



NATIONAL BOARD FOR TECHNICAL EDUCATION

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

HIGHER NATIONAL DIPLOMA

IN

FORESTRY AND ENVIRONMENTAL TECHNOLOGY

CURRICULUM AND COURSE SPECIFICATIONS

JUNE, 2026

PREFACE

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

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

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

ACKNOWLEDGEMENT

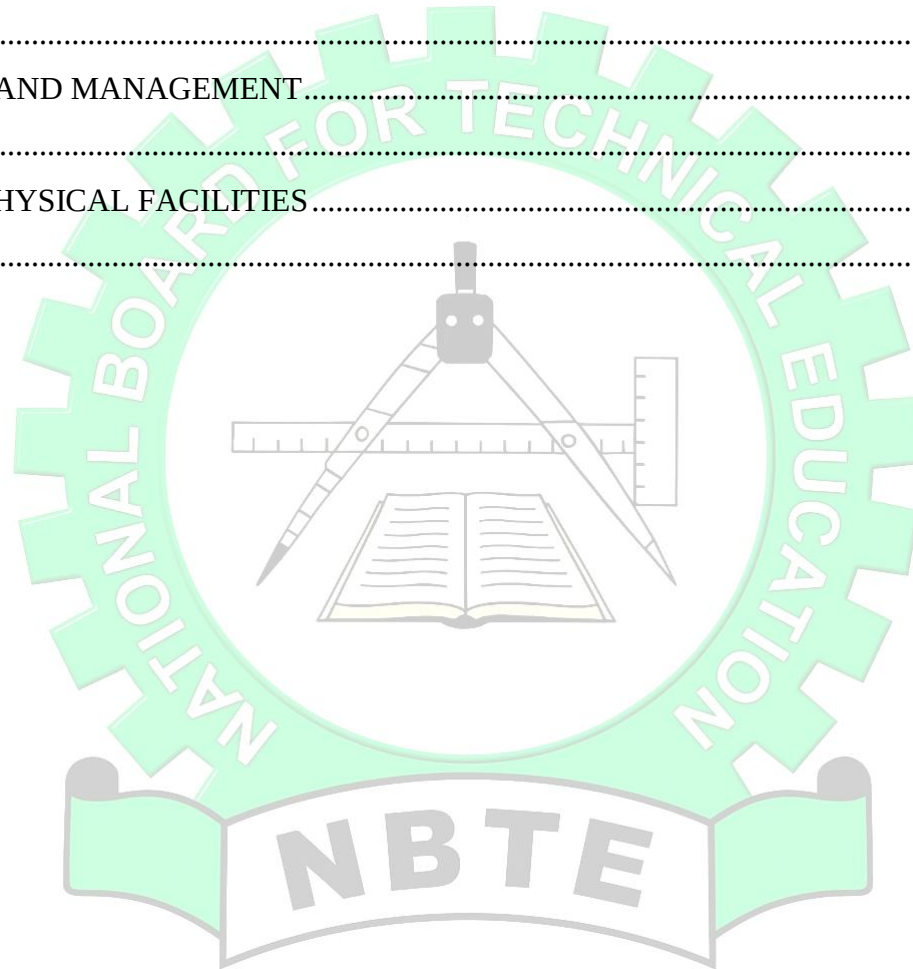
The National Board for Technical Education (NBTE) expresses its profound appreciation to all individuals and organizations whose invaluable support, expertise, and commitment made the successful review and modernization of the Agricultural Education curricula for Nigerian tertiary institutions possible.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

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

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GENERAL INFORMATION

1.0 TITLE OF THE PROGRAMME

The title of the programme is Higher National Diploma (HND) in Forestry and Environmental Technology

2.0 PROGRAMME GOAL

The Higher National Diploma (HND) programme in Forestry and Environmental Technology is designed to produce skilled technologists with adequate knowledge, practical skills, and professional attitudes for sustainable, environmental and forest resources management.

3.0 OBJECTIVES OF THE PROGRAMME

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

- i. Carry out advanced forest inventory and forest assessment using appropriate field and digital technologies;
- ii. Apply principles of sustainable forest management in the conservation and utilization of forest resources;
- iii. Operate and maintain forestry equipment and machines used in forest engineering and mechanized forestry operations;
- iv. Apply watershed management and soil conservation techniques for environmental protection and sustainable land use;
- v. Plan, establish, and manage forest plantations, shelterbelts, and agroforestry systems;
- vi. Identify and control forest pests and diseases using appropriate management strategies;
- vii. Apply GIS, remote sensing, and ICT tools in forestry data collection, analysis, mapping, and reporting;
- viii. Conduct environmental monitoring and environmental impact assessment related to forestry activities;
- ix. Apply principles of forest ecology, savanna ecology, and environmental forestry in ecosystem management;
- x. Implement urban forestry and recreational forestry programmes for environmental improvement and public wellbeing;
- xi. Apply climate-smart forestry practices and carbon management strategies in addressing climate change challenges;
- xii. Carry out sand dune fixation and erosion control measures for environmental stabilization;
- xiii. Promote biodiversity conservation and sustainable utilization of forest and environmental resources;
- xiv. Prepare technical reports, forestry maps, environmental records, and professional documentation;
- xv. Apply entrepreneurial and managerial skills in forestry and environmental enterprises;
- xvi. Collaborate effectively with professionals, communities, industries, and government agencies in forestry and environmental management;
- xvii. Conduct research and development activities in forestry and environmental technology;
- xviii. Promote sustainable environmental practices for national economic growth and ecological stability.

4.0 ENTRY REQUIREMENTS

The minimum entry requirement for admission into the Higher National Diploma (HND) Forestry and Environmental Technology programme: National Diploma (ND) with a minimum of Lower Credit in Forestry and Environmental Technology, Forestry Technology, Agricultural Technology, Horticultural Technology, Wood and Paper Technology, Environmental Management, or other related disciplines from an NBTE-accredited institution; A minimum of one-year mandatory post-National Diploma Industrial Training experience.

Candidates with a Pass grade at the ND level with two (2) or more years post-ND cognate work experience may be considered for admission into the programme.

5.0 STRUCTURE/DURATION OF THE PROGRAMME

The Programme is structured to last for two (2) academic years (four semesters) of classroom instruction, laboratory work and field practicals. Each semester shall consist of:

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

6.0 CURRICULUM

The curriculum of the programme consists of four main components. These are:

- i. General Studies;
- ii. Foundation Courses;
- iii. Core Courses;
- iv. Project.

7.0 STAFFING REQUIREMENTS

7.1 Core Teaching Staff

A minimum of four (4) Core teaching staff who should be Lecturer II and above, with minimum qualification HND/B.Sc., M.Sc. or Ph.D. holders in Forestry, Wildlife, Wood and Paper Technology, Environmental Technology or related discipline.

7.2 Headship of the Department

The Head of Department (HOD) should possess HND/BSc/BTech, MSc/MTech or higher degrees in Forestry, Wildlife, Wood and Paper Technology, Environmental Technology or related discipline, He or she shall not be below the rank of a Senior Lecturer, must be registered with the relevant professional body and must have a minimum of twelve (12) years' experience in both academic and industry.

