees. • Monitor performance and correct errors on forage cropping calendar.	
GENERAL OBJECTIVE 4.0: Know pasture fertilization and irrigation						
10-12	4.1 Describe soil testing for pasture 4.2 Describe fertilizer application 4.3 Describe soil Ph balance (lime and gypsum use in improving soil) 4.4 Explain irrigation systems in pasture production	• Illustrate soil testing for pasture with charts and local examples. • Clarify fertilizer application through guided questioning. • Relate soil Ph balance (lime and gypsum use in improving soil) to pasture and range field situations. • Discuss irrigation systems in pasture production.	Fertilization/irrigation texts, LCD projector, marker board, Charts.	• Perform pasture soil test • Apply fertilizer on pasture • Apply lime/gypsum to improve the soil • Carryout different irrigation methods	• Demonstrate pasture soil test with relevant tools and field examples. • Supervise guided practice on fertilizer on pasture. • Provide checklists or templates for lime/gypsum to improve the soil. • Monitor performance and correct errors on different irrigation methods.	Soil test kit, fertilizers, irrigation systems equipment
GENERAL OBJECTIVE 5.0: Understand pasture renovation and weed management						
13-15	5.1 Explain pasture-renovation methods (inter-row seeding, over-seeding) 5.2 Describe weed	• Illustrate pasture-renovation methods (inter-row seeding, over-seeding) with charts and local	Renovation texts, LCD projector, marker board, Charts.	• Identify inter-row/over-seeding • Examine weed management • Identify mob-grazing	• Demonstrate inter-row/over-seeding with relevant tools and field examples. • Supervise guided practice on weed	Pasture plots, weeders, livestock

	management on pastures 5.3 Explain mob-grazing for renovation 5.4 Describe degraded-pasture reclamation	examples. • Clarify weed management on pastures through guided questioning. • Relate mob-grazing for renovation to pasture and range field situations. • Discuss degraded-pasture reclamation.		• Reclaim degraded pasture	management. • Provide checklists or templates for mob-grazing. • Monitor performance and correct errors on degraded pasture.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

RANGE DEVELOPMENT, RESEEDING AND RESTORATION

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: RANGE DEVELOPMENT, RESEEDING AND RESTORATION	COURSE CODE: PRM 325	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 for range development.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know range development planning. 2.0 Know range reseeding and overseeding. 3.0 Know brush and woody-plant control. 4.0 Know water-point development. 5.0 Understand rangeland restoration.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: RANGE DEVELOPMENT, RESEEDING & RESTORATION			COURSE CODE: PRM 325		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 for range development.						
GENERAL OBJECTIVE 1.0: Know range development planning						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain range development objectives 1.2 Describe range development plan structure 1.3 Describe stakeholder consultation (pastoralists, communities) 1.4 Explain budgeting and resource allocation	• Illustrate range development objectives with charts and local examples. • Clarify range development plan structure through guided questioning. • Relate stakeholder consultation (pastoralists, communities) to pasture and range field situations. • Discuss budgeting	Range development texts, LCD projector, marker board, Charts.			

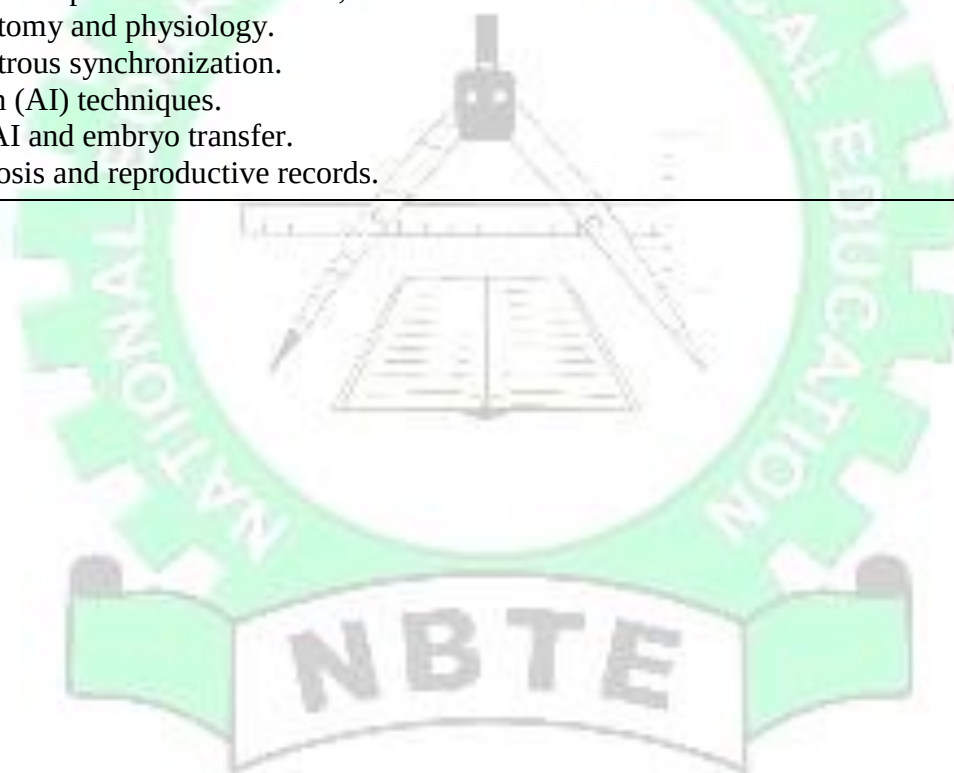
		and resource allocation.				
GENERAL OBJECTIVE 2.0: Know range reseeding and overseeding						
4-6	2.1 Explain reseeding species selection 2.2 Describe hand and mechanical reseeding 2.3 Describe overseeding into existing range	• Illustrate reseeding species selection with charts and local examples. • Clarify hand and mechanical reseeding through guided questioning. • Relate overseeding into existing range to pasture and range field situations.	Reseeding texts, LCD projector, marker board, Charts.	• Select reseeding species • Prepare seedbed • Reseed by hand/machine • Overseed existing range	• Demonstrate reseeding species with relevant tools and field examples. • Supervise guided practice on seedbed. • Provide checklists or templates for by hand/machine. • Monitor performance and correct errors on existing range.	Rangeland site, seeds, seeders
GENERAL OBJECTIVE 3.0: Know brush and woody-plant control						
7-9	3.1 Describe mechanical control (chaining, bulldozing, cutting) 3.2 Describe chemical control (herbicides) 3.3 Describe prescribed fire 3.4 Describe biological control	• Illustrate mechanical control (chaining, bulldozing, cutting) with charts and local examples. • Clarify chemical control (herbicides) through guided questioning.	Brush control texts, LCD projector, marker board, Charts.	• Identify mechanical brush control • Identify herbicides. • Access prescribed fire • Examine browsing-based control	• Demonstrate mechanical brush control with relevant tools and field examples. • Supervise guided practice on herbicides. • Provide checklists or templates for prescribed fire. • Monitor	Tools, herbicides, browsing animals, fire-safety equipment

	(browsing goats/camels)	• Relate prescribed fire to pasture and range field situations. • Discuss biological control (browsing goats/camels).			performance and correct errors on browsing-based control.	
GENERAL OBJECTIVE 4.0: Know water-point development						
10-12	4.1 Describe water-point (boreholes, dams, troughs) 4.2 Describe borehole construction 4.3 Describe earth-dam construction 4.4 Explain water-point management	• Illustrate water-point (boreholes, dams, troughs) with charts and local examples. • Clarify borehole construction through guided questioning. • Relate earth-dam construction to pasture and range field situations. • Discuss water-point management.	Water-point texts, LCD projector, marker board, Charts.	• Identify Site water points • Inspect borehole/installation • Identify earth-dam siting • Examine water-point management	• Demonstrate Site water points with relevant tools and field examples. • Supervise guided practice on borehole/installation. • Provide checklists or templates for earth-dam siting. • Monitor performance and correct errors on water-point management.	Water-point site, GPS, mapping tools
GENERAL OBJECTIVE 5.0: Understand rangeland restoration						
13-15	5.1 Describe degraded land restoration (soil conservation, contour bunds) 5.2 Describe gully reclamation	• Illustrate degraded land restoration (soil conservation, contour bunds) with charts and local examples.	Restoration texts, LCD projector, marker board, Charts.	• Identify soil conservation/bunds • Reclaim gully • Identify Plant rangeland trees	• Demonstrate soil conservation/bunds with relevant tools and field examples. • Supervise guided	Tools, seedlings, community engagement

	5.3 Explain tree planting for rangeland 5.4 Describe Community-Managed Restoration (CMR)	• Clarify gully reclamation through guided questioning. • Relate tree planting for rangeland to pasture and range field situations. • Discuss Community-Managed Restoration (CMR).		• Inspect Lead community restoration	practice on gully. • Provide checklists or templates for Plant rangeland trees. • Monitor performance and correct errors on Lead community restoration.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

REPRODUCTIVE MANAGEMENT FOR RANGE LIVESTOCK

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: REPRODUCTIVE MANAGEMENT FOR RANGE LIVESTOCK	COURSE CODE: PRM 326	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills on reproductive management for range livestock		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand reproductive anatomy and physiology. 2.0 Know heat detection and oestrous synchronization. 3.0 Know Artificial Insemination (AI) techniques. 4.0 Understand small-ruminant AI and embryo transfer. 5.0 Understand pregnancy diagnosis and reproductive records.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: REPRODUCTIVE MANAGEMENT FOR RANGE LIVESTOCK			COURSE CODE: PRM 326		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills on reproductive management for range livestock.						
GENERAL OBJECTIVE 1.0: Understand reproductive anatomy and physiology						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Describe female reproductive anatomy of range animals 1.2 Describe male reproductive anatomy of range animals 1.3 Describe oestrous cycle and reproductive hormones 1.4 Explain breeding seasonality in tropical livestock	• Illustrate female reproductive anatomy of range animals with charts and local examples. • Clarify male reproductive anatomy of range animals through guided questioning. • Relate oestrous cycle and reproductive hormones to pasture and range field situations. • Discuss breeding seasonality in tropical	Reproductive anatomy texts, LCD projector, whiteboard, marker, internet	• Examine female anatomy models and abattoir specimen • Examine male anatomy • Monitor oestrous cycles • Profile breeding seasonality	• Demonstrate female anatomy models and abattoir specimen with relevant tools and field examples. • Supervise guided practice on male anatomy. • Provide checklists or templates for oestrous cycles. • Monitor performance and correct errors on breeding seasonality.	Anatomy models, abattoir specimens, charts

		livestock.				
GENERAL OBJECTIVE 2.0: Know heat detection and oestrous synchronization						
4-6	2.1 Describe heat-detection signs 2.2 Explain heat-detection aids 2.3 Explain oestrous synchronisation protocols 2.4 Explain pasture-based heat-detection logistics	• Illustrate heat-detection signs with charts and local examples. • Clarify heat-detection aids through guided questioning. • Relate oestrous synchronisation protocols to pasture and range field situations. • Discuss pasture-based heat-detection logistics.	Reference texts, LCD projector	• Examine heat signs in pasture-based herd • Operate heat-detection aids • Apply synchronization protocol • Plan pasture-based heat detection	• Demonstrate heat signs in pasture-based herd with relevant tools and field examples. • Supervise guided practice on heat-detection aids. • Provide checklists or templates for synchronization protocol. • Monitor performance and correct errors on pasture-based heat detection.	Herds, heat detection aids (computer Software), synchronisation drugs
GENERAL OBJECTIVE 3.0: Know Artificial insemination (AI) techniques						
7-9	3.1 Explain semen collection and processing 3.2 Describe semen storage 3.3 Describe equipment used in AI 3.4 Describe AI methods 3.5 Describe rectal-palpation in	• Illustrate semen collection and processing with charts and local examples. • Clarify semen storage through guided questioning. • Relate equipment used in AI to pasture and range field situations. • Discuss AI methods.	AI texts, LCD projector	• Collect semen and process • Handle liquid nitrogen and semen straws • Operate AI gun, sheath, thaw straws • Perform palpation per rectum AI on cattle or model	• Demonstrate semen and process with relevant tools and field examples. • Supervise guided practice on liquid nitrogen and semen straws. • Provide checklists or templates for AI gun, sheath, thaw straws. • Monitor performance	LN2 dewar, AI Kits, semen straws, AI gun, AI model / cow

	Artificial Insemination	Review responses on rectal-palpation in Artificial Insemination and correct misconceptions.			and correct errors on palpation per rectum AI on cattle or model.	
GENERAL OBJECTIVE 4.0: Know small-ruminant AI and embryo transfer						
10-12	4.1 Explain sheep/goat AI (cervical, intrauterine) 4.2 Describe estrous synchronization for small ruminants 4.3 Describe embryo transfer concepts (intro) 4.4 Explain natural mating planning	- Illustrate sheep/goat AI (cervical, intrauterine) with charts and local examples. - Clarify estrous synchronization for small ruminants through guided questioning. - Relate embryo transfer concepts (intro) to pasture and range field situations. - Discuss natural mating planning.	Reference texts, LCD projector, whiteboard	- Perform AI on models or live animals - Synchronize the live animal - Browse embryo transfer protocols - Plan natural mating	- Demonstrate AI on models or live animals with relevant tools and field examples. - Supervise guided practice on the live animal. - Provide checklists or templates for embryo transfer protocols. - Monitor performance and correct errors on natural mating.	Models, drugs, planning tools, AI Kits,
GENERAL OBJECTIVE 5.0: understand pregnancy diagnosis and reproductive records						
13-15	5.1 Describe palpation per rectum in pregnancy diagnosis 5.2 Describe abdominal ballotment in	- Illustrate palpation per rectum in pregnancy diagnosis with charts and local examples. - Clarify abdominal ballotment in small animals through guided questioning.	Pregnancy diagnosis texts, LCD projector	- Perform palpation per rectum pregnancy diagnosis - Operate ultrasound and hormonal assay	- Demonstrate palpation per rectum pregnancy diagnosis with relevant tools and field examples. - Supervise guided practice on ultrasound and hormonal assay	Ultrasound machine, records app, herd, theriogenology kits.