7.3 Technical Staff

There should be technical staff:

i) Technologist

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

ii) Technician

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

iii) Farm Assistants

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

7.4 Career and Academic Prospects

i. Academic Progression

Holders of the HND in Forestry and Environmental Technology are eligible for direct admission into relevant postgraduate programmes in Forestry, Environmental Management, Forest Engineering, Agroforestry, Climate Change Studies, Wildlife Management, Natural Resource Management, and related disciplines.

ii. Career Prospects

Holders of the HND can work in public or private establishments such as:

- Forestry Departments and Forestry Commissions;
- Environmental Protection Agencies;
- National Parks and Wildlife Services;
- Research Institutes;
- NGOs and Environmental Organizations;
- GIS and Remote Sensing Firms;
- Forest Plantation Companies;
- Timber and Wood Industries;
- Environmental Consultancy Firms;
- Agricultural and Agroforestry Enterprises;
- Climate Change and Conservation Agencies;
- Education and Research Institutions; or
- Establish their own forestry and environmental management businesses.

8.0 CERTIFICATION

A diplomate of this programme shall be awarded the Higher National Diploma (HND) in Forestry and Environmental Technology.

9.0 AWARD OF HIGHER NATIONAL DIPLOMA (HND)

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

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

9.1 Conditions for the Award of HND:

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

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

9.2 Classification of Diplomas:

Diploma Certificates shall be awarded based on the following classifications:

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

10.0 ACCREDITATION OF PROGRAMME

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

11.0 LOGBOOK

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

12.0 FINAL YEAR PROJECTS

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

13.0 GUIDANCE NOTES FOR TEACHERS

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

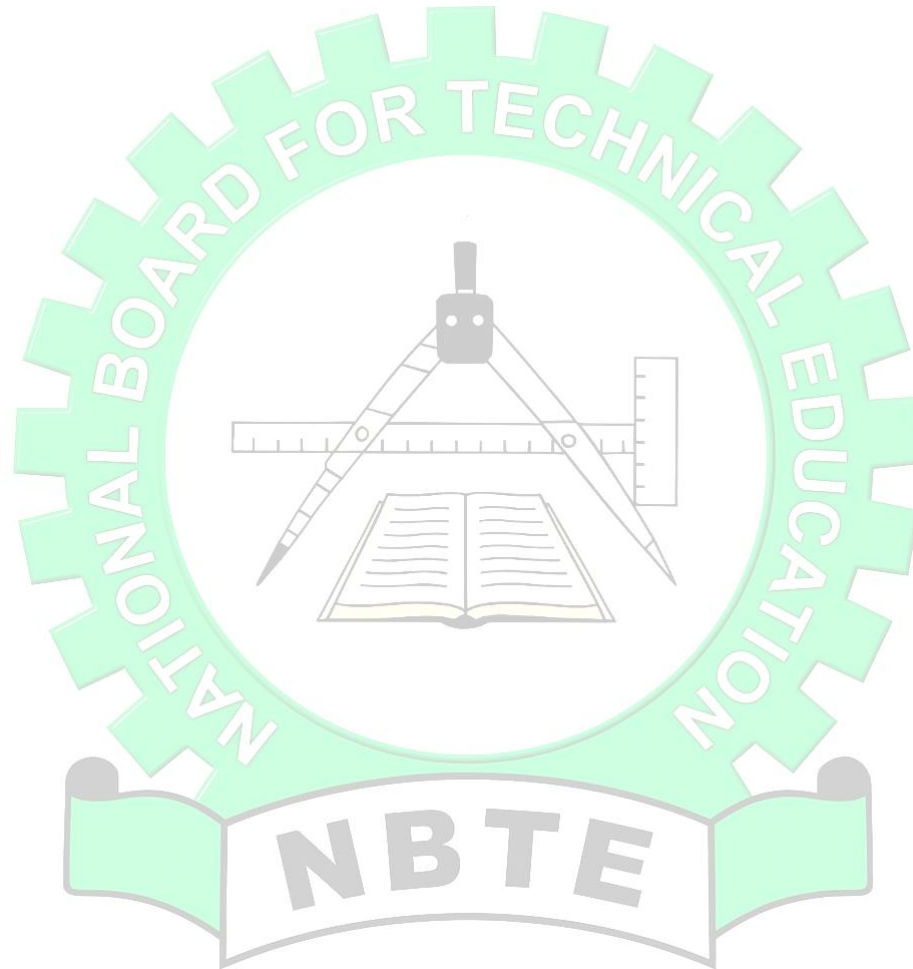
13.2 In designing the units, the principle of the modular system by product has been adopted, thus making each professional module, when completed, provide students with technical operative skills that can be used for employment purposes.

13.3 As the success of the credit unit system depends on the articulation of programmes between institutions and industry, the curriculum content has been written in behavioural objectives so that the specific learning objectives of students who successfully complete some of the courses or graduate from the programme are clear to all. There is a slight departure from the presentation of the performance-based curriculum, which categorically states the specific learning objectives for students. Also, there is a deliberate attempt to further involve the teaching staff of the department by introducing another column titled *Teacher's Activities*. This is to ensure that teachers deliver the required learning objectives. There is also a third column for the resources required for each learning objective. Each department is expected to develop its own teaching curriculum from this minimum guide curriculum and ensure that the required resources are available. The Academic Board of the institution may vet departmental submissions on the final curriculum. Our aim is to continue to ensure that a solid internal evaluation system exists in each institution for maintaining minimum standards and quality of education in the programmes offered throughout TVET institutions.

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

14.0 GUIDELINES ON MANDATORY SKILLS QUALIFICATIONS (MSQ)

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



CURRICULUM TABLE

Year I - Semester I

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 301	Use of English III	2	0	0	2	2
2.	MSQ 311	Principles of Quality Assurance Assessment	1	0	1	2	2
3.	AED 312	Agricultural Extension Methods	1	0	2	3	3
4.	HOT 311	Fruits and Vegetable Production Systems	1	0	3	4	4
5.	CPT 313	Agro-Climatology and Climate-Smart Agriculture	1	0	2	3	3
6.	CPT 316	Annual Crops	1	0	2	3	3
7.	FET 311	Advanced Forest Inventory	1	0	2	3	3
8.	FET 312	Advanced Forest Management	1	0	2	3	3
9.	FET 313	Advanced Forest Engineering	1	0	2	3	3
10.	FET 314	Watershed and Soil Conservation	1	0	2	3	3
11.	FET 315	Geographic Information System (GIS) and Remote Sensing in Forestry	1	0	2	3	3
12.	FET 316	Forest Ecology	1	0	2	3	3
13.	FET 317	ICT Application in Forestry	1	0	2	3	3
TOTAL			14	0	24	38	38

Year I Semester II

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 302	Communication in English III	2	0	0	2	2
2.	ENT 326	Practice of Entrepreneurship I	2	0	2	4	4
3.	MSQ 321	Practice of Quality Assurance Assessment	1	0	1	2	2
4.	AGR 302	Field Experimentation & Data Analysis	1	0	1	2	2
5.	ABM 327	Resource and Environmental Economics	1	0	2	3	3
6.	WEM 322	Wildlife Management	1	0	3	4	4
7.	WPT 322	Advanced Sawmilling and Timber Processing Technology	1	0	3	4	4
8.	FET 321	Ground and Aerial Survey	1	0	2	3	3
9.	FET 322	Plantation Management	1	0	2	3	3
10.	FET 323	Forest Pest and Disease Management	1	0	2	3	3
11.	FET 324	Community Forestry and Extension	1	0	2	3	3
12.	FET 325	Carbon and Climate Change	1	0	2	3	3
13.	FET 326	Urban Forestry and Recreation	1	0	2	3	3
TOTAL			15	0	24	39	39