	small animals 5.3 Describe ultrasound and hormonal assay in pregnancy diagnosis 5.4 Explain pregnancy: stages and parturition prediction 5.5 Explain reproductive records	• Relate ultrasound and hormonal assay in pregnancy diagnosis to pasture and range field situations. • Discuss pregnancy: stages and parturition prediction. • Review responses on reproductive records and correct misconceptions.		for pregnancy diagnosis • Predict parturition • Maintain reproductive records	for pregnancy diagnosis. • Provide checklists or templates for parturition. • Monitor performance and correct errors on reproductive records.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

FIELD PRACTICAL I (PASTURE ESTABLISHMENT AND RANGE ASSESSMENT)

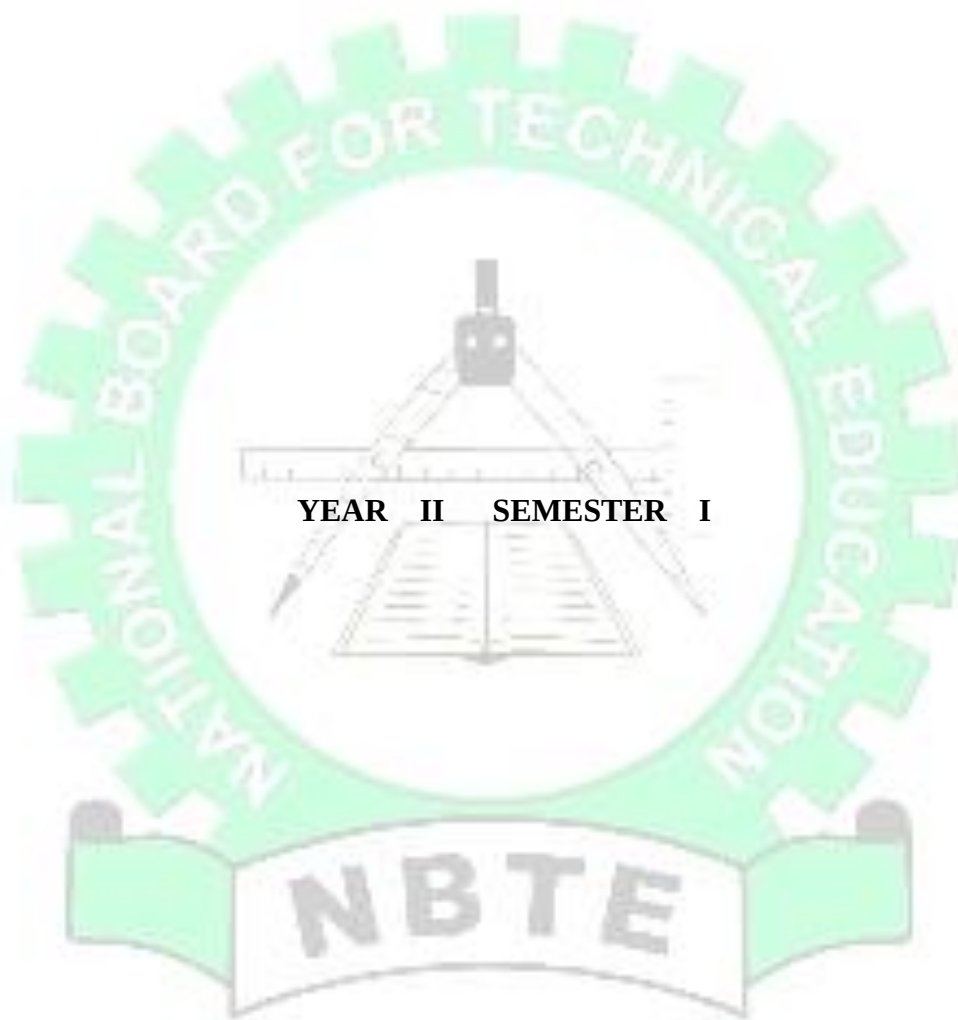
PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: FIELD PRACTICAL I (PASTURE ESTABLISHMENT & RANGE ASSESSMENT)	COURSE CODE: PRM 327	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 0 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with Knowledge and skills of intensive field-practical of integrated pasture-establishment and range-assessment in real conditions.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Apply pre-fieldwork preparation. 2.0 Apply pasture establishment fieldwork. 3.0 Apply range assessment fieldwork. 4.0 Apply integration and decision support. 5.0 Apply reporting and presentation.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: FIELD PRACTICAL I (PASTURE ESTABLISHMENT AND RANGE ASSESSMENT)			COURSE CODE: PRM 327		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 0 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 intensive field-practical of integrated pasture-establishment and range-assessment in real conditions.						
GENERAL OBJECTIVE 1.0: Apply pre-fieldwork preparation						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3				• Carryout field site visits and identify target ecological zones • Prepare field kits (quadrats, transects, GPS, sample bags) • Brief students on protocols and safety • Calibrate field instruments and digital tools	• Demonstrate field site visits and identify target ecological zones with relevant tools and field examples. • Supervise guided practice on field kits (quadrats, transects, GPS, sample bags). • Provide checklists or templates for students on protocols and safety.	Field kits, GPS, smartphones, field site

					• Monitor performance and correct errors on field instruments and digital tools.	
GENERAL OBJECTIVE 2.0: Apply pasture establishment fieldwork						
4-7				• Establish 3 pasture plots (grass, legume, mixture) • Apply seeding, fertilising, weeding • Monitor establishment performance • Maintain GPS-tagged plot log	• Demonstrate 3 pasture plots (grass, legume, mixture) with relevant tools and field examples. • Supervise guided practice on seeding, fertilising, weeding. • Provide checklists or templates for establishment performance. • Monitor performance and correct errors on GPS-tagged plot log.	Field plots, seeds, fertilisers, GPS
GENERAL OBJECTIVE 3.0: Apply range assessment fieldwork						
8-11				• Perform range condition assessment (quadrats, transects)	• Demonstrate range condition assessment (quadrats, transects) with	Quadrats, transects, datasheets

				• Compute species composition and ground cover • Assess range health indicators • Build range assessment report	relevant tools and field examples. • Supervise guided practice on species composition and ground cover. • Provide checklists or templates for range health indicators. • Monitor performance and correct errors on range assessment report.	
GENERAL OBJECTIVE 4.0: Apply integration and decision support						
12-13				• Integrate pasture and range data • Compute carrying capacity • Make management recommendations • Compile field workbook	• Demonstrate pasture and range data with relevant tools and field examples. • Supervise guided practice on carrying capacity. • Provide checklists or templates for management recommendations. • Monitor performance and correct errors on field workbook.	Datasets, computation tools, workbook

GENERAL OBJECTIVE 5.0: Apply reporting and presentation						
14-15				• Write 15-page field-practical report • Prepare 12-slide presentation • Defend report to panel • Submit corrected report	• Demonstrate 15-page field-practical report with relevant tools and field examples. • Supervise guided practice on 12-slide presentation. • Provide checklists or templates for report to panel. • Monitor performance and correct errors on corrected report.	Report templates, panel
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



PRECISION FORAGE PRODUCTION

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: PRECISION FORAGE PRODUCTION	COURSE CODE: PRM 411	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: PRM 316	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills of precision forage production.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand fundamentals of precision forage production. 2.0 Understand fertigation for forage production. 3.0 Know variable-rate seeding and fertilization. 4.0 Know yield-mapping for fodder. 5.0 Apply sensors and decision-support apps.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: PRECISION FORAGE PRODUCTION			COURSE CODE: PRM 411		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: PRM 316		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of precision forage production.						
GENERAL OBJECTIVE 1.0: Understand fundamentals of precision forage production						
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 forage production concept 1.2 Explain spatial variability mapping 1.3 Explain precision-forage cycle 1.4 Explain the economics of precision forage production	• Illustrate precision forage production concept with charts and local examples. • Clarify spatial variability mapping through guided questioning. • Relate precision-forage cycle to pasture and range field situations. • Discuss the economics of precision forage production.	Precision Ag texts, LCD projector	• Apply 5 Rs to forage • Map spatial variability in field • Apply precision-forage cycle • Compute economics analysis	• Demonstrate 5 Rs to forage with relevant tools and field examples. • Supervise guided practice on spatial variability in field. • Provide checklists or templates for precision-forage cycle. • Monitor performance and correct errors on economics analysis.	Field site, GPS, sampling tools

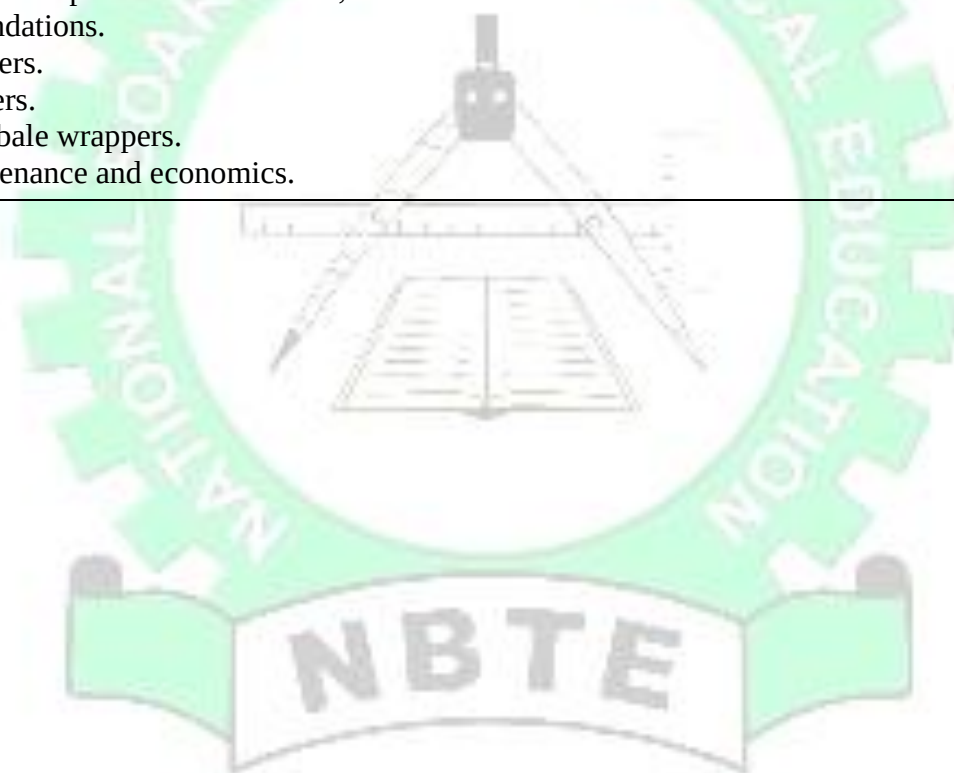
GENERAL OBJECTIVE 2.0: Understand fertigation for forage						
4-6	2.1 Explain fertigation principles 2.2 Explain fertigation system 2.3 Explain drip-irrigation system design for forage production 2.4 Describe drip-fertigation scheduling for pastures	• Illustrate fertigation principles with charts and local examples. • Clarify fertigation system through guided questioning. • Relate drip-irrigation system design for forage production to pasture and range field situations. • Discuss drip-fertigation scheduling for pastures.	Drip-fertigation texts, LCD projector	• Design drip system for forage plot • Apply fertigation • Install nutrient injection • Apply fertigation schedule	• Demonstrate drip system for forage plot with relevant tools and field examples. • Supervise guided practice on fertigation. • Provide checklists or templates for nutrient injection. • Monitor performance and correct errors on fertigation schedule.	Drip kit, fertigation injectors, forage plot, pumping machine, fertigation tanks,
GENERAL OBJECTIVE 3.0: Know variable-rate seeding and fertilization						
7-9	3.1 Explain variable-rate seeding (VRS) concepts 3.2 Describe soil-zone mapping for VR application 3.3 Explain variable-rate seeders and spreaders 3.4 Explain VR fertilizer application	• Illustrate variable-rate seeding (VRS) concepts with charts and local examples. • Clarify soil-zone mapping for VR application through guided questioning. • Relate variable-rate seeders and	VR texts, LCD projector	• Apply VRS to forage plot • Build soil-zone map • Operate VR seeder / spreader • Apply VR fertilizer	• Demonstrate VRS to forage plot with relevant tools and field examples. • Supervise guided practice on soil-zone map. • Provide checklists or templates for VR seeder / spreader. • Monitor performance and	VR equipment, soil-zone maps

		spreaders to pasture and range field situations. • Discuss VR fertilizer application.			correct errors on VR fertilizer.	
GENERAL OBJECTIVE 4.0: Know yield-mapping for fodder						
10-12	4.1 Define forage yield-mapping (NDVI, drone-based) 4.2 Explain harvest-time yield monitoring 4.3 Explain post-harvest yield analysis 4.4 Describe yield-zone management	• Illustrate forage yield-mapping (NDVI, drone-based) with charts and local examples. • Clarify harvest-time yield monitoring through guided questioning. • Relate post-harvest yield analysis to pasture and range field situations. • Discuss yield-zone management.	Yield mapping texts, LCD projector,	• Build forage yield map (NDVI/drone) • Monitor yield at harvest • Perform post-harvest analysis • Apply yield-zone management	• Demonstrate forage yield map (NDVI/drone) with relevant tools and field examples. • Supervise guided practice on yield at harvest. • Provide checklists or templates for post-harvest analysis. • Monitor performance and correct errors on yield-zone management.	Yield mapping tools, GIS, drone data, Mobile apps (land area measurement)
GENERAL OBJECTIVE 5.0: Apply sensors and decision-support apps						
13-15	5.1 Explain soil-moisture sensors (TDR, tensiometer, capacitance) 5.2 Explain weather stations and	• Illustrate soil-moisture sensors (TDR, tensiometer, capacitance) with charts and local examples.	Sensor texts, LCD projector	• Install and read soil-moisture sensors • Install weather station / use climate	• Demonstrate and read soil-moisture sensors with relevant tools and field examples. • Supervise guided	Sensors, weather station, lab PCs, apps

	pasture climate apps 5.3 Describe decision-support applications for planting-date selection 5.4 Explain integration of sensors, drones, GIS for precision forage	• Clarify weather stations and pasture climate apps through guided questioning. • Relate decision-support applications for planting-date selection to pasture and range field situations. • Discuss integration of sensors, drones, GIS for precision forage.		applications • Apply decision-support apps for planting • Integrate sensors/drones/GIS data	practice on weather station / use climate applications. • Provide checklists or templates for decision-support apps for planting. • Monitor performance and correct errors on sensors/drones/GIS data.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

FARM MACHINERY AND PRECISION EQUIPMENT

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: FARM MACHINERY AND PRECISION EQUIPMENT	COURSE CODE: PRM 412	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 of forage machinery and precision equipment		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know forage machinery foundations. 2.0 Know mowers and conditioners. 3.0 Know rakes, tedders and balers. 4.0 Know forage harvesters and bale wrappers. 5.0 Understand preventive maintenance and economics.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: FARM MACHINERY & PRECISION EQUIPMENT			COURSE CODE: PRM 412		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 of forage machinery and precision equipment.						
GENERAL OBJECTIVE 1.0: Know forage machinery 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 tractor and PTO basics 1.2 Describe hitching and 3-point linkage 1.3 Describe hydraulics for forage equipment 1.4 Explain tractor-equipment matching	• Illustrate tractor and PTO basics with charts and local examples. • Clarify hitching and 3-point linkage through guided questioning. • Relate hydraulics for forage equipment to pasture and range field situations. • Discuss tractor-equipment matching.	Machinery texts, LCD projector	• Inspect tractor and PTO • Hitch implements • Inspect hydraulics • Match tractor to implements	• Demonstrate tractor and PTO with relevant tools and field examples. • Supervise guided practice on implements. • Provide checklists or templates for hydraulics. • Monitor performance and correct errors on tractor to implements.	Tractors, implements
GENERAL OBJECTIVE 2.0: Know mowers and conditioners						

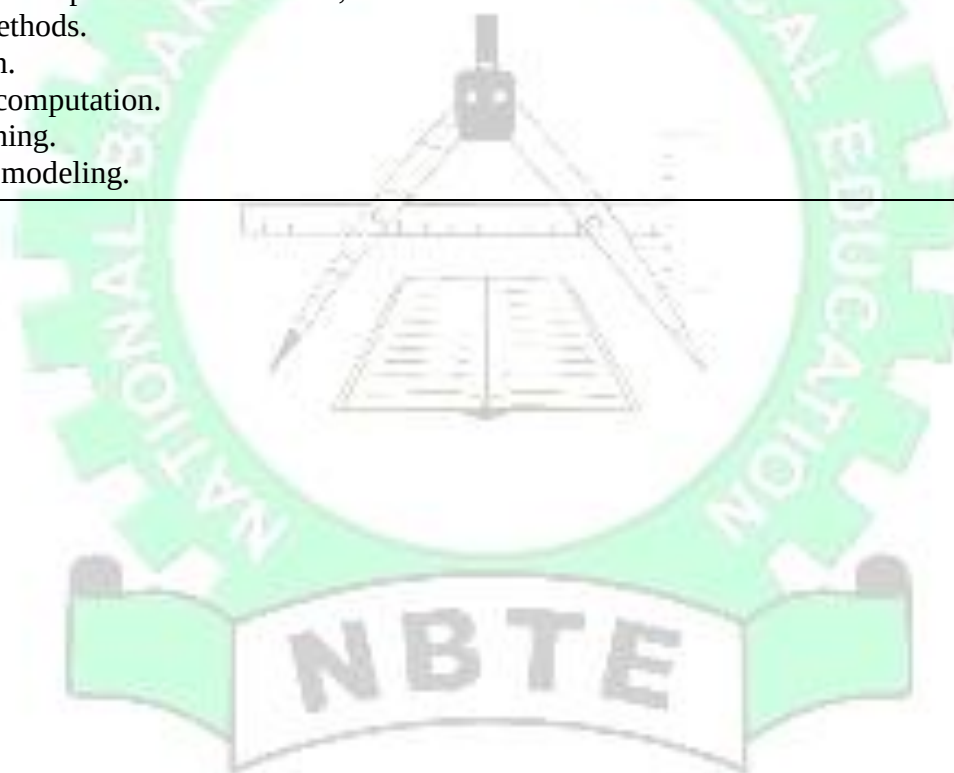
4-6	2.1 Explain disc mower operation 2.2 Describe drum mower and sickle bar 2.3 Describe mower-conditioner (intermesh, roller) 2.4 Explain mower maintenance and safety	• Illustrate disc mower operation with charts and local examples. • Clarify drum mower and sickle bar through guided questioning. • Relate mower-conditioner (intermesh, roller) to pasture and range field situations. • Discuss mower maintenance and safety.	Mower texts, LCD projector	• Operate disc mower • Operate drum/sickle bar • Operate mower-conditioner • Perform maintenance routine	• Demonstrate disc mower with relevant tools and field examples. • Supervise guided practice on drum/sickle bar. • Provide checklists or templates for mower-conditioner. • Monitor performance and correct errors on maintenance routine.	Mowers, maintenance tools
GENERAL OBJECTIVE 3.0: Know rakes, tedders and balers						
7-9	3.1 Describe rotary rake and tedder 3.2 Describe wheel rake and parallel-bar rake 3.3 Describe baler operation	• Illustrate rotary rake and tedder with charts and local examples. • Clarify wheel rake and parallel-bar rake through guided questioning. • Relate baler operation to pasture and range field situations.	Baling texts, LCD projector, whiteboard	• Operate rotary rake/tedder • Operate wheel/parallel-bar rake • Operate round baler • Operate square/mini-baler	• Demonstrate rotary rake/tedder with relevant tools and field examples. • Supervise guided practice on wheel/parallel-bar rake. • Provide checklists or templates for round baler. • Monitor performance and	Rakes, tedders, balers

					correct errors on square/mini-baler.	
GENERAL OBJECTIVE 4.0: Know forage harvesters and bale wrappers						
10-12	4.1 Describe forage harvester (chopper) operation 4.2 Describe bale wrapper operation 4.3 Describe silage trailers and loaders 4.4 Describe forage-equipment safety standards	• Illustrate forage harvester (chopper) operation with charts and local examples. • Clarify bale wrapper operation through guided questioning. • Relate silage trailers and loaders to pasture and range field situations. • Discuss forage-equipment safety standards.	Forage harvest texts, LCD projector, whiteboard, internet	• Operate bale wrapper • Operate forage harvester • Operate silage trailers / loaders • Apply equipment safety	• Demonstrate bale wrapper with relevant tools and field examples. • Supervise guided practice on forage harvester. • Provide checklists or templates for silage trailers / loaders. • Monitor performance and correct errors on equipment safety.	Wrappers, harvesters, trailers, PPE
GENERAL OBJECTIVE 5.0: Understand preventive maintenance and economics						
13-15	5.1 Explain preventive maintenance schedules 5.2 Describe lubrication, blade sharpening, knife replacement 5.3 Explain machinery costs and Return on Investment	• Illustrate preventive maintenance schedules with charts and local examples. • Clarify lubrication, blade sharpening, knife replacement through guided	Maintenance/economics texts, LCD projector	• Build PM schedule for fleet • Apply lubrication/sharpening • Compute costs/return on Investment • Design contracting business model	• Demonstrate PM schedule for fleet with relevant tools and field examples. • Supervise guided practice on lubrication/sharpening. • Provide checklists or templates for	Schedule templates, tools, business templates

	5.4 Explain machinery service/contracting business	questioning. • Relate machinery costs and Return on Investment to pasture and range field situations. • Discuss machinery service/contracting business.			costs/return on Investment. • Monitor performance and correct errors on contracting business model.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

ADVANCED RANGE MANAGEMENT

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: ADVANCED RANGE MANAGEMENT	COURSE CODE: PRM 413	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills for management of rangelands for sustained animal production		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know range inventory methods. 2.0 Know biomass estimation. 3.0 Know carrying-capacity computation. 4.0 Know stocking-rate planning. 5.0 Understand spatial range modeling.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: ADVANCED RANGE MANAGEMENT			COURSE CODE: PRM 413		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills for management of rangelands for sustained animal production.						
GENERAL OBJECTIVE 1.0: Know range inventory methods						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Describe transect-based sampling 1.2 Explain quadrat-based sampling 1.3 Explain double-sampling methods 1.4 Describe Global Positioning Systems (GPS)-tagged inventory	• Illustrate transect-based sampling with charts and local examples. • Clarify quadrat-based sampling through guided questioning. • Relate double-sampling methods to pasture and range field situations. • Discuss Global Positioning Systems (GPS)-tagged inventory.	Inventory texts, LCD projector, Marker, White board, charts	• Perform transect sampling • Perform quadrat sampling • Identify double-sampling • Perform GPS-tagged inventory	• Demonstrate transect sampling with relevant tools and field examples. • Supervise guided practice on quadrat sampling. • Provide checklists or templates for double-sampling. • Monitor performance and correct errors on GPS-tagged inventory.	Transect lines, quadrats, GPS, Measuring tapes

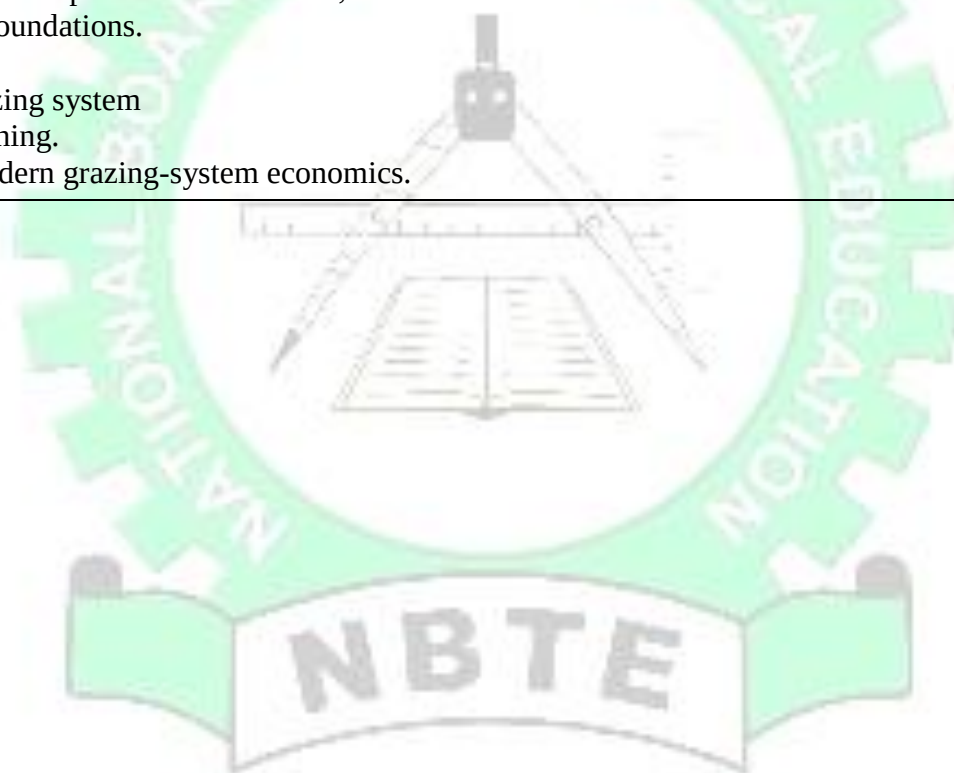
GENERAL OBJECTIVE 2.0: Know biomass estimation						
4-6	2.1 Explain destructive (clipping) biomass 2.2 Explain non-destructive biomass (visual, rising-plate meter) 2.3 Describe Normalized Difference Vegetation Index (NDVI) based biomass estimation 2.4 Describe Unmanned Aerial Vehicle (UAV) photogrammetry biomass	• Illustrate destructive (clipping) biomass with charts and local examples. • Clarify non-destructive biomass (visual, rising-plate meter) through guided questioning. • Relate Normalized Difference Vegetation Index (NDVI) based biomass estimation to pasture and range field situations. • Discuss Unmanned Aerial Vehicle (UAV) photogrammetry biomass.	Biomass texts, LCD projector, Marker, White board, charts	• Perform clipping biomass • Operate rising-plate meter / visual • Identify NDVI biomass • Identify UAV photogrammetry	• Demonstrate clipping biomass with relevant tools and field examples. • Supervise guided practice on rising-plate meter / visual. • Provide checklists or templates for NDVI biomass. • Monitor performance and correct errors on UAV photogrammetry.	Clippers, balances, NDVI data, drone
GENERAL OBJECTIVE 3.0: Know carrying-capacity computation						
7-9	3.1 Explain Animal Unit (AU) concepts 3.2 Explain carrying-capacity (CC) formulas	• Illustrate Animal Unit (AU) concepts with charts and local examples. • Clarify carrying-capacity	CC texts, LCD projector, Marker, White board, charts	• Compute AU equivalents • Compute CC for 1 rangeland • Compute seasonal CC	• Demonstrate AU equivalents with relevant tools and field examples. • Supervise guided practice on CC for	CC templates, datasets