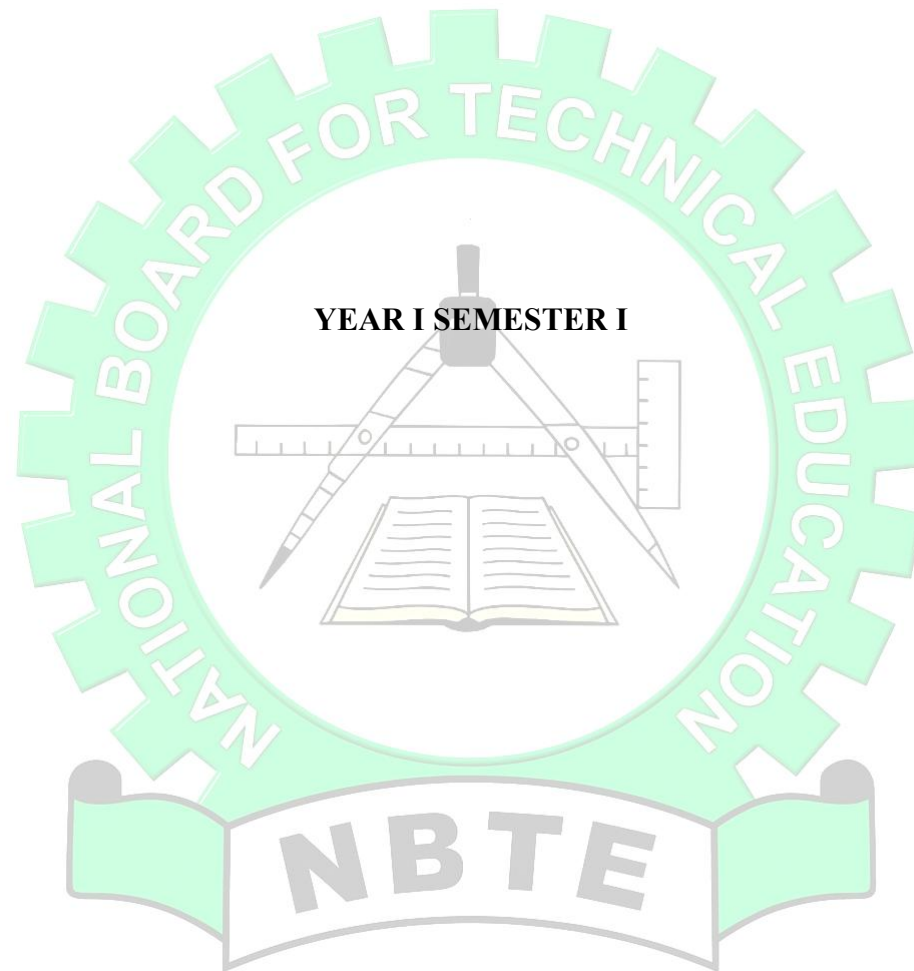
Year II- Semester I

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	ENT 416	Practice of Entrepreneurship II	2	0	2	4	4
2.	AGR 401	Research Methodology and Scientific Writing	1	0	1	2	2
3.	AED 414	Extension Administration, Personnel Management and Leadership	1	0	2	3	3
4.	CPT 412	Plant Breeding, Seed Technology and Biotechnology	1	0	2	3	3
5.	CPT 416	Soil Fertility, Crop Nutrition and Organic Farming	1	0	3	4	4
6.	FET 411	Forest Conservation	1	0	2	3	3
7.	FET 412	Agroforestry	1	0	2	3	3
8.	FET 413	Sand Dune Fixation Techniques	1	0	2	3	3
TOTAL			9	0	16	25	25

Year II- Semester II

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	WPT 422	Furniture Design and Construction	1	0	3	4	4
2.	AED 424	Rural Sociology	1	0	1	2	2
3.	FET 421	Forest and Savanna Ecology	1	0	2	3	3
4.	FET 422	Environmental Forestry	1	0	1	2	2
5.	FET 423	Shelterbelt Establishment and Management	1	0	3	4	4
6.	FET 425	Forestry Mechanization	1	0	3	4	4
7.	FET 426	Project	0	0	4	4	4
TOTAL			6	0	17	23	23

Keys: L – Lectures (Hours/week), T – Tutorial (Hours/week), P – Practical (Hours/week), CU – Credit Unit, CH – Contact Hours (Hours/week)



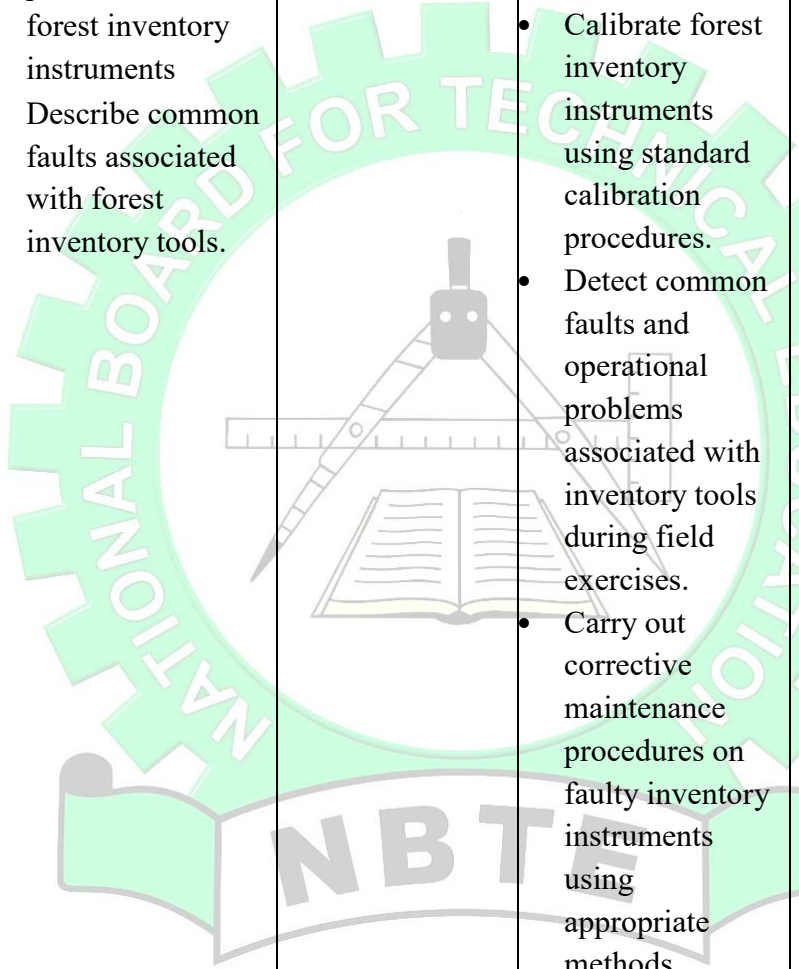
ADVANCED FOREST INVENTORY

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: ADVANCED FOREST INVENTORY	COURSE CODE: FET 311	CONTACT HOURS: 3HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills of forest measurements, develop their ability to present field measurements and predict future wood production		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles of tree measurement, sampling methods and inventory; 2.0 Know the use of inventory tools and equipment in field operations; 3.0 Understand forest inventory measurements using standard sampling and measurement techniques; 4.0 Apply mathematical models for forest resources management; 5.0 Apply field mapping and data recording procedures for forest assessments; 6.0 Understand forest attributes and analyse field data to support management decisions; 7.0 Apply inventory data in estimating forest biomass and greenhouse gas (GHG) inventories using IPCC guidelines for above-ground, below-ground, soil, and litter carbon pools.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: ADVANCED FOREST INVENTORY			COURSE CODE: FET 311		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 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 the knowledge and skills of forest measurements, develop their ability to present field measurements and predict future wood production.						
GENERAL OBJECTIVE 1.0: Understand the principles of tree measurement, sampling methods and inventory						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Explain the concept of forest inventory 1.2 State the importance of inventory 1.3 Explain sampling methods 1.4 Describe the types of inventory techniques 1.5 Describe tree measurement principles	• Discuss the concept of forest inventory • Outline the importance of inventory • Discuss sampling methods • Explain the types of inventory techniques • Describe tree measurement principles	Forest inventory textbooks, Mensuration manuals, Charts & diagrams, Projector/slides, Field notebooks, Multimedia presentations, Computer etc.	• Identify forest resources during field exercises • Collect inventory information in field conditions. • Record inventory data for forest management and planning purposes using standard field procedures. • Apply inventory data in estimating	Guide students to: • Demonstrate procedures for identifying forest resources during field exercises. • Collect forest inventory information under field conditions. • Record inventory data using standard field procedures and inventory sheets. • Demonstrate the use of inventory data in timber	Diameter tapes, Digital Clinometers, Measuring tapes, Compasses, GPS devices, Ranging poles, Field notepads, Safety boots, Gloves, Haga altimeter, Spigel relascope.

				timber volume and assessing biodiversity resources in forest stands. • Establish sample plots using appropriate sampling methods during field exercises. • Select representative forest samples using field layouts and sampling techniques. • Apply different inventory techniques in forest assessment activities based on field conditions. • Measure tree diameter, height, and volume accurately using standard forestry instruments.	volume estimation and biodiversity assessment. • Establish sample plots using appropriate sampling methods. • Select representative forest samples using standard field layouts and sampling techniques. • Demonstrate different forest inventory techniques applicable to varying field conditions. • Carry out hands-on training on the use of forestry instruments for measuring tree diameter, height, and volume. • Carry out tree measurement and data-recording exercises.	
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				Record tree measurement data accurately in field notebooks and inventory sheets.	Provide feedback on accuracy in field measurements, data recording, and organization of inventory information.	
General Objective 2.0: Know maintenance and safety precautions of inventory tools						
3-4	2.1 Describe routine maintenance procedures for forest inventory instruments. 2.2 Describe safety precautions required in the handling and use of forest inventory tools. 2.3 Analyse the importance of proper maintenance and safety practices in ensuring accurate forest inventory data collection. 2.4 Explain calibration procedures for forest	- Explain routine maintenance procedures for forest inventory instruments. - Explain safety precautions required in the handling and use of forest inventory tools. - Outline the importance of proper maintenance and safety practices in ensuring accurate forest inventory data collection.	Forest inventory textbooks, Mensuration manuals, Charts & diagrams, Projector/slides, Field notebooks, Multimedia presentations, Computer etc.	- Perform routine maintenance procedures on forest inventory instruments using standard operational guidelines. - Apply safety precautions during handling and operation of forest inventory tools in field conditions. - Assess the effects of poor maintenance and unsafe handling	Guide students to: - Perform routine maintenance procedures on forest inventory instruments using standard operational guidelines. - Apply safety precautions during handling and operation of forest inventory tools in field conditions. - Assess the effects of poor maintenance and unsafe handling on	Diameter tapes, Digital Clinometers, Hypsometers, GPS devices, Measuring tapes, Compasses, Tool kits, Safety helmets, gloves.

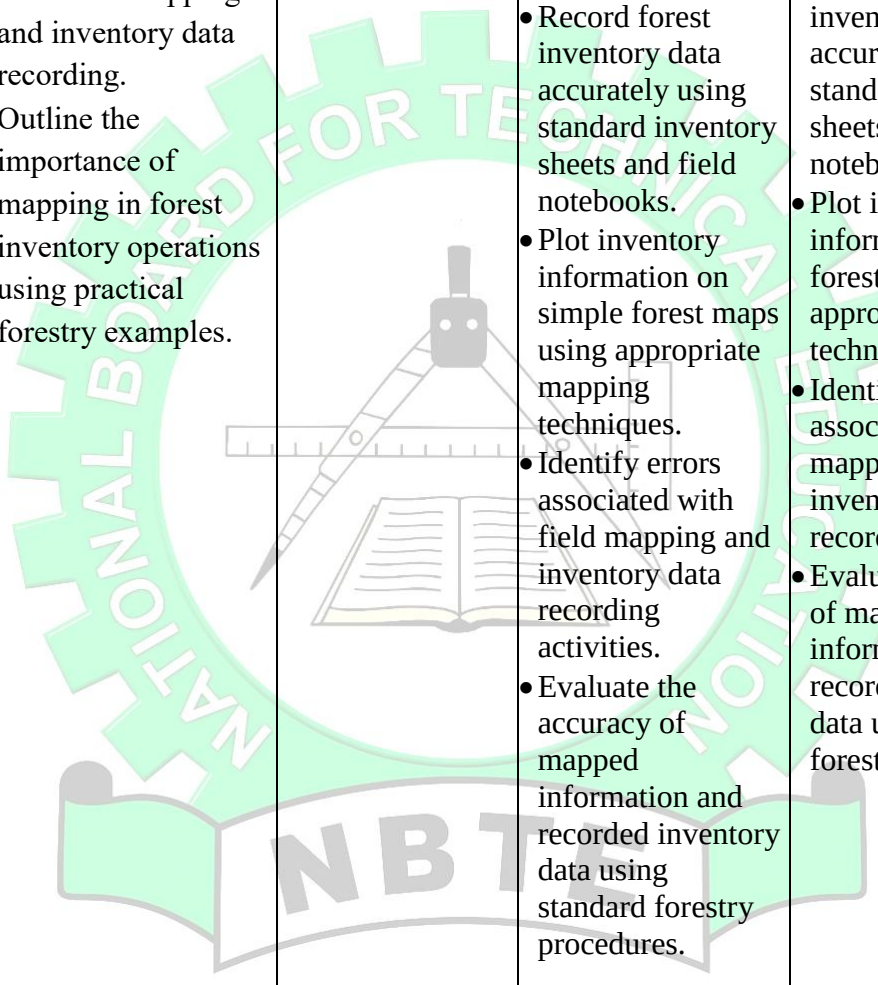
	inventory instruments. 2.5 Identify common faults associated with forest inventory tools.	• Discuss calibration procedures for forest inventory instruments • Describe common faults associated with forest inventory tools.		on accuracy of forest inventory data collection. • Calibrate forest inventory instruments using standard calibration procedures. • Detect common faults and operational problems associated with inventory tools during field exercises. • Carry out corrective maintenance procedures on faulty inventory instruments using appropriate methods. • Inspect inventory tools	accuracy of forest inventory data collection. • Calibrate forest inventory instruments using standard calibration procedures. • Detect common faults and operational problems associated with inventory tools during field exercises. • Carry out corrective maintenance procedures on faulty inventory instruments using appropriate methods. • Inspect inventory tools for safety and operational	
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				for safety and operational efficiency before field use. Record maintenance, calibration, and fault detection activities accurately in field maintenance logs.	efficiency before field use. Record maintenance, calibration, and fault detection activities accurately in field maintenance logs.	
General Objective 3.0: Understand forest inventory measurements using standard techniques.						
5-6	3.1 Explain diameter and height measurement 3.2 Describe plot establishment 3.3 Analyse tree volume calculations 3.4 Evaluate measurement accuracy	- Discuss diameter and height measurement - Discuss plot establishment - Discuss tree volume calculations - Discuss measurement accuracy.	Forest inventory textbooks, Mensuration manuals, Charts & diagrams, Projector/slides, Field notebooks, Multimedia presentations, Computer etc.	- Identify instruments used for tree measurement in forestry operations. - Measure tree diameter accurately using standard forestry instruments. - Determine tree	Guide students to: - Identify instruments used for tree measurement in forestry operations. - Measure tree diameter accurately using standard forestry instruments. - Determine tree	Diameter tapes, Digital Clinometers, Measuring tapes, Pegs and ropes, GPS devices, Field notebooks, Calculators, PPE.