	3.3 Explain seasonal carrying capacity 3.4 Describe degraded-range carrying capacity adjustments	(CC)formulas through guided questioning. - Relate seasonal carrying capacity to pasture and range field situations. - Discuss degraded-range carrying capacity adjustments.		Adjust CC for degraded range	1 rangeland. - Provide checklists or templates for seasonal CC. - Monitor performance and correct errors on CC for degraded range.	
GENERAL OBJECTIVE 4.0: Know stocking-rate planning						
10-12	4.1 Describe stocking-rate computation 4.2 Explain set and flexible stocking 4.3 Describe stocking-rate decision-making 4.4 Describe stocking-rate adjustment to weather and forage	- Illustrate stocking-rate computation with charts and local examples. - Clarify set and flexible stocking through guided questioning. Relate stocking-rate decision-making to pasture and range field situations. - Discuss stocking-rate adjustment to weather and forage.	Stocking texts, LCD projector, Marker, White board, Charts	- Compute stocking rates - Identify set and flexible stocking - Make stocking decisions - Adjust stocking with weather and forage	- Demonstrate stocking rates with relevant tools and field examples. - Supervise guided practice on set and flexible stocking. - Provide checklists or templates for stocking decisions. - Monitor performance and correct errors on stocking with weather and forage.	Stocking templates
GENERAL OBJECTIVE 5.0: Understand spatial range modelling						
13-15	5.1 Describe Geographic Information	Illustrate Geographic Information System	Spatial modeling texts, LCD projector,	- Build GIS CC map - Identify NDVI CC dynamics	Demonstrate GIS CC map with relevant tools and	Lab PCs, GIS, NDVI data

	System (GIS) - based carrying capacity (CC) mapping 5.2 Explain Normalized Difference Vegetation Index (NDVI) based CC dynamics 5.3 Explain range simulation models (RHEM, GLEAMS intro) 5.4 Explain range scenario planning	(GIS) -based carrying capacity (CC) mapping with charts and local examples. - Clarify Normalized Difference Vegetation Index (NDVI) based CC dynamics through guided questioning. - Relate range simulation models (RHEM, GLEAMS intro) to pasture and range field situations. - Discuss range scenario planning.	Marker, White board, Charts	- Browse range models - Identify scenario planning	field examples. - Supervise guided practice on NDVI CC dynamics. - Provide checklists or templates for range models. - Monitor performance and correct errors on scenario planning.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

GRAZING MANAGEMENT SYSTEMS

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: GRAZING MANAGEMENT SYSTEMS	COURSE CODE: PRM 414	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in grazing management systems.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand grazing system foundations. 2.0 Know the types of grazing. 3.0 Know ultra-high density grazing system 4.0 Know pastoral mobility planning. 5.0 Understand ranching and modern grazing-system economics.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: GRAZING MANAGEMENT SYSTEMS			COURSE CODE: PRM 414		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills in grazing management systems.						
GENERAL OBJECTIVE 1.0: Understand grazing system 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 grazing management systems 1.2 Explain pasture-animal interactions 1.3 Explain herbage allowance and utilization 1.4 Explain effects of grazing on pasture	• Illustrate grazing management systems with charts and local examples. • Clarify pasture-animal interactions through guided questioning. • Relate herbage allowance and utilization to pasture and range field situations. • Discuss effects of grazing on pasture.	Grazing texts, LCD projector, textbooks, journals, internet, white board	• Identify different grazing systems • Examine pasture-animal interactions • Compute herbage allowance/ utilization • Assess grazing impact	• Demonstrate different grazing systems with relevant tools and field examples. • Supervise guided practice on pasture-animal interactions. • Provide checklists or templates for herbage allowance/ utilization. • Monitor performance and correct errors on grazing impact.	Field site, datasheets

GENERAL OBJECTIVE 2.0: Know types of grazing						
4-6	2.1 Explain types of grazing. 2.2 Explain grazing system design (paddock layout) 2.3 Explain fencing (electric, conventional, living fence) 2.4 Explain grazing scheduling 2.5 Explain rest/recovery periods	• Illustrate types of grazing with charts and local examples. • Clarify grazing system design (paddock layout) through guided questioning. • Relate fencing (electric, conventional, living fence) to pasture and range field situations. • Discuss grazing scheduling. • Review responses on rest/recovery periods and correct misconceptions.	Grazing systems texts, LCD projector, textbooks, journals, internet, white board	• Design grazing systems layout • Install electric/conventional/living fence • Identify grazing schedule • Manage rest/recovery	• Demonstrate grazing systems layout with relevant tools and field examples. • Supervise guided practice on electric/conventional/living fence. • Provide checklists or templates for grazing schedule. • Monitor performance and correct errors on rest/recovery.	Paddock site, fencing materials
GENERAL OBJECTIVE 3.0: Know ultra-high density grazing system						
7-9	3.1 Describe Allan Savory holistic-planned grazing concepts 3.2 Explain ultra-high-density grazing (mob) 3.3 Explain pasture	• Illustrate Allan Savory holistic-planned grazing concepts with charts and local examples. • Clarify ultra-high-density grazing	Holistic texts, LCD projector, textbooks, journals, internet, white board	• Identify holistic grazing plan • Implement mob grazing • Renewal through impact • Browse Nigerian holistic pilots	• Demonstrate holistic grazing plan with relevant tools and field examples. • Supervise guided practice on mob grazing.	Grazing planning templates

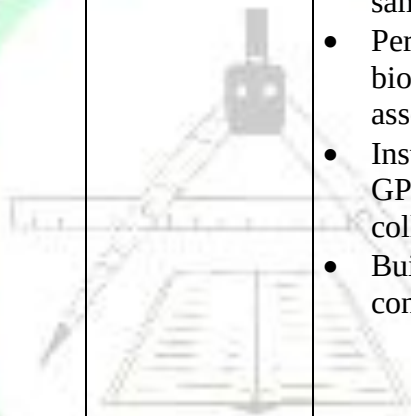
	renewal through mob impact 3.4 Describe Nigerian holistic grazing pilots	(mob) through guided questioning. - Relate pasture renewal through mob impact to pasture and range field situations. - Discuss Nigerian holistic grazing pilots.			- Provide checklists or templates for through impact. - Monitor performance and correct errors on Nigerian holistic pilots.	
GENERAL OBJECTIVE 4.0: Know pastoral mobility planning						
10-12	4.1 Explain pastoralism and transhumance 4.2 Explain Nigerian grazing reserves and stock routes 4.3 Explain pastoral limitations and peace building	- Illustrate pastoralism and transhumance with charts and local examples. - Clarify Nigerian grazing reserves and stock routes through guided questioning. - Relate pastoral limitations and peace building to pasture and range field situations.	Pastoral texts, LCD projector, textbooks, journals, internet, white board	- Map transhumance routes - Profile Nigerian grazing reserves - Identify conflict-resolution tools	- Demonstrate transhumance routes with relevant tools and field examples. - Supervise guided practice on Nigerian grazing reserves. - Provide checklists or templates for conflict-resolution tools.	Maps, reserves data,
GENERAL OBJECTIVE 5.0: Understand ranching and grazing-system economics						
13-15	5.1 Explain ranching grazing systems 5.2 Describe feedlot-	Illustrate ranching grazing systems with charts and	Ranching texts, LCD projector, textbooks,	- Design ranch grazing system - Integrate feedlot	Demonstrate ranch grazing system with relevant tools	Ranch case studies, templates

	pasture integration 5.3 Explain grazing-system economics 5.4 Explain Nigerian ranches and grazing models	local examples. • Clarify feedlot-pasture integration through guided questioning. • Relate grazing-system economics to pasture and range field situations. • Discuss Nigerian ranches and grazing models.	journals, internet, white board	with pasture • Compute economics • Profile Nigerian ranches	and field examples. • Supervise guided practice on feedlot with pasture. • Provide checklists or templates for economics. • Monitor performance and correct errors on Nigerian ranches.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

FIELD PRACTICAL II (DIGITAL AND CLIMATE-SMART PASTURE MANAGEMENT)

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: FIELD PRACTICAL II (DIGITAL AND CLIMATE-SMART PASTURE MANAGEMENT)	COURSE CODE: PRM 415	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 0
YEAR: II SEMESTER: I	PRE-REQUISITE: PRM 313	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills of intensive field-practical of digital pasture monitoring and climate-smart pasture management in real conditions		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Apply digital monitoring preparation. 2.0 Apply digital pasture monitoring fieldwork. 3.0 Apply climate-smart pasture fieldwork. 4.0 Apply integrated data analysis. 5.0 Apply reporting and dissemination.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: FIELD PRACTICAL II (DIGITAL AND CLIMATE-SMART PASTURE MANAGEMENT)			COURSE CODE: PRM 415		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 0	
YEAR: II SEMESTER: I			PRE-REQUISITE: PRM 313		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of intensive field-practical of digital pasture monitoring and climate-smart pasture management in real conditions.						
GENERAL OBJECTIVE 1.0: Apply digital monitoring preparation						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3				- Plan digital monitoring (target rangelands, sites, equipment) - Calibrate drone/GPS/NDVI tools - Prepare GIS and dashboard tools - Brief students on protocols and safety	- Demonstrate digital monitoring (target rangelands, sites, equipment) with relevant tools and field examples. - Supervise guided practice on drone/GPS/NDVI tools. - Provide checklists or templates for GIS and dashboard tools. - Monitor	Drone, GPS, NDVI tools, lab PCs

					performance and correct errors on students on protocols and safety.	
GENERAL OBJECTIVE 2.0: Apply digital pasture monitoring fieldwork						
4-7				• Perform GPS-tagged biomass sampling • Perform drone biomass and NDVI assessment • Install/monitor GPS livestock collars • Build pasture-condition map	• Demonstrate GPS-tagged biomass sampling with relevant tools and field examples. • Supervise guided practice on drone biomass and NDVI assessment. • Provide checklists or templates for Install/monitor GPS livestock collars. • Monitor performance and correct errors on pasture-condition map.	Sampling tools, drone, GPS collars, GIS
GENERAL OBJECTIVE 3.0: Apply climate-smart pasture fieldwork						
8-11				• Establish climate-smart demo (silvopasture, drought-tolerant species) • Apply rotational	• Demonstrate climate-smart demo (silvopasture, drought-tolerant species) with relevant tools and	Demo plots, livestock, soil augers, NDVI tools

				grazing for carbon • Sample soil for carbon sequestration • Apply pasture EWS/NDVI forecasting	field examples. • Supervise guided practice on rotational grazing for carbon. • Provide checklists or templates for soil for carbon sequestration. • Monitor performance and correct errors on pasture EWS/NDVI forecasting.	
GENERAL OBJECTIVE 4.0: Apply integrated data analysis						
12-13				• Integrate digital and climate-smart data • Build pasture decision dashboard • Compute carrying-capacity and stocking dynamics • Map climate-smart pasture portfolio	• Demonstrate digital and climate-smart data with relevant tools and field examples. • Supervise guided practice on pasture decision dashboard. • Provide checklists or templates for carrying-capacity and stocking dynamics. • Monitor performance and correct errors on climate-smart	Lab PCs, dashboard tools, datasets

					pasture portfolio.	
GENERAL OBJECTIVE 5.0: Apply reporting and dissemination						
14-15				• Write 20-page integrated field report • Build interactive web-map/dashboard • Prepare 15-slide presentation • Defend to panel	• Demonstrate 20-page integrated field report with relevant tools and field examples. • Supervise guided practice on interactive web-map/dashboard. • Provide checklists or templates for 15-slide presentation. • Monitor performance and correct errors on to panel.	Report templates, web tools, panel
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

RANGE PATROL AND DISASTER RESPONSE

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: RANGE PATROL AND DISASTER RESPONSE	COURSE CODE: PRM 416	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE: PRM 313	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills of conducting routine range patrols and disaster recovery.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Know range patrol foundations and routine surveillance 2.0 Know hazard detection and digital surveillance technologies 3.0 Know rangeland fire management 4.0 Know drought and flood disaster response 5.0 Know livestock-disease outbreak and biosecurity response 6.0 Know emergency coordination, evacuation and post-disaster recovery		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: RANGE PATROL AND DISASTER RESPONSE			COURSE CODE: PRM 416		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNITS: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE: PRM 313		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of conducting routine range patrols and disaster recovery.						
GENERAL OBJECTIVE 1.0: Know range patrol foundations and routine surveillance						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define range patrol and its objectives (observation, deterrence, documentation, intervention). 1.2 Explain patrol patterns 1.3 Explain patrol frequency based	Illustrate range patrol and its objectives (observation, deterrence, documentation, intervention) with charts and local examples.	Textbooks, smart boards, patrol-procedure handbooks, charts, LCD projector.	- Plan a patrol route for a 100-ha rangeland. - Perform a transect patrol on a demonstration site. - Record patrol observations	- Demonstrate a patrol route for a 100-ha rangeland with relevant tools and field examples. - Supervise guided practice on a transect patrol on	Topographic maps, GPS, digital cameras, smartphones, patrol logbooks, demonstration rangeland, vehicle/motorcycle/horse, PPE.

	on risk profile and seasonality. 1.4 Describe patrol documentation	- Clarify patrol patterns through guided questioning. - Relate patrol frequency based on risk profile and seasonality to pasture and range field situations. - Discuss patrol documentation.		using logbook, GPS and camera. Compile a 2-page patrol report.	a demonstration site. - Provide checklists or templates for patrol observations using logbook, GPS and camera. - Monitor performance and correct errors on a 2-page patrol report.	
GENERAL OBJECTIVE 2.0: Know hazard detection and digital surveillance technologies						
4-6	2.1 Describe rangeland hazard categories 2.2 Explain digital surveillance using drones/UAVs, GPS trackers and satellite imagery. 2.3 Describe early-warning indicators and trigger thresholds. 2.4 Explain community-	- Illustrate rangeland hazard categories with charts and local examples. - Clarify digital surveillance using drones/UAVs, GPS trackers and satellite imagery through guided	Textbooks, NIMET/ NDVI data, NEMA early-warning materials, LCD projector.	- Identify 8 hazard signs on a demonstration rangeland. - Operate a drone for aerial surveillance. - Interpret satellite NDVI imagery for hazard detection. - Set up a community informant	- Demonstrate 8 hazard signs on a demonstration rangeland with relevant tools and field examples. - Supervise guided practice on a drone for aerial surveillance. - Provide checklists or templates for satellite NDVI imagery for	Drone (DJI or equivalent), smartphones, tablets, QGIS/Google Earth Engine, NDVI imagery, community sites, internet.