				height using appropriate height-measuring instruments. • Establish sample plots using standard sampling procedures and field techniques. • Calculate tree volume using standard forestry formulae and field data. • Identify errors associated with forest measurements during field exercises. • Evaluate the accuracy and reliability of measurement data using standard forestry	height using appropriate height-measuring instruments. • Establish sample plots using standard sampling procedures and field techniques. • Calculate tree volume using standard forestry formulae and field data. • Identify errors associated with forest measurements during field exercises. • Evaluate the accuracy and reliability of measurement data using standard forestry procedures.	
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				procedures.		
General Objective 4.0: Apply mathematical models for forest resources management						
7-9	4.1 Explain the concept of forest growth modelling 4.2 Explain mathematical relationships used in forest management (growth and yield prediction) 4.3 Analyse inventory data using basic statistical tools (Python, R/RStudio, Excel, SPSS etc) 4.4 Evaluate application of mathematical models in forest management and planning	• Discuss the concept of forest growth modelling • Discuss mathematical relationships used in forest management (growth and yield prediction) • Analyse inventory data using basic statistical tools (Python, R/RStudio, Excel, SPSS etc) • Explain application of mathematical models in forest management and planning	Forest inventory textbooks, Mensuration manuals, Charts & diagrams, Projector/slides, Field notebooks, Multimedia presentations, Computer etc.	• Identify software applications used in forest inventory data analysis and modelling. • Import forest inventory datasets into statistical and spreadsheet software applications. • Organize forest inventory data for statistical analysis and modelling exercises. • Apply basic statistical techniques in analysing forest inventory datasets. • Generate graphs, tables, and charts from analysed forest inventory data. • Compute forest growth and yield values using	Guide students to: • Identify software applications used in forest inventory data analysis and modelling. • Import forest inventory datasets into statistical and spreadsheet software applications. • Organize forest inventory data for statistical analysis and modelling exercises. • Apply basic statistical techniques in analysing forest inventory datasets. • Generate graphs, tables, and charts from analysed forest inventory data. • Compute forest growth and yield values using mathematical relationships and inventory data.	Computers/laptops, Spreadsheet software, Scientific calculators, Inventory datasets, Graph sheets, Field notebooks, Projector, Safety gear, PPE.

				mathematical relationships and inventory data. • Interpret statistical outputs generated from forest inventory data analysis. • Evaluate the suitability of mathematical models for forest management and planning purposes.	• Interpret statistical outputs generated from forest inventory data analysis. Evaluate the suitability of mathematical models for forest management and planning purposes.	
General Objective 5.0: Apply field mapping and data recording procedures for forest assessments						
10-11	5.1 Describe field mapping techniques used in forestry 5.2 Describe procedures for recording inventory data accurately 5.3 Analyse common errors associated with field mapping and data recording 5.4 Explain importance of mapping in forest inventory operations	• Explain field mapping techniques used in forestry with the aid of maps, sketches, GPS readings, and field illustrations. • Explain procedures for recording inventory data accurately using standard inventory sheets and field notebooks.	Forest inventory textbooks, Mensuration manuals, Charts & diagrams, Projector/slides, Field notebooks, Multimedia presentations, Computer etc.	• Identify mapping instruments and materials used in forest inventory operations. • Use compasses and GPS devices during field mapping exercises. • Prepare field sketches of forest inventory sample areas using standard mapping procedures. • Establish reference	Guide students to: • Identify mapping instruments and materials used in forest inventory operations. • Use compasses and GPS devices during field mapping exercises. • Prepare field sketches of forest inventory sample areas using standard mapping procedures. • Establish reference	GPS devices, Compasses, Mapping sheets, Measuring tapes, Field notebooks, Drawing materials, Pegs, Ranging poles, PPE.

		• Explain common errors associated with field mapping and inventory data recording. • Outline the importance of mapping in forest inventory operations using practical forestry examples.	 - points during forest mapping activities. • Record forest inventory data accurately using standard inventory sheets and field notebooks. • Plot inventory information on simple forest maps using appropriate mapping techniques. • Identify errors associated with field mapping and inventory data recording activities. • Evaluate the accuracy of mapped information and recorded inventory data using standard forestry procedures.	- points during forest mapping activities. • Record forest inventory data accurately using standard inventory sheets and field notebooks. • Plot inventory information on simple forest maps using appropriate mapping techniques. • Identify errors associated with field mapping and inventory data recording activities. • Evaluate the accuracy of mapped information and recorded inventory data using standard forestry procedures.	
General Objective 6.0: Understand forest attributes and analyse field data to support management decisions					

12-13	6.1 Explain the concept of forest monitoring and assessment 6.2 Describe forest attributes used in management decision-making 6.3 Explain procedures for analysing forest inventory data 6.4 Analyse trends in forest growth and productivity 6.5 State the importance of inventory data in forest management planning	• Discuss the concept of forest monitoring and assessment using forestry reports, charts, and field examples. • Explain forest attributes used in management decision-making, such as tree height, diameter, volume, species composition, density, regeneration, and health condition. • Explain procedures for analysing forest inventory data using sample datasets, tables, and basic statistical methods. • Illustrate trends in forest growth and productivity using graphs, charts, and inventory records.	Forest inventory textbooks, Mensuration manuals, Charts & diagrams, Projector/slides, Field notebooks, Multimedia presentations, Computer etc.	• Identify forest attributes used in monitoring and assessment activities. • Collect forest inventory data during field monitoring exercises. • Organize forest inventory data using standard forestry procedures. • Analyse forest inventory data using appropriate statistical and graphical methods. • Prepare tables, charts, and graphs showing forest growth and productivity trends.	Guide students to: • Identify forest attributes used in monitoring and assessment activities. • Collect forest inventory data during field monitoring exercises. • Organize forest inventory data using standard forestry procedures. • Analyse forest inventory data using appropriate statistical and graphical methods. • Prepare tables, charts, and graphs showing forest growth and productivity trends. • Interpret forest monitoring results	Inventory datasheets, Computers/laptops, GPS devices, Measuring tapes, Field notebooks, Spreadsheet software, Safety gear, PPE.
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		Outline the importance of inventory data in forest management planning using practical forestry examples.		- Interpret forest monitoring results for management decision-making purposes. - Identify changes in forest growth and productivity using inventory records and field observations. - Evaluate the suitability of inventory data for forest management planning and resource assessment.	for management decision-making purposes. - Identify changes in forest growth and productivity using inventory records and field observations. - Evaluate the suitability of inventory data for forest management planning and resource assessment.	
General Objective 7.0: Apply forest biomass and greenhouse gas inventories using IPCC guidelines						
14-15	7.1 Explain forest biomass and carbon pools 7.2 Describe IPCC	Discuss forest biomass and carbon pools using diagrams, charts,	Forest inventory textbooks, Mensuration manuals,	Identify forest biomass components and	Guide students to: Identify forest biomass components	Diameter tapes, Digital clinometers, Soil augers, Sample bags,

	guidelines for greenhouse gas inventory estimation 7.3 Explain methods for estimating above-ground and below-ground biomass 7.4 Describe procedures for assessing soil and litter carbon stocks 7.5 State the roles of forest inventory in climate change mitigation and carbon accounting	and forestry examples. • Explain IPCC guidelines for greenhouse gas inventory estimation using relevant manuals and reporting frameworks. • Discuss methods for estimating above-ground and below-ground biomass using standard forestry procedures. • Illustrate procedures for assessing soil and litter carbon stocks using field examples and sample records. • Outline the roles of forest inventory in climate change mitigation and carbon accounting using practical forestry examples.	Charts & diagrams, Projector/slides, Field notebooks, Multimedia presentations, Computer etc.	carbon pools during field exercises. • Measure tree parameters required for biomass estimation using standard forestry instruments. • Estimate above-ground biomass using standard forestry formulae and field data. • Estimate below-ground biomass using appropriate biomass conversion methods. • Collect soil and litter samples for carbon stock assessment during field activities. • Record biomass	and carbon pools during field exercises. • Measure tree parameters required for biomass estimation using standard forestry instruments. • Estimate above-ground biomass using standard forestry formulae and field data. • Estimate below-ground biomass using appropriate biomass conversion methods. • Collect soil and litter samples for carbon stock assessment during field activities. • Record biomass and carbon inventory data accurately using standard inventory sheets	GPS devices, Calculators, Computers/laptops, PPE.
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				and carbon inventory data accurately using standard inventory sheets. • Apply IPCC guidelines in estimating greenhouse gas inventories from forest ecosystems. • Evaluate the contribution of forest inventory data to climate change mitigation and carbon accounting activities.	• Apply IPCC guidelines in estimating greenhouse gas inventories from forest ecosystems. • Evaluate the contribution of forest inventory data to climate change mitigation and carbon accounting activities.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

ADVANCED FOREST MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: ADVANCED FOREST MANAGEMENT	COURSE CODE: FET 312	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills in the management of forest estates and develop their ability to collect and collate information required for the preparation of operational plans.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Apply the principles of sustainable forest management; 2.0 Know silvicultural techniques and management practices in forest stands; 3.0 Know forest management plans in field settings for productivity and sustainability; 4.0 Know maintenance and monitoring of forest operations; 5.0 Understand forest management outcomes using field-based observations and data; 6.0 Apply adaptive silviculture techniques such as Variable Retention Harvesting for climate-resilient stand development; 7.0 Understand Reduced Impact Logging (RIL) and precision forestry principles to minimize soil disturbance and ecological damage during harvesting operations.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: ADVANCED FOREST MANAGEMENT			COURSE CODE: FET 312		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 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 the knowledge and skills in the management of forest estates and develop their ability to collect and collate information required for the preparation of operational plans.						
GENERAL OBJECTIVE 1.0: Understand the principles of sustainable forest management						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Explain the concept and principles of sustainable forest management 1.2 Describe the objectives and components of sustainable forestry practices 1.3 Explain the relationship between forest conservation and sustainable development 1.4 Analyse factors affecting sustainability in forest ecosystems 1.5 Explain the importance of sustainable forest management in environmental	- Discuss the concept and principles of sustainable forest management using forestry policies, diagrams, and environmental case studies. - Discuss the objectives and components of sustainable forestry practices using management plans and practical forestry examples. - Explain the relationship	Forest management textbooks, Forestry policy documents, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, etc.	- Identify components of sustainable forest management in field conditions. - Assess forest conditions using sustainability indicators during field exercises. - Apply sustainable forestry practices in forest management activities. - Record environmental and forest management	Guide students to: - Identify components of sustainable forest management in field conditions. - Assess forest conditions using sustainability indicators during field exercises. - Apply sustainable forestry practices in forest management activities. - Record	GPS devices, Measuring tapes, Field notebooks, Digital cameras, Assessment checklists, Safety boots and gloves, Raincoat, Machete, PPE.

	protection and economic development	between forest conservation and sustainable development using environmental reports and global sustainability frameworks. • Analyse factors affecting sustainability in forest ecosystems using ecological data and forestry case studies. • Explain the importance of sustainable forest management in environmental protection and economic development using practical examples from forestry operations.		data using standard field procedures. • Identify factors affecting sustainability in forest ecosystems during field observations. • Evaluate conservation practices used in sustainable forest management activities. • Assess the effects of forest management practices on environmental protection and resource utilization. • Prepare reports on sustainable forest management practices using field data and observations.	environmental and forest management data using standard field procedures. • Identify factors affecting sustainability in forest ecosystems during field observations. • Evaluate conservation practices used in sustainable forest management activities. • Assess the effects of forest management practices on environmental protection and resource utilization. • Prepare reports on sustainable forest management practices using field data and observations.	
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General Objective 2.0: Know silvicultural techniques and management practices in forest stands						
3-4	2.1 Explain concept of silviculture 2.2 Describe silvicultural systems in forest management 2.3 Explain stand establishment and tending operations 2.4 Analyse thinning, pruning, and regeneration techniques 2.5 Evaluate effects of silvicultural practices on productivity	• Discuss concept of silviculture • Describe silvicultural systems in forest management • Describe stand establishment and tending operations • Describe thinning, pruning, and regeneration techniques • Evaluate effects of silvicultural practices on productivity	Forest management textbooks, Forestry policy documents, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, etc.	• Identify silvicultural systems used in forest management operations. • Carry out site preparation activities for stand establishment during field exercises. • Establish forest stands using appropriate planting procedures and spacing techniques. • Apply tending operations in forest stands using standard silvicultural practices. • Perform thinning operations using appropriate forestry tools and procedures. • Carry out pruning	Guide students to: • Identify silvicultural systems used in forest management operations. • Carry out site preparation activities for stand establishment during field exercises. • Establish forest stands using appropriate planting procedures and spacing techniques. • Apply tending operations in forest stands using standard silvicultural practices. • Perform thinning operations	Hoes, Cutlasses, Pruning tools, Measuring tapes, GPS devices, PPE.

				activities in plantation and natural forest stands. • Apply regeneration techniques in forest management activities. • Evaluate effects of silvicultural practices on forest growth and productivity using field observations.	using appropriate forestry tools and procedures. • Carry out pruning activities in plantation and natural forest stands. • Apply regeneration techniques in forest management activities. • Evaluate effects of silvicultural practices on forest growth and productivity using field observations.	
General Objective 3.0: Know forest management plans in field settings for productivity and sustainability						
5-6	3.1 Explain the concept of forest management and planning 3.2 Explain components of	• Discuss the concept of forest management and planning	Forest management textbooks, Forestry policy	• Identify components of forest management plans during field and classroom	Guide students to: • Identify components of forest management	GPS devices, Plantation maps, Computers/laptops, Spreadsheet software,

	management plans 3.3 State the importance of forest management 3.4 Explain procedures for data collection and organization 3.5 Analyse productivity planning and scheduling methods 3.6 Evaluate management planning approaches	• Discuss components of management plans • Outline the importance of forest management • Describe procedures for data collection and organization • Analyse productivity planning and scheduling methods • Evaluate management planning approaches	documents, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, etc.	exercises. • Collect forest management data using standard forestry procedures. • Organize forest inventory and operational data using appropriate recording formats. • Prepare simple forest management schedules for field operations. • Apply productivity planning methods in forest management activities. • Develop work plans for forest management operations using field data. • Interpret forest management records and operational schedules. • Evaluate management	plans during field and classroom exercises. • Collect forest management data using standard forestry procedures. • Organize forest inventory and operational data using appropriate recording formats. • Prepare simple forest management schedules for field operations. • Apply productivity planning methods in forest management activities. • Develop work plans for forest management	Measuring tapes, Calculators, Safety boots and gloves.
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				planning approaches using practical forestry case studies and field observations.	- operations using field data - Interpret forest management records and operational schedules. - Evaluate management planning approaches using practical forestry case studies and field observations.	
General Objective 4.0: Know maintenance and monitoring of forest operations						
7-8	4.1 Explain the importance of monitoring in forest operations 4.2 Explain monitoring techniques for productivity 4.3 Discuss operational challenges in forest operations 4.4 Evaluate monitoring systems in forest operations	- Discuss the importance of monitoring in forest operations - Describe monitoring techniques for productivity - Evaluate operational challenges in forest operations - Evaluate monitoring	Forest management textbooks, Forestry policy documents, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals,	- Identify monitoring tools and instruments used in forest operations. - Apply monitoring techniques during forest operation activities. - Record operational data using standard monitoring procedures and field formats. - Measure	Guide students to: - Identify monitoring tools and instruments used in forest operations. - Apply monitoring techniques during forest operation activities. - Record	Monitoring checklists, GPS devices, Measuring tapes, Cameras, Maintenance tools, Safety gears, Computer/laptop.

		systems in forest operations	Multimedia presentations, etc.	productivity indicators during forest operation exercises. • Identify operational challenges affecting forest productivity and efficiency in field conditions. • Assess operational performance using monitoring records and field observations. • Interpret monitoring data for forest operation decision-making purposes. • Evaluate effectiveness of monitoring systems used in forest operations.	operational data using standard monitoring procedures and field formats. • Measure productivity indicators during forest operation exercises. • Identify operational challenges affecting forest productivity and efficiency in field conditions. • Assess operational performance using monitoring records and field observations. • Interpret monitoring data for forest operation decision-making	
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					purposes. • Evaluate effectiveness of monitoring systems used in forest operations.	
General Objective 5.0: Understand forest management outcomes using field-based data						
9-10	5.1 Explain evaluation methods of forest management. 5.2 Describe productivity indicators in forest management. 5.3 Explain data analysis procedures in forest management. 5.4 Analyse management interventions 5.5 Evaluate forest management outcomes using indicators	• Discuss evaluation methods • Explain productivity indicators • Describe data analysis procedures • Analyse management interventions • Evaluate outcomes using indicators	Forest management textbooks, Forestry policy documents, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, etc.	• Identify productivity indicators used in forest management and operational activities. • Collect operational and productivity data using standard field procedures. • Organize productivity data using appropriate recording formats and inventory sheets. • Apply basic data analysis techniques in evaluating forest operation performance. • Interpret productivity indicators using operational records	Guide students to: • Identify productivity indicators used in forest management and operational activities. • Collect operational and productivity data using standard field procedures. • Organize productivity data using appropriate recording formats and inventory sheets. Apply basic data analysis	GPS devices, Measuring tapes, Cameras, Laptops, Spreadsheet software, Calculators, Safety gear.

				and field observations. • Assess management interventions using field data and operational results. • Compare operational outcomes using standard evaluation indicators. • Evaluate effectiveness of forest management activities using productivity and performance indicators.	techniques in evaluating forest operation performance. • Interpret productivity indicators using operational records and field observations. • Assess management interventions using field data and operational results. • Compare operational outcomes using standard evaluation indicators. • Evaluate effectiveness of forest management activities using productivity and performance indicators.	
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General Objective 6.0: Apply adaptive silviculture techniques such as Variable Retention Harvesting for climate-resilient stand development						
11-13	6.1 Explain adaptive silviculture concepts 6.2 Describe Variable Retention Harvesting 6.3 Explain climate-resilient stand development 6.4 Analyse biodiversity and stability effects 6.5 State the role of climate mitigation in forestry	• Discuss adaptive silviculture concepts • Describe Variable Retention Harvesting • Discuss climate-resilient stand development • Analyse biodiversity and stability effects • Outline the role of climate mitigation in forestry	Forest management textbooks, Forestry policy documents, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, etc.	• Identify adaptive silvicultural practices used in forest management operations. • Apply Variable Retention Harvesting techniques during field management activities. • Assess stand conditions for climate-resilient forest development. • Identify biodiversity components affected by silvicultural interventions in forest stands. • Record field observations on ecosystem stability and stand productivity during forest operations.	Guide students to: • Identify adaptive silvicultural practices used in forest management operations. • Apply Variable Retention Harvesting techniques during field management activities. • Assess stand conditions for climate-resilient forest development. • Identify biodiversity components affected by silvicultural interventions in forest stands. • Record field	GPS devices, Measuring tapes, Biodiversity tools, Cameras, Mapping sheets, Safety gear.

				• Apply stand management practices that support climate resilience in forest ecosystems. • Evaluate effects of adaptive silvicultural practices on biodiversity and forest stability using field observations. • Assess the contribution of forestry practices to climate mitigation and sustainable forest management.	observations on ecosystem stability and stand productivity during forest operations. • Apply stand management practices that support climate resilience in forest ecosystems. • Evaluate effects of adaptive silvicultural practices on biodiversity and forest stability using field observations. • Assess the contribution of forestry practices to climate mitigation and sustainable forest management.	
General Objective 7.0: Understand Reduced Impact Logging (RIL) and precision forestry principles to minimize soil disturbance and						

ecological damage during harvesting operations						
14-15	7.1 Explain Reduced Impact Logging (RIL) 7.2 Describe precision forestry technologies 7.3 Explain ecological effects of logging 7.4 Analyse mitigation methods 7.5 Evaluate sustainable harvesting practices (allowable cut)	• Explain Reduced Impact Logging (RIL) • Describe precision forestry technologies • Explain ecological effects of logging • Analyse mitigation methods • Evaluate sustainable harvesting practices (allowable cut)	RIL manuals, Precision forestry textbooks, Whiteboard and markers, Charts and diagrams, Projector and slides Journals, Environmental reports, etc.	• Identify tools and equipment used in Reduced Impact Logging operations. • Apply Reduced Impact Logging techniques during harvesting activities in field conditions. • Operate precision forestry technologies used in forest resource assessment and harvesting operations. • Assess ecological impacts of logging activities using field observations and monitoring procedures. • Record environmental data associated with logging operations using standard field formats. • Apply mitigation measures for reducing soil disturbance and	Guide students to: • Identify tools and equipment used in Reduced Impact Logging operations. • Apply Reduced Impact Logging techniques during harvesting activities in field conditions. • Operate precision forestry technologies used in forest resource assessment and harvesting operations. • Assess ecological impacts of logging activities using field observations and monitoring procedures. • Record environmental data associated	GPS devices, Harvesting equipment, Measuring tapes, Precision forestry tools, Safety helmets and gloves, Cameras.

				ecological damage during harvesting operations. • Calculate allowable cut using forest inventory and yield data. • Evaluate sustainable harvesting practices using operational records and field assessment results.	with logging operations using standard field formats. • Apply mitigation measures for reducing soil disturbance and ecological damage during harvesting operations. • Calculate allowable cut using forest inventory and yield data. • Evaluate sustainable harvesting practices using operational records and field assessment results.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