	based monitoring and informant networks.	- questioning. - Relate early-warning indicators and trigger thresholds to pasture and range field situations. - Discuss community-based monitoring and informant networks.		network for hazard reporting.	- hazard detection. - Monitor performance and correct errors on up a community informant network for hazard reporting.	
GENERAL OBJECTIVE 3.0: Know rangeland fire management						
7-8	3.1 Explain rangeland fire types. 3.2 Describe the fire triangle (fuel, oxygen, heat). 3.3 Explain prevention strategies. 3.4 Explain fire detection and suppression methods. 3.5 Explain controlled burning as a	- Illustrate rangeland fire types with charts and local examples. - Clarify the fire triangle (fuel, oxygen, heat) through guided questioning. - Relate prevention	Textbooks, fire safety charts, NFS/NEMA fire manuals, LCD projector.	- Construct a 20-m fire break. - Operate fire-suppression equipment (knapsack pump, beaters, firefighting tools). - Perform a controlled burn on a	- Demonstrate a 20-m fire break with relevant tools and field examples. - Supervise guided practice on fire-suppression equipment (knapsack pump, beaters, firefighting tools). - Provide checklists	Knapsack pumps, fire beaters, drip torch, fire rakes, PPE (Nomex, boots, gloves, goggles), demonstration plot, communication radios, water

	range-improvement tool.	strategies to pasture and range field situations. • Discuss fire detection and suppression methods. • Review responses on controlled burning as a range-improvement tool and correct misconceptions.		demonstration plot (with permission). • Perform post-fire assessment and reseeding recommendation.	or templates for a controlled burn on a demonstration plot (with permission). • Monitor performance and correct errors on post-fire assessment and reseeding recommendation.	tanker.
GENERAL OBJECTIVE 4.0: Know drought and flood disaster response						
9-11	4.1 Define drought and flood in the rangeland context. 4.2 Explain drought indicators 4.3 Explain drought mitigation 4.4 Explain flood response. 4.5 Explain Nigerian agro-ecological zone	• Illustrate drought and flood in the rangeland context with charts and local examples. • Clarify drought indicators through guided questioning.	Textbooks, NIMET data, IPCC reports, NEMA drought/flood briefs, LCD projector.	• Assess drought severity using NDVI and rainfall records. • Apply a destocking decision matrix. • Implement an emergency water-point setup. • Plan a livestock	• Demonstrate drought severity using NDVI and rainfall records with relevant tools and field examples. • Supervise guided practice on a destocking decision matrix.	NDVI imagery, NIMET rainfall data, decision-matrix templates, water tanks, evacuation-route maps, body-condition score charts, recovery

	drought/flood profiles.	• Relate drought mitigation to pasture and range field situations. • Discuss flood response. • Review responses on Nigerian agro-ecological zone drought/flood profiles and correct misconceptions.		evacuation for a flood scenario. • Perform a post-disaster pasture assessment.	• Provide checklists or templates for an emergency water-point setup. • Monitor performance and correct errors on a livestock evacuation for a flood scenario. • Review outputs on a post-disaster pasture assessment and give feedback.	checklists.
GENERAL OBJECTIVE 5.0: Know emergency coordination, evacuation and post-disaster recovery						
14-15	5.1 Define disaster-command 5.2 Explain emergency-response stakeholders 5.3 Explain evacuation procedures and safe-assembly points. 5.4 Explain post-disaster damage assessment and	• Illustrate disaster-command with charts and local examples. • Clarify emergency-response stakeholders through guided questioning. • Relate	Textbooks, NEMA/SEMA manuals, ICS guides, recovery-planning templates, LCD projector.	• Simulate a disaster-command exercise. • Perform a stakeholder-coordination meeting. • Execute a livestock-evacuation drill. • Perform a rapid	• Demonstrate a disaster-command exercise with relevant tools and field examples. • Supervise guided practice on a stakeholder-coordination meeting. • Provide checklists or templates for a	Command-structure templates, stakeholder contact lists, evacuation-route maps, damage-assessment forms, recovery-plan templates, role-

	reporting. 5.5 Describe notifiable diseases and reporting channels 5.6 Describe psychosocial support and recovery planning.	evacuation procedures and safe-assembly points to pasture and range field situations. • Discuss post-disaster damage assessment and reporting. • Review responses on notifiable diseases and reporting channels and correct misconceptions. • Illustrate psychosocial support and recovery planning with charts and local examples.		damage assessment. • Submit an outbreak report through veterinary channels. • Develop a 4-week post-disaster recovery plan.	livestock-evacuation drill. • Monitor performance and correct errors on a rapid damage assessment. • Review outputs on an outbreak report through veterinary channels and give feedback. • Demonstrate a 4-week post-disaster recovery plan with relevant tools and field examples.	play scripts.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10%						

Practical:	40%
Examination:	40%
Total:	100%



YEAR II SEMESTER II



RANGE LIVESTOCK HEALTH AND BIOSECURITY

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: RANGE LIVESTOCK HEALTH AND BIOSECURITY	COURSE CODE: PRM 421	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills on range livestock health and biosecurity		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know fundamentals of livestock disease of range. 2.0 Know tick-borne diseases and ectoparasites. 3.0 Know diseases caused by helminths 4.0 know biosecurity and herd health. 5.0 Know mobile veterinary services and One Health concept.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: RANGE LIVESTOCK HEALTH & BIOSECURITY			COURSE CODE: PRM 421		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills on range livestock health and biosecurity.						
GENERAL OBJECTIVE 1.0: Know fundamentals of livestock disease of range						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain infectious diseases of livestock in range 1.2 Explain Nutritional diseases affecting livestock in the range 1.3 Describe the epidemiology of diseases of economic importance prevalence 1.4 Explain the prevention and control of diseases	• Illustrate infectious diseases of livestock in range with charts and local examples. • Clarify Nutritional diseases affecting livestock in the range through guided questioning. • Relate the epidemiology of diseases of economic importance prevalence to	Disease texts, LCD projector, Textbooks, journals, whiteboard,	• Identify diseases base on causative agents and clinical signs • Describe clinical manifestation of diseases • Describe drugs used in the control and eradication of diseases	• Demonstrate diseases base on causative agents and clinical signs with relevant tools and field examples. • Supervise guided practice on clinical manifestation of diseases. • Provide checklists or templates for drugs used in the control and eradication of diseases.	Clinical materials, disease, drugs, vaccines, charts refrigerators

		pasture and range field situations. • Discuss the prevention and control of diseases.				
GENERAL OBJECTIVE 2.0: Know tick-borne diseases and ectoparasites						
4-6	2.1 Describe the various types and species of ticks 2.2 Explain the roles of ticks in transmission of diseases 2.3 Describe common tick-borne diseases of range (anaplasmosis, babesiosis, theileriosis, heartwater) 2.4 Describe treatment a mode of control ticks 2.5 Describe treatment and control of tick-borne diseases	• Illustrate the various types and species of ticks with charts and local examples. • Clarify the roles of ticks in transmission of diseases through guided questioning. • Relate common tick-borne diseases of range (anaplasmosis, babesiosis, theileriosis, heartwater) to pasture and range field situations. • Discuss treatment a mode of control ticks. • Review responses on treatment and control of tick-	Tick texts, LCD projector Disease texts, LCD projector, Textbooks, journals, whiteboard	• Identify tick species • Diagnose tick-borne disease • Identify drugs used in treatment of tick-borne diseases acaricides • Describe tick control measures	• Demonstrate tick species with relevant tools and field examples. • Supervise guided practice on tick-borne disease. • Provide checklists or templates for drugs used in treatment of tick-borne diseases acaricides. • Monitor performance and correct errors on tick control measures.	Tick specimens, acaricides, anti-protozoans livestock

		borne diseases and correct misconceptions.				
GENERAL OBJECTIVE 3.0: Know diseases caused by helminths.						
7-9	3.1 Describe classes of helminths 3.2 Explain mode of transmission and infestation 3.3 Explain the clinical manifestation of Helminthosis 3.4 Explain the role of faeces and Faecal Egg Count (FEC) in diagnosis of helminthosis 3.5 Explain grazing and use of drugs as a control measure	• Illustrate classes of helminths with charts and local examples. • Clarify mode of transmission and infestation through guided questioning. • Relate the clinical manifestation of Helminthosis to pasture and range field situations. • Discuss the role of faeces and Faecal Egg Count (FEC) in diagnosis of helminthosis. • Review responses on grazing and use of drugs as a control measure and correct misconceptions.	Helminth texts, LCD projector, Disease texts, LCD projector, Textbooks, journals, whiteboard	• Identify helminth species and their classes • 3.2P Conduct FEC (McMaster method) for faecal analysis • 3.4P Apply targeted selective deworming	• Demonstrate helminth species and their classes with relevant tools and field examples. • Supervise guided practice on Conduct FEC (McMaster method) for faecal analysis. • Provide checklists or templates for Apply targeted selective deworming.	Microscopes, FEC kit, FAMACHA cards, floatation kits, slides, dissecting microscopes hand slides, coverslips salt beakers flasks
GENERAL OBJECTIVE 4.0: Know biosecurity and herd health						
10-12	4.1 Explain	• Illustrate	Biosecurity	• Identify	• Demonstrate	Biosecurity

	biosecurity protocols 4.2 Describe vaccination calendars 4.3 Describe herd health monitoring 4.4 Explain surveillance and mortality investigation 4.5 Explain record keeping	biosecurity protocols with charts and local examples. • Clarify vaccination calendars through guided questioning. • Relate herd health monitoring to pasture and range field situations. • Discuss surveillance and mortality investigation. • Review responses on record keeping and correct misconceptions.	texts, LCD projector	biosecurity protocols • Build vaccination calendar • Apply herd-health monitoring • Perform mortality investigation	biosecurity protocols with relevant tools and field examples. • Supervise guided practice on vaccination calendar. • Provide checklists or templates for herd-health monitoring. • Monitor performance and correct errors on mortality investigation.	kits, vaccines, monitoring forms
GENERAL OBJECTIVE 5.0: Know mobile veterinary services and One Health concept						
13-15	5.1 Explain mobile veterinary-service logistics 5.2 Explain Community Animal Health Worker (CAHW) model 5.3 Describe zoonotic-disease surveillance 5.4 Explain the role of	• Illustrate mobile veterinary-service logistics with charts and local examples. • Clarify Community Animal Health Worker (CAHW) model through guided questioning. • Relate zoonotic-	One Health texts, LCD projector, Disease texts, LCD projector, Textbooks, journals, whiteboard	• Plan mobile vet service (ambulatory services) • Perform zoonotic surveillance • Demonstrate One Health framework	• Demonstrate mobile vet service (ambulatory services) with relevant tools and field examples. • Supervise guided practice on zoonotic surveillance. • Provide checklists or templates for	Mobile clinic kit, training materials, surveillance forms, record forms

	pastoral Association in livestock extension activity	disease surveillance to pasture and range field situations. Discuss the role of pastoral Association in livestock extension activity.			One Health framework.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

FEEDLOT OPERATIONS AND PASTURE-TO-PLATE VALUE CHAIN

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: FEEDLOT OPERATIONS AND PASTURE-TO-PLATE VALUE CHAIN	COURSE CODE: PRM 422	CONTACT HOURS: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: PRM 314, PRM 321	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is designed to equip students with the knowledge and skills to implement feedlot operations		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know feedlot foundations. 2.0 Know feedlot nutrition and transition. 3.0 Know feedlot operations management. 4.0 Know grass-fed premium markets. 5.0 Know fundamentals of cold-chain operations.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: FEEDLOT OPERATIONS AND PASTURE-TO-PLATE VALUE CHAIN			COURSE CODE: PRM 422		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE: PRM 314, PRM 321		PRACTICAL: 1 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and skills to implement feedlot operations						
GENERAL OBJECTIVE 1.0: Know feedlot foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Describe feedlot concept and integration with pasture-backgrounding 1.2 Describe feedlot-pen design and layout 1.3 Explain feedlot infrastructure 1.4 Describe Nigerian feedlot operations and prospects	• Illustrate feedlot concept and integration with pasture-backgrounding with charts and local examples. • Clarify feedlot-pen design and layout through guided questioning. • Relate feedlot infrastructure to pasture and range field situations. • Discuss Nigerian	Feedlot texts, LCD projector, textbooks, journals, internet, whiteboard	• Design feedlot infrastructure • Carryout feedlot operations	• Demonstrate feedlot infrastructure with relevant tools and field examples. • Supervise guided practice on feedlot operations.	Feedlot facility, Back-grounded Animals, design templates

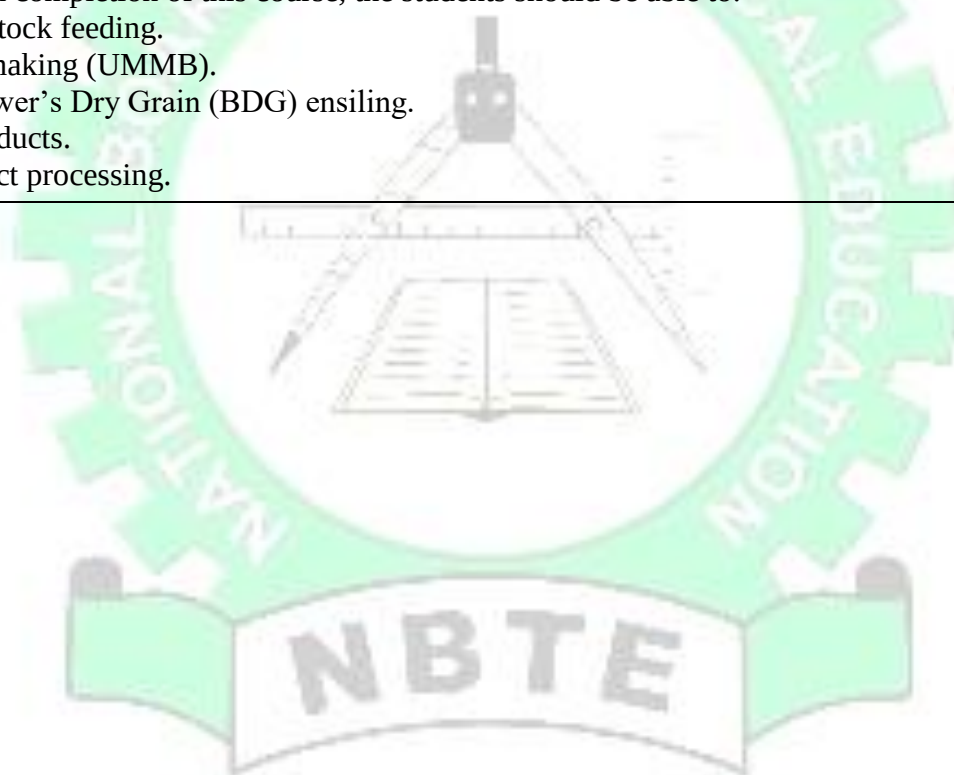
		feedlot operations and prospects.				
GENERAL OBJECTIVE 2.0: Know feedlot nutrition and transition						
4-6	2.1 Describe transition diets from pasture to feedlot 2.2 Explain step-up rations and adaptation 2.3 Explain finishing diets and daily-gain targets 2.4 Describe Body Condition Score (BCS) management	• Illustrate transition diets from pasture to feedlot with charts and local examples. • Clarify step-up rations and adaptation through guided questioning. • Relate finishing diets and daily-gain targets to pasture and range field situations. • Discuss Body Condition Score (BCS) management.	Feedlot nutrition texts, LCD projector, textbooks, journals, internet, whiteboard	• Design transition diet • Build step-up ration plan • Apply finishing rations • Apply BCS scoring and management	• Demonstrate transition diet with relevant tools and field examples. • Supervise guided practice on step-up ration plan. • Provide checklists or templates for finishing rations. • Monitor performance and correct errors on BCS scoring and management.	Ration templates, BCS scoring sheets
GENERAL OBJECTIVE 3.0: Know feedlot operations management						
7-9	3.1 Describe animal-acquisition and grading 3.2 Explain feedlot health management 3.3 Describe weight gain monitoring	• Illustrate animal-acquisition and grading with charts and local examples. • Clarify feedlot health management through guided	Feedlot ops texts, LCD projector, textbooks, journals, internet, whiteboard	• Perform animal grading • plan feedlot health management • Monitor weight gain • Make finishing time decisions	• Demonstrate animal grading with relevant tools and field examples. • Supervise guided practice on feedlot health management. • Provide checklists	Live animals, grading scorecards, scales

	3.4 Describe finishing-time decision and marketing	- questioning. - Relate weight gain monitoring to pasture and range field situations. - Discuss finishing-time decision and marketing.			- or templates for weight gain. - Monitor performance and correct errors on finishing time decisions.	
GENERAL OBJECTIVE 4.0: Know grass-fed premium markets						
10-12	4.1 Describe grass-fed beef certification /standards 4.2 Describe grass-fed premium markets. 4.3 Describe traceability process for grass-fed products	- Illustrate grass-fed beef certification /standards with charts and local examples. - Clarify grass-fed premium markets through guided questioning. - Relate traceability process for grass-fed products to pasture and range field situations.	Grass-fed texts, LCD projector, textbooks, journals, internet, whiteboard	- Apply grass-fed certification checklist - Map grass-fed market opportunities - Design grass-fed branding/label - Apply traceability system	- Demonstrate grass-fed certification checklist with relevant tools and field examples. - Supervise guided practice on grass-fed market opportunities. - Provide checklists or templates for grass-fed branding/label. - Monitor performance and correct errors on traceability system.	Certification docs, branding templates, traceability tools
GENERAL OBJECTIVE 5.0: Know fundamentals of cold-chain operations						
13-15	5.1 Describe cold-chain logistics from abattoir to table	Illustrate cold-chain logistics from abattoir to table with charts	Cold-chain texts, LCD projector, textbooks,	- Design cold-chain logistics - Visit/inspect abattoir	Demonstrate cold-chain logistics with relevant tools and field examples.	Cold-chain models, abattoir visit, VC templates

	5.2 Describe abattoir/slaughterhouse operations 5.3 Describe chilled/frozen meat distribution 5.4 Describe pasture-to-table value chain.	and local examples. - Clarify abattoir/slaughterhouse operations through guided questioning. Relate chilled/frozen meat distribution to pasture and range field situations. - Discuss pasture-to-table value chain.	journals, internet, whiteboard	- Plan distribution - Map full pasture-to-table value chain	- Supervise guided practice on Visit/inspect abattoir. - Provide checklists or templates for distribution. - Monitor performance and correct errors on full pasture-to-table value chain.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

CROP RESIDUES IMPROVEMENT AND DERIVATIVES

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: CROP RESIDUES IMPROVEMENT AND DERIVATIVES	COURSE CODE: PRM 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 on the use of various crop residues in feeding livestock.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know crop residues for livestock feeding. 2.0 Know urea-molasses block making (UMMB). 3.0 Know ammoniation and Brewer's Dry Grain (BDG) ensiling. 4.0 Know agro-industrial by-products. 5.0 Understand animal by-product processing.		



PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: CROP RESIDUES IMPROVEMENT AND DERIVATIVES			COURSE CODE: PRM 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 on the use of various crop residues in feeding livestock.						
GENERAL OBJECTIVE 1.0: Know crop residues for livestock feeding						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain Nigerian crop residue inventory 1.2 Explain residue nutritive value 1.3 Describe processing methods of various crop residues	• Illustrate Nigerian crop residue inventory with charts and local examples. • Clarify residue nutritive value through guided questioning. • Relate processing methods of various crop residues to pasture and range field situations.	Crop residue texts, LCD projector, Marker, White board, Charts	• Prepare inventory of available crop residues • Analyse residue nutritive value • Identify chemical treatment • Identify chopping/pelleting • Identify enzymes, synthetic microbes	• Demonstrate of available crop residues with relevant tools and field examples. • Supervise guided practice on residue nutritive value. • Provide checklists or templates for chemical treatment. • Monitor performance and correct errors on chopping/pelleting. • Review outputs on	Residue samples, urea, choppers, enzymes, synthetic microbes

					enzymes, synthetic microbes and give feedback.	
GENERAL OBJECTIVE 2.0: Know urea-molasses block making (UMMB)						
4-6	2.1 Explain Urea Molasses Mineral Block (UMMB) ingredients and formulation 2.2 Describe UMMB mixing and moulding 2.3 Describe UMMB drying and storage 2.4 Explain UMMB feeding practice and economics	• Illustrate Urea Molasses Mineral Block (UMMB) ingredients and formulation with charts and local examples. • Clarify UMMB mixing and moulding through guided questioning. • Relate UMMB drying and storage to pasture and range field situations. • Discuss UMMB feeding practice and economics.	UMMB texts, LCD projector, Marker, White board, Charts	• Source UMMB ingredients • Mix and mould UMMB • Dry and store UMMB • Identify UMMB feeding and compute economics	• Demonstrate UMMB ingredients with relevant tools and field examples. • Supervise guided practice on and mould UMMB. • Provide checklists or templates for and store UMMB. • Monitor performance and correct errors on UMMB feeding and compute economics.	UMMB ingredients, moulds, drying area, livestock
GENERAL OBJECTIVE 3.0: Know ammoniation and Brewer's Dry Grain (BDG) ensiling						
7-9	3.1 Describe bulk ammoniation of straw (urea, anhydrous NH ₃) 3.2 Explain ammoniation chamber / stack design	• Illustrate bulk ammoniation of straw (urea, anhydrous NH₃) with charts and local examples. • Clarify ammoniation chamber / stack	Ammoniation texts, LCD projector, Marker, White board, Charts	• Perform ammoniation • Build ammoniation chamber/stack • Ensile BDG • Perform mycotoxin	• Demonstrate ammoniation with relevant tools and field examples. • Supervise guided practice on ammoniation chamber/stack.	Ammoniation materials, BDG, mycotoxin kit

	3.3 Explain Brewers Dried Grain (BDG) ensiling 3.4 Explain mycotoxin screening (aflatoxin, ochratoxin)	design through guided questioning. • Relate Brewers Dried Grain (BDG) ensiling to pasture and range field situations. • Discuss mycotoxin screening (aflatoxin, ochratoxin).		screening	• Provide checklists or templates for BDG. • Monitor performance and correct errors on mycotoxin screening.	
GENERAL OBJECTIVE 4.0: Know agro-industrial by-products						
10-12	4.1 Describe agro-industrial by products 4.2 Explain the nutritional content of agro-by product 4.3 Explain the limitations of the use of agro-industrial by-products 4.4 Explain processing and commercialization of industrial by product	• Illustrate agro-industrial by products with charts and local examples. • Clarify the nutritional content of agro-by product through guided questioning. • Relate the limitations of the use of agro-industrial by-products to pasture and range field situations. • Discuss processing and commercialization of industrial by product.	By-product texts, LCD projector, Marker, White board, Charts	• Operate of oilseed cakes/offals • Operate brewery/bakery wastes • Operate oil-palm by-products • Operate fruit wastes	• Demonstrate of oilseed cakes/offals with relevant tools and field examples. • Supervise guided practice on brewery/bakery wastes. • Provide checklists or templates for oil-palm by-products. • Monitor performance and correct errors on fruit wastes.	By-product samples, sources, livestock
GENERAL OBJECTIVE 5.0: Understand animal by-product processing						

THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
13-15	5.1 Describe animal by products 5.2 Describe the processing of animal by products 5.3 Explain rendering	• Illustrate animal by products with charts and local examples. • Clarify the processing of animal by products through guided questioning. • Relate rendering to pasture and range field situations.	Animal by-products texts, LCD projector, Marker, White board, Charts	• Identify primary hide / skin curing • Produce bone meal • Identify tallow/rendering • Visit tannery/leather works	• Demonstrate primary hide / skin curing with relevant tools and field examples. • Supervise guided practice on bone meal. • Provide checklists or templates for tallow/rendering. • Monitor performance and correct errors on tannery/leather works.	Curing materials, rendering equipment, tannery visit
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

INTEGRATED FORAGE-LIVESTOCK SYSTEMS DESIGN

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: INTEGRATED FORAGE-LIVESTOCK SYSTEMS DESIGN	COURSE CODE: PRM 424	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: PRM 314, PRM 321, PRM 412, PRM 422	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills to design an integrated forage-livestock enterprise		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know integrated systems thinking. 2.0 Know pasture and forage component design. 3.0 Know livestock component design. 4.0 Know value-chain and feedlot integration. 5.0 Know full enterprise plan and defense.		

PROGRAMME: HND PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: INTEGRATED FORAGE-LIVESTOCK SYSTEMS DESIGN			COURSE CODE: PRM 424		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE: PRM 314, PRM 321, PRM 412, PRM 422		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and skills to design an integrated forage-livestock enterprise.						
GENERAL OBJECTIVE 1.0: Know integrated systems thinking						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Describe systems thinking for forage-livestock 1.2 Describe integrated farming system (IFS) models 1.3 Describe Nigerian commercial pasture-based enterprises 1.4 Describe enterprise selection (dairy, beef, sheep, goat)	• Illustrate systems thinking for forage-livestock with charts and local examples. • Clarify integrated farming system (IFS) models through guided questioning. • Relate Nigerian commercial pasture-based enterprises to pasture and range field situations.	Systems texts, LCD projector, textbooks, journals, internet, whiteboard	• Apply systems framework • Model IFS • Profile 5 Nigerian commercial enterprises • Select 1 enterprise for capstone design	• Demonstrate systems framework with relevant tools and field examples. • Supervise guided practice on IFS. • Provide checklists or templates for 5 Nigerian commercial enterprises. • Monitor performance and correct errors on 1 enterprise for capstone design.	Systems frameworks, case studies, litterature

		Discuss enterprise selection (dairy, beef, sheep, goat).				
GENERAL OBJECTIVE 2.0: Know pasture and forage component design						
4-6	2.1 Describe pasture/forage resource design 2.2 Describe pasture-area sizing for the enterprise 2.3 Describe seasonal forage budget 2.4 Describe hay/silage/concentrate strategy	- Illustrate pasture/forage resource design with charts and local examples. - Clarify pasture-area sizing for the enterprise through guided questioning. - Relate seasonal forage budget to pasture and range field situations. - Discuss hay/silage/concentrate strategy.	Design texts, LCD projector, textbooks, journals, internet, whiteboard	- Design pasture/forage resource - Size pasture area - Build seasonal forage budget - Design hay/silage/concentrate strategy	- Demonstrate pasture/forage resource with relevant tools and field examples. - Supervise guided practice on pasture area. - Provide checklists or templates for seasonal forage budget. - Monitor performance and correct errors on hay/silage/concentrate strategy.	Design templates, forage tables
GENERAL OBJECTIVE 3.0: Know livestock component design						
7-9	3.1 Describe breed and herd composition design 3.2 Describe reproductive and AI strategy 3.3 Describe health and biosecurity strategy	- Illustrate breed and herd composition design with charts and local examples. - Clarify reproductive and AI strategy through guided	Livestock design texts, LCD projector, textbooks, journals, internet, whiteboard	- Design herd composition - Design AI/reproductive plan - Design health/biosecurity plan - Design	- Demonstrate herd composition with relevant tools and field examples. - Supervise guided practice on AI/reproductive plan. - Provide checklists	Design templates