ADVANCED FOREST ENGINEERING

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: ADVANCED FOREST ENGINEERING	COURSE CODE: FET 313	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip student with the knowledge and skills of engineering applications in Forestry and Environmental Technology		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles of forest engineering and mechanized operations; 2.0 Know the structural features and working principles of tractors, implements, equipment and machinery used in forest operations; 3.0 Know how to operate forestry machinery and equipment safely in field conditions; 4.0 Apply engineering techniques in forest infrastructure development and harvesting; 5.0 Know construction and maintenance of forest structures; 6.0 Understand field measurements and evaluate engineering solutions for sustainable forest management; 7.0 Apply precision forestry technologies including LiDAR and high-resolution satellite imagery for operational planning and resource assessment.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: ADVANCED FOREST ENGINEERING		COURSE CODE: FET 313			CONTACT HOURS: 3 HOURS/WEEK	
		CREDIT UNIT: 3			THEORY: 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 the knowledge and skills of engineering applications in Forestry and Environmental Technology						
GENERAL OBJECTIVE 1.0: Understand the principles of forest engineering and mechanized operations.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Explain the principles of forest engineering in forestry operations. 1.2 Describe mechanized operations used in forest management activities. 1.3 Identify engineering components involved in forest operations. 1.4 Explain the importance of engineering applications in sustainable forestry. 1.5 Explain the relationship between mechanization and forest productivity	- Discuss the principles of forest engineering in forestry operations. - Describe mechanized operations used in forest management activities. - Identify engineering components involved in forest operations. - Outline the importance of engineering	Textbooks, Forestry machinery manuals, Engineering drawing materials, Forest harvesting manuals, Precision forestry manuals, GIS and remote sensing manuals, LiDAR and satellite	- Identify engineering components used in forestry operations. - Assess mechanized forestry activities in field conditions. - Classify forest engineering operations based on field applications. - Demonstrate basic mechanized forestry procedures in field exercises. - Record observations on	Guide students to: - Identify engineering components used in forestry operations. - Assess mechanized forestry activities in field conditions. - Classify forest engineering operations based on field applications.	Tractors and forestry machinery, Forestry implements and equipment, Workshop tools, GPS devices, LiDAR datasets and satellite imagery, GIS software and computers, Surveying equipment,

		applications in sustainable forestry. Discuss the relationship between mechanization and forest productivity	imagery guides, Whiteboard and markers, Charts and diagrams, Multimedia projector and slides, Forestry journals and technical reports Safety manuals, etc.	engineering operations accurately.	Demonstrate basic mechanized forestry procedures in field exercises. Record observations on engineering operations accurately	Measuring tapes and clinometers, Safety boots, helmets, and gloves Construction materials, Digital mapping tools, Engineering measuring instruments.
General Objective 2.0: Know the structural features and working principles of tractors, implements, equipment and machinery used in forest operations						
3-4	2.1 Explain the structural features of tractors and forestry machinery. 2.2 Describe the working principles of forestry implements and equipment. 2.3 Identify components and functions of forestry machinery systems. 2.4 Explain maintenance requirements for forestry equipment and machinery. 2.5 Explain the operational	- Discuss the structural features of tractors and forestry machinery. - Describe the working principles of forestry implements and equipment. - Describe components and functions of forestry machinery systems. - Discuss maintenance requirements for forestry equipment	Forestry machinery manuals, Engineering drawing materials, Forest harvesting manuals, Precision forestry manuals, GIS and remote sensing manuals,	- Identify components of tractors and forestry machinery in workshop conditions. - Demonstrate operational procedures of forestry equipment safely. - Carry out routine maintenance activities on forestry machinery. - Assess performance	Guide students to: - Identify components of tractors and forestry machinery in workshop conditions. - Demonstrate operational procedures of forestry equipment safely.	Tractors and forestry machinery, Forestry implements and equipment, Workshop tools, GPS devices, LiDAR datasets and satellite imagery, GIS software

	efficiency of forestry machinery in field operations.	and machinery. • Explain the operational efficiency of forestry machinery in field operations.	LiDAR and satellite imagery guides, Whiteboard and markers, Charts and diagrams, Multimedia projector and slides, Forestry journals and technical reports Safety manuals, etc.	of forestry machinery during field operations. • Record maintenance and operational observations accurately	• Carry out routine maintenance activities on forestry machinery. • Assess performance of forestry machinery during field operations. • Record maintenance and operational observations accurately	and computers, Surveying equipment, Measuring tapes and clinometers, Construction materials, Digital mapping tools, Engineering measuring instruments, PPE.
General Objective 3.0: Know how to operate forestry machinery and equipment safely in field conditions						
5-6	3.1 Explain safety regulations governing forestry machinery operations. 3.2 Describe operational procedures for forestry machinery and equipment. 3.3 Identify hazards associated with mechanized forestry operations	• Discuss safety regulations governing forestry machinery operations. • Describe operational procedures for forestry machinery and equipment. Identify hazards associated with mechanized forestry	Textbooks Forestry machinery manuals, Engineering drawing materials, Forest harvesting manuals, Precision forestry	• Operate forestry machinery following standard safety procedures. • Demonstrate safe handling of forestry equipment during field operations. • Identify hazards associated with mechanized forestry activities.	Guide students to: • Operate forestry machinery following standard safety procedures. • Demonstrate safe handling of forestry equipment during field operations.	Tractors and forestry machinery, Forestry implements and equipment, Workshop tools, GPS devices, LiDAR datasets and

	3.4 Discuss prevention measures in forestry engineering activities. 3.5 Explain the importance of safety practices in mechanized forestry operations	operations. - Describe accident prevention measures in forestry engineering activities. - Outline the importance of safety practices in mechanized forestry operations	manuals, GIS and remote sensing manuals, LiDAR and satellite imagery guides, Whiteboard and markers, Charts and diagrams, Multimedia projector and slides, Forestry journals and technical reports Safety manuals, etc.	- Apply accident prevention measures during machinery operation. - Record operational and safety observations accurately	- Identify hazards associated with mechanized forestry activities. - Apply accident prevention measures during machinery operation. - Record operational and safety observations accurately	satellite imagery, GIS software and computers, Surveying equipment, Measuring tapes and clinometers, PPE, Construction materials, Digital mapping tools, Engineering measuring instruments.
General Objective 4.0: Apply engineering techniques in forest infrastructure development and harvesting						
7-9	4.1 Explain engineering techniques used in forest infrastructure development. 4.2 Describe harvesting systems used in forestry operations. 4.3 Identify engineering requirements for forest roads and bridges. 4.4 Explain procedures for	- Discuss engineering techniques used in forest infrastructure development. - Discuss harvesting systems used in forestry operations. - Identify engineering requirements for forest roads and	Textbooks Forestry machinery manuals, Engineering drawing materials, Forest harvesting manuals, Precision	- Carry out basic field layout activities for forest infrastructure development. - Demonstrate harvesting procedures in field conditions. - Assess infrastructure conditions in forestry	Guide students to: - Carry out basic field layout activities for forest infrastructure development. - Demonstrate harvesting procedures in	Tractors and forestry machinery, Forestry implements and equipment, Workshop tools, GPS devices, LiDAR

	planning harvesting operations in forestry. 4.5 Explain the importance of engineering techniques in efficient forest harvesting	bridges. • Explain procedures for planning harvesting operations in forestry. • Outline the importance of engineering techniques in efficient forest harvesting	forestry manuals, GIS and remote sensing manuals, LiDAR and satellite imagery guides, Whiteboard and markers, Charts and diagrams, Multimedia projector and slides, Forestry journals and technical reports Safety manuals, etc.	operational sites. • Apply engineering measurements during forest harvesting exercises. • Record infrastructure and harvesting observations accurately	field conditions. • Assess infrastructure conditions in forestry operational sites. • Apply engineering measurements during forest harvesting exercises. Record infrastructure and harvesting observations accurately	datasets and satellite imagery, GIS software and computers, Surveying equipment, Measuring tapes and clinometers, PPE, Construction materials, Digital mapping tools, Engineering measuring instruments.
General Objective 5.0: Know construction and maintenance of forest structures.						
10-11	5.1 Explain construction principles used in forest structures. 5.2 Describe materials used in forest structure construction and maintenance. 5.3 Identify types and functions of forest structures.	• Discuss construction principles used in forest structures. • Describe materials used in forest structure construction and maintenance.	Forestry machinery manuals, Engineering drawing materials, Forest harvesting manuals, Precision	• Identify materials used in construction of forest structures. • Carry out basic maintenance activities on forest structures. • Demonstrate simple construction	Guide students to: • Identify materials used in construction of forest structures. • Carry out basic maintenance activities on forest structures.	Tractors