	3.4 Describe welfare and housing strategy	- questioning. - Relate health and biosecurity strategy to pasture and range field situations. - Discuss welfare and housing strategy.		welfare/housing	- or templates for health/biosecurity plan. - Monitor performance and correct errors on welfare/housing.	
GENERAL OBJECTIVE 4.0: Know value-chain and feedlot integration						
10-12	4.1 Describe feedlot and finishing strategy 4.2 Describe value-chain integration (pasture-to-plate) 4.3 Describe branding (grass-fed) 4.4 Describe digital systems (GIS/monitoring/records)	- Illustrate feedlot and finishing strategy with charts and local examples. - Clarify value-chain integration (pasture-to-plate) through guided questioning. - Relate branding (grass-fed) to pasture and range field situations. - Discuss digital systems (GIS/monitoring/records).	VC integration texts, LCD projector, textbooks, journals, internet, whiteboard	- Design feedlot strategy - Map VC integration - Design grass-fed branding - Design digital management plan	- Demonstrate feedlot strategy with relevant tools and field examples. - Supervise guided practice on VC integration. - Provide checklists or templates for grass-fed branding. - Monitor performance and correct errors on digital management plan.	VC templates
GENERAL OBJECTIVE 5.0: Know full enterprise plan and defense						
13-15	5.1 Describe 5-year business plan and	Illustrate 5-year business plan and	Business plan texts, LCD	Build 5-year business plan	Demonstrate 5-year business plan with	Business plan templates,

	financial model 5.2 Describe risk assessment and mitigation 5.3 Describe sustainability/climate-smart integration 5.4 Describe capstone defence and refinement	financial model with charts and local examples. - Clarify risk assessment and mitigation through guided questioning. - Relate sustainability/climate-smart integration to pasture and range field situations. - Discuss capstone defence and refinement.	projector, textbooks, journals, internet, whiteboard	- Perform risk assessment - Integrate climate-smart elements	relevant tools and field examples. - Supervise guided practice on risk assessment. - Provide checklists or templates for climate-smart elements.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

PASTURE AND RANGELAND FENCING

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PASTURE AND RANGE MANAGEMENT		
COURSE TITLE: PASTURE AND RANGELAND FENCING	COURSE CODE: PRM 425	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNITS: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills required to design, install, maintain and manage pasture and rangeland fencing systems.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Know principles of fencing and design 2.0 know conventional fencing materials and systems 3.0 Know electric and energised fencing systems 4.0 Know rotational grazing and paddock fencing 5.0 Know virtual fencing technologies 6.0 Know fencing installation, maintenance and economics		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PASTURE AND RANGE MANAGEMENT						
COURSE TITLE: PASTURE AND RANGELAND FENCING			COURSE CODE: PRM 425		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNITS: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills required to design, install, maintain and manage pasture and rangeland fencing systems						
GENERAL OBJECTIVE 1.0: Know fencing principles and design foundations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1	1.1 Define fencing and its purposes 1.2 Describe the types of fences 1.3 Explain fencing as part of grazing management. 1.4 Explain factors influencing fence design	• Illustrate fencing and its purposes with charts and local examples. • Clarify the types of fences through guided questioning. • Relate fencing as part of grazing management to pasture and range field situations. • Discuss factors	Textbooks, fence-design charts, LCD projector, smart board, internet.	• Survey a pasture site for fencing design. • Identify suitable fence type for different terrains. • Sketch a fence layout for a 1-hectare paddock.	• Demonstrate a pasture site for fencing design with relevant tools and field examples. • Supervise guided practice on suitable fence type for different terrains. • Provide	GPS, measuring tape, ranging poles, sketch pads, demonstration site.

		influencing fence design.			checklists or templates for a fence layout for a 1-hectare paddock.	
GENERAL OBJECTIVE 2.0: Know conventional fencing materials and systems						
2-4	2.1 Describe wood post-and-rail fencing. 2.2 Explain barbed-wire fencing components 2.3 Describe woven-wire (stock-mesh) fencing systems. 2.4 Describe chain-link fencing for high-value enclosures. 2.5 Explain live (vegetative) fences using Gliricidia, Leucaena, Jatropha and Euphorbia.	• Illustrate wood post-and-rail fencing with charts and local examples. • Clarify barbed-wire fencing components through guided questioning. • Relate woven-wire (stock-mesh) fencing systems to pasture and range field situations. • Discuss chain-link fencing for high-value enclosures. • Review responses on live (vegetative) fences using	Textbooks, samples of fencing materials, charts, LCD projector.	• Identify components of a barbed-wire fence. • Construct a 20-m section of post-and-rail fencing. • Erect a 10-m section of woven-wire fencing. • Establish a live fence using Gliricidia or Leucaena cuttings.	• Demonstrate components of a barbed-wire fence with relevant tools and field examples. • Supervise guided practice on a 20-m section of post-and-rail fencing. • Provide checklists or templates for a 10-m section of woven-wire fencing. • Monitor performance and correct errors on a live fence using	Fence posts, barbed wire, woven wire, chain-link panels, post-hole diggers, wire strainers, hammers, staples, live cuttings, watering cans, demonstration site, PPE.

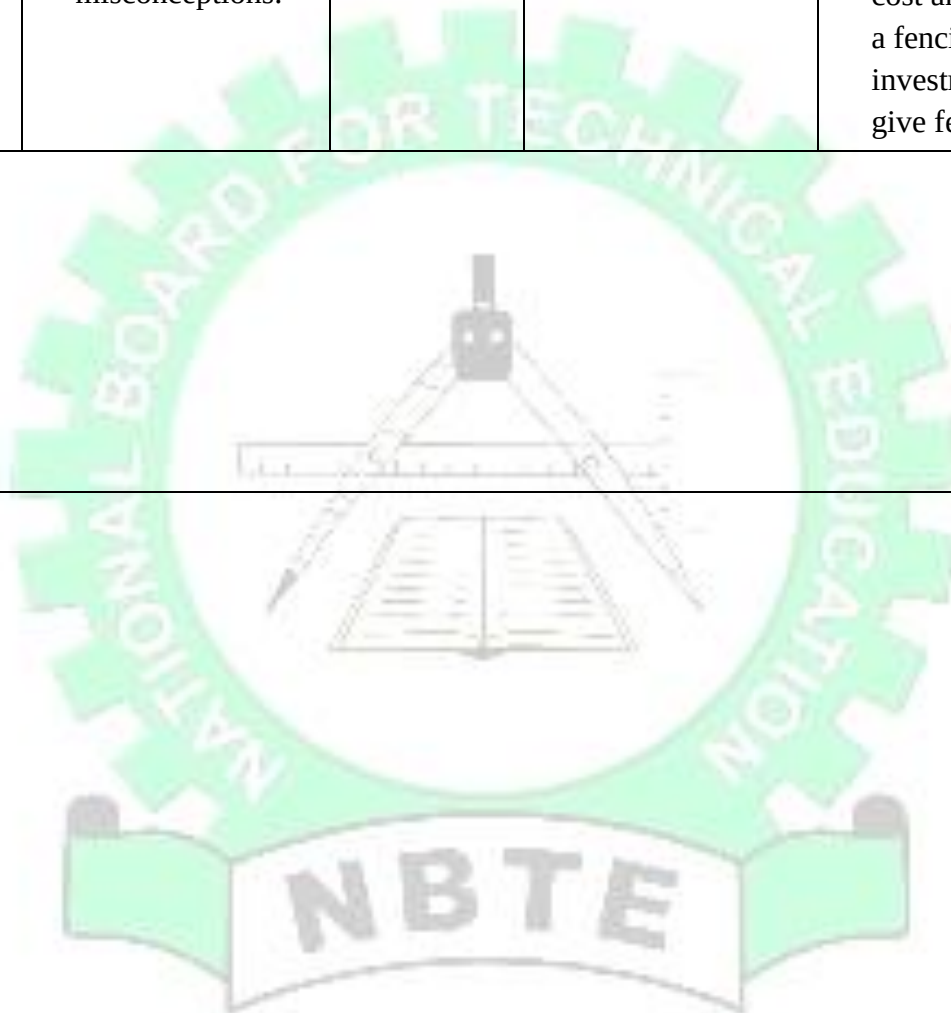
		Gliricidia, Leucaena, Jatropha and Euphorbia and correct misconceptions.			Gliricidia or Leucaena cuttings.	
GENERAL OBJECTIVE 3.0: Know electric and energized fencing systems						
5-6	3.1 Explain the principles of electric fencing (pulsed-current containment). 3.2 Describe components of electric fencing. 3.3 Describe safety, signage and animal training for electric fences. 3.4 Explain solar-powered electric fences for off-grid sites.	• Illustrate the principles of electric fencing (pulsed-current containment) with charts and local examples. • Clarify components of electric fencing through guided questioning. • Relate safety, signage and animal training for electric fences to pasture and range field situations. • Discuss solar-powered electric	Textbooks, safety-signage charts, LCD projector, whiteboard,	• Set up an energiser with battery/solar panel. • Install a 50-m single-strand electric fence. • Perform a voltage test using a fence tester. • Demonstrate animal training to an electric fence.	• Demonstrate up an energiser with battery/solar panel with relevant tools and field examples. • Supervise guided practice on a 50-m single-strand electric fence. • Provide checklists or templates for a voltage test using a fence tester. • Monitor performance	Electric-fence energiser, solar panel, batteries, conductors, insulators, earthing rods, fence tester, gate handles, demonstration animals, PPE.

		fences for off-grid sites.			and correct errors on animal training to an electric fence.	
GENERAL OBJECTIVE 4.0: Know rotational grazing and paddock fencing						
7-9	4.1 Explain rotational grazing principles and rest-rotation rationale. 4.2 Explain paddock design 4.3 Describe water-point placement and laneway design. 4.4 Calculate paddock size based on stocking rate, forage availability and rest period.	• Illustrate rotational grazing principles and rest-rotation rationale with charts and local examples. • Clarify paddock design through guided questioning. • Relate water-point placement and laneway design to pasture and range field situations. • Discuss paddock size based on stocking rate, forage availability and rest period.	Textbooks, design charts, stocking-rate tables, calculators, LCD projector.	• Design a 4-paddock rotational system for 5 ha of pasture. • Calculate paddock size for 20 sheep at a given stocking rate. • Lay out paddock corners using GPS. • Install temporary polywire / polytape paddock fencing.	• Demonstrate a 4-paddock rotational system for 5 ha of pasture with relevant tools and field examples. • Supervise guided practice on paddock size for 20 sheep at a given stocking rate. • Provide checklists or templates for paddock corners using GPS. • Monitor performance and correct errors on	Pasture maps, GPS, ranging poles, calculators, polywire, polytape, step-in posts, energiser, demonstration paddock.

					temporary polywire / polytape paddock fencing.	
GENERAL OBJECTIVE 5.0: Know virtual fencing technologies						
10-12	5.1 Define virtual fencing and its principles 5.2 Describe GPS-collar technology 5.3 Explain geofencing apps/software, mobile apps and cloud dashboards. 5.4 Explain training of livestock to virtual fences. 5.5 Explain advantages, limitations, costs and ethics of virtual fencing.	• Illustrate virtual fencing and its principles with charts and local examples. • Clarify GPS-collar technology through guided questioning. • Relate geofencing apps/software, mobile apps and cloud dashboards to pasture and range field situations. • Discuss training of livestock to virtual fences. • Review responses on advantages, limitations, costs	Textbooks, GPS, charts, LCD projector, internet, smartphones, whiteboard.	• Configure a GPS collar (or simulator) for livestock use. • Identify a geofence boundary on a mobile app. • Monitor livestock movement within a geofence. • Adjust virtual-fence boundaries remotely.	• Demonstrate a GPS collar (or simulator) for livestock use with relevant tools and field examples. • Supervise guided practice on a geofence boundary on a mobile app. • Provide checklists or templates for livestock movement within a geofence. • Monitor performance and correct	GPS collars or simulator app, smartphones, tablets, geofencing app subscription, internet, demonstration livestock.

		and ethics of virtual fencing and correct misconceptions.			errors on virtual-fence boundaries remotely.	
GENERAL OBJECTIVE 6.0: Know fencing installation, maintenance and economics						
13-15	6.1 Explain fence installation steps 6.2 Describe routine inspection and maintenance schedules. 6.3 Explain common fence problems 6.4 Explain installation cost per metre for different fence types. 6.5 Explain benefit-cost analysis of fencing investment.	• Illustrate fence installation steps with charts and local examples. • Clarify routine inspection and maintenance schedules through guided questioning. • Relate common fence problems to pasture and range field situations. • Discuss installation cost per metre for different fence types. • Review responses on benefit-cost analysis of fencing	Textbooks, cost tables, BCA templates, LCD projector, whiteboard, marker.	• Perform a fence inspection on an existing perimeter. • Repair a damaged section of fence. • Replace broken insulators/fence posts. • Compute a cost estimate for fencing 1 ha. • Perform a benefit-cost analysis of a fencing investment.	• Demonstrate a fence inspection on an existing perimeter with relevant tools and field examples. • Supervise guided practice on a damaged section of fence. • Provide checklists or templates for broken insulators/fence posts. • Monitor performance and correct errors on a cost estimate for fencing 1 ha.	Existing fence section, repair tools, replacement posts and insulators, costing templates, calculators, BCA worksheets.

		investment and correct misconceptions.			Review outputs on a benefit-cost analysis of a fencing investment and give feedback.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



LIST OF MINIMUM REQUIREMENTS

1.0 RANGE & PASTURE BOTANY / TAXONOMY LABORATORY

S/N	Equipment/ Facility/Software	Minimum Quantity
1.	Stereo Dissecting Microscopes (zoom, with LED illumination)	20
2.	Compound Microscopes (binocular)	20
3.	Range / Pasture Plant Reference Collection (grasses, legumes, browse; 100+ species)	1 collection
4.	Herbarium Cabinets with Specimen Sheets	6
5.	Plant Press, Drying Frames and Mounting Materials	20 sets
6.	Hand Lenses (10x, 20x triplet)	40
7.	Plant Taxonomic Keys and Identification Manuals (Tropical Grasses, Legumes, Browse)	20 sets
8.	Dissecting Kits (forceps, scalpels, needles, scissors)	20 kits
9.	Plant Sample Bottles, Killing Jars and Preservation Reagents	40 sets
10.	Field Plant Presses and Field Notebooks	40 sets
11.	Smartphones with AI Plant ID Apps (PlantNet, iNaturalist, Seek)	20
2.0 ANIMAL NUTRITION / FORAGE QUALITY LABORATORY		

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Proximate Analysis Apparatus (Kjeldahl, Soxhlet, Muffle Furnace)	1 set each
2.	Detergent Fibre Apparatus (NDF, ADF, ADL)	1 set
3.	Bomb Calorimeter (Gross Energy determination)	1
4.	In-Vitro Digestibility Apparatus (Tilley & Terry)	1 set
5.	NIRS (Near-Infrared Spectroscopy) Analyser - access or onsite	1 (or formal access to NAPRI / IAR)
6.	Drying Ovens (forced-air, 250 °C) and Muffle Furnaces	2 + 2
7.	Analytical Balance (0.0001 g) and Top-Loading Balance	2 each
8.	Tissue Grinders / Wiley Mills and Sample Sieves	4 + 10
9.	Refrigerator and Deep-Freezer (-20 °C)	2 + 1
10.	Glassware Set (beakers, flasks, crucibles, pipettes)	20 sets
11.	Fume Hood / Chemical Cabinet	1
12.	Distilled / Deionised Water Apparatus	1

3.0 COMPUTER-AIDED FEED FORMULATION COMPUTER LABORATORY

S/N	Equipment/Facility/Software	Minimum Quantity
1.	Desktop / Laptop Workstations (i5 / i7, 16 GB RAM, SSD, internet-enabled)	40

2.	WinFeed (Educational / Trial Licence)	1 lab licence
3.	Concept5/Format International (Educational / Trial)	1 lab licence
4.	BFM (Best Feed Management) (Educationa/Trial)	1 lab licence
5.	Brill/Adifo Bestmix (Educational/Trial)	1 lab licence
6.	UFFDA (Open-Source Feed Formulation Software)	1 lab installation
7.	Microsoft Excel with Solver Add-In	40 licences
8.	R / RStudio for Ration Optimisation	1 lab installation
9.	Nigerian Feed Ingredient Database (NAPRI, Feedipedia subscription)	1 lab account
10.	Mobile Feed-Formulation Apps (FeedExpert, Feeder)	20 device installs
11.	UPS (1.5 kVA) for Each Workstation	40
12.	High-Speed Internet (≥ 100 Mbps fibre)	1 line

4.0 GIS & REMOTE-SENSING LABORATORY

S/N	Equipment/Facility/Software	Minimum Quantity
1.	GIS Workstations (i7, 32 GB RAM, 4 GB GPU, dual-monitor)	20
2.	QGIS (Free / Open Source) and ArcGIS Desktop / Online Lab Licence	1 lab licence
3.	MaxEnt / R for Species Distribution Modelling	1 lab installation

4.	Satellite Imagery Access (Sentinel, Landsat, MODIS, Planet Labs trial)	1 lab account
5.	NDVI Processing Software (Google Earth Engine, SNAP)	1 lab account
6.	Handheld GPS Receivers (sub-metre accuracy)	20
7.	RTK / DGPS Receivers for Precision Pasture Mapping	2 sets
8.	Plotters / Large-Format Printers (A0)	1
9.	Topographic and Agro-Ecological Maps of Nigeria	≥ 50 sheets
10.	Reference Texts on GIS, Remote Sensing, Range Modelling (current editions)	15 sets

5.0 DRONE / UAV EQUIPMENT LABORATORY

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Multi-Rotor Survey Drones (with high-resolution RGB camera)	4
2.	Multi-Rotor Drones with Multispectral Sensor (NDVI capable)	2
3.	Spare Batteries, Chargers and Propellers	20 sets
4.	Drone Flight-Planning Software (Pix4D, DroneDeploy, DJI Terra trial)	1 lab licence
5.	Drone Image Processing Software (Pix4D, Agisoft Metashape, OpenDroneMap)	1 lab licence
6.	NCAA Drone Registration / Licensing Documentation	1 set
7.	Drone Pre-Flight Checklist and Safety Equipment (helmets, vests, cones)	5 sets

8.	Photogrammetry Workstations (i7, 32 GB RAM)	4
9.	Drone Storage Cabinets and Transport Cases	4 sets
10.	Spray Drone (for precision-forage demonstration) - access	1 (or formal access)

6.0 GPS LIVESTOCK TRACKING & VIRTUAL FENCING LABORATORY

S/N	Equipment / Facility / Software	Minimum Quantity
1.	GPS Livestock Tracking Collars (cattle / small ruminant)	20 collars
2.	Virtual Fencing System (Nofence / Vence / Halter demo or trial)	1 demo set
3.	Solar-Powered Charging Stations for Collars / Sensors	4 sets
4.	Livestock Movement Analytics Software	1 lab licence
5.	Bluetooth / LoRa Gateways for Remote Monitoring	4 sets
6.	Smartphones / Tablets for Field Data Capture (Kobo / ODK)	20
7.	Reference Texts on GPS Livestock Tracking and Virtual Fencing	10 sets

7.0 PASTURE DEMONSTRATION FIELD

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Demonstration Pasture Plots (sown pastures, silvopasture, rotational paddocks)	≥ 5 ha

2.	Push-Pull / Mixed-Sward Demonstration (grass-legume mixtures)	0.5 ha
3.	Silvopasture Plots with Faidherbia, Leucaena, Gliricidia, Sesbania	0.5 ha
4.	Drought-Tolerant Pasture Plots (Cenchrus, Andropogon, Stylosanthes)	0.5 ha
5.	Fenced Rotational Grazing Paddocks (electric and conventional)	4 paddocks $\geq$ 1 ha each
6.	Pasture Demonstration Irrigation (sprinkler / drip)	1 set
7.	Pasture Sampling Tools (quadrats, transects, sample bags, rising-plate meter)	20 sets
8.	Automated Weather Station for Pasture Microclimate Monitoring	1
9.	Soil Moisture Sensors (TDR, tensiometer, capacitance)	10 each
10.	Pasture Demonstration Records System (digital app + manual)	1 lab account

8.0 HAY & SILAGE PRODUCTION UNIT

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Round Baler (small / medium) - access or onsite	1 (or formal access)
2.	Square / Mini-Baler	1
3.	Bale Wrapper (in-line or rotating)	1
4.	Bale Storage Shed / Tarpaulins for Open-Air Storage	1 shed + tarpaulins
5.	Forage Chopper / Chaff Cutter	2

6.	Pellet Mill (small-scale forage pelleting)	1
7.	Vacuum Packing Equipment for Silage	1 set
8.	Demonstration Silos (bag silo, bunker silo, drum silo)	1 each
9.	Silage Additives (lactic acid bacteria, molasses, urea)	Sufficient stock
10.	Moisture Probe Meter for Hay / Silage	5
11.	Silage pH Meter / Forage Quality Test Kit	2 each
12.	Cold-Chain Storage Demonstration Unit (insulated container)	1

9.0 FORAGE MACHINERY WORKSHOP

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Disc Mower (tractor-mounted)	1
2.	Mower-Conditioner	1
3.	Rotary Rake / Tedder	1 set
4.	Wheel Rake / Parallel-Bar Rake	1
5.	Forage Harvester (chopper)	1
6.	Silage Trailer / Loader Wagon	1
7.	Tractors (60-90 HP) for Forage Operations	2

8.	PTO and 3-Point Hitch Accessories	4 sets
9.	Maintenance Tools (spanners, grease guns, blade sharpeners, knife replacement)	4 sets
10.	Lubricants, Greases and Hydraulic Fluids	Sufficient stock
11.	Personal Protective Equipment (PPE) for Machinery Operation	20 sets
12.	Workshop Bench with Vice, Drill Press, Welding Set (basic)	1 each

10.0 APIARY & BEEKEEPING UNIT

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Kenyan Top Bar (KTB) Hives	20
2.	Langstroth Hives with Frames and Foundation	10
3.	Bee-Suits, Veils, Gloves, Boots (full PPE sets)	20 sets
4.	Smokers and Hive Tools	20 sets
5.	Honey Extractor (Manual / Electric)	2
6.	Honey Settling / Storage Tanks (stainless steel)	4
7.	Wax Press and Beeswax Processing Equipment	1 set
8.	Queen-Rearing Equipment (queen cages, grafting tools)	5 sets
9.	Pollination Service Demo Materials (forage legume plots)	0.25 ha

10.	Apiary Records System and NAFDAC Registration Documentation	1 set
11.	Bee Predator / Pest Control Materials (ant guards, hive beetle traps)	20 sets

11.0 LIVESTOCK & AI DEMONSTRATION UNIT

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Breeding Livestock (cattle, sheep, goats — tropically-adapted breeds)	≥ 20 head
2.	Livestock Housing (kraal, milking parlour, shelter)	1 set
3.	Livestock Handling Facilities (race, crush, chute, head-bail)	1 set
4.	Rectal Palpation Simulator (cow model for AI training)	2
5.	AI Gun, Sheaths, Thaw Flask, Tweezers	10 sets
6.	Liquid Nitrogen (LN2) Dewar / Tank (with frozen-semen straws)	1 + 50 straws
7.	Ultrasound Machine (B-mode, with rectal probe) - access or onsite	1 (or formal access)
8.	Oestrous Synchronisation Drugs (CIDR, PGF2 α , GnRH)	Sufficient stock
9.	Heat-Detection Aids (chalk markers, KMar, ChinBall)	20 sets
10.	Animal-ID Equipment (ear tags, RFID readers, branding iron, freeze brand)	Sufficient stock
11.	Reproductive Records System (digital app + manual)	1 lab account
12.	Live-Weight Scales (cattle, small ruminant) and BCS Scoring Cards	2 sets

12.0 FEEDLOT DEMONSTRATION UNIT

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Feedlot Demonstration Pens (transition, grow-out, finishing)	4 pens
2.	Feed Bunks, Water Troughs and Salt Lick Stations	Sufficient
3.	Mixed-Ration Wagon / TMR Mixer (small-scale) - access	1 (or formal access)
4.	Feedlot Records System (intakes, daily gain, mortality)	1 lab account
5.	Live-Weight Scales (cattle, ≥ 1 tonne capacity)	1
6.	BCS (Body Condition Score) Reference Charts and Stations	4 sets
7.	Feedlot Health Equipment (pour-on dewormer, vaccine cooler, syringe set)	4 sets
8.	Feedlot Cost / ROI Spreadsheets	1 lab template

13.0 RANGE LIVESTOCK HEALTH / VETERINARY LABORATORY

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Faecal Egg Count (FEC) Kit (McMaster slides, flotation salt)	20 kits
2.	FAMACHA Scoring Cards (laminated)	40 cards
3.	Acaricide Stocks (dip / pour-on / spray) for Demonstration	Sufficient

4.	Vaccine Cooler / Cold-Chain Kit (with thermometers)	4 sets
5.	Mobile Veterinary Clinic Kit (drugs, syringes, restraint, refrigeration)	1 set
6.	Veterinary Microscope (for FEC / blood smears)	5
7.	Blood-Smear Kit (Giemsa, Wright stain) for Tick-Borne Disease Diagnosis	5 kits
8.	Tick Collection / Identification Tools (forceps, jars, Dissecting microscope)	10 sets
9.	Pour-On / Hand Sprayer for Ectoparasite Control	10
10.	Vaccines (CBPP, FMD, anthrax, blackleg, PPR) for Demonstration	Sufficient stock
11.	Personal Protective Equipment (gloves, masks, coverall, boots)	20 sets

14.0 AUDIO-VISUAL & LECTURE EQUIPMENT

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Multimedia / Smart Lecture Theatres (capacity 80) with HD Projector, Sound, Recording	2
2.	LCD / LED Projectors (4K) for Lecture Rooms	6
3.	Document Cameras for Live Specimen / Field Demonstration	4

4.	Smart-Boards with Stylus, Annotation and Recording	4
5.	Public Address Systems (Wireless Microphones, Speakers)	4 sets
6.	Lecture-Capture Hardware / Software (for Recorded Lessons)	4 sets
7.	Video Conferencing Cameras and Microphones (for Hybrid Lectures)	4 sets

15.0 PASTURE AND RANGELAND FENCING

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Fence-design charts	4
2.	GPS	4
3.	Measuring tape	5
4.	Ranging poles	5
5.	Sketch pads	Per student
6.	Demonstration site	2 units
7.	Samples of fencing materials	As required
8.	Fence posts	20
9.	Barbed wire	As required
10.	Woven wire	As required
11.	Chain-link panels	As required

12.	Post-hole diggers	3
13.	Wire strainers	2
14.	Hammers	2
15.	Staples	2
16.	Live cuttings	As required
17.	Watering cans	20
18.	PPE	Per student
19.	Safety-signage charts	5
20.	Whiteboard	2
21.	Electric-fence energiser	As required
22.	Solar panel	3
23.	Batteries	5
24.	Earthing rods	2
25.	Gate handles	10
26.	Demonstration animals	30
27.	Design charts	3
28.	Stocking-rate tables	3

29.	Calculators	10
30.	Pasture maps	5
31.	Polywire	As required
32.	Polytape	As required
33.	Geofencing app subscription	As required
34.	Repair tools	1 set
35.	Replacement posts	As required



16.0 RANGE PATROL AND DISASTER RESPONSE

S/N	Equipment / Facility / Software	Minimum Quantity
1.	Patrol-procedure handbooks	As required
2.	Topographic maps	3
3.	GPS	2
4.	Digital cameras	2
5.	Patrol logbooks	As required
6.	Demonstration rangeland	1
7.	Vehicle/motorcycle	1/5/5
8.	PPE	Per student
9.	NIMET/NDVI data	As required
10.	NEMA early-warning materials	As required
11.	Drone (DJI or equivalent)	2
12.	Tablets	10
13.	QGIS/Google Earth Engine	As required
14.	Fire safety charts	2
15.	NFS/NEMA fire manuals	2

16.	Knapsack pumps	5
17.	Fire beaters	5
18.	Drip torch	3
19.	Fire rakes	5
20.	PPE (Nomex, boots, gloves, goggles)	Per student
21.	Communication radios	1 set
22.	Water tanker	1 unit
23.	Evacuation-route maps	5
24.	Body-condition score charts	5
25.	Recovery checklists	5
26.	NEMA/SEMA manuals	5
27.	Damage-assessment forms	As required

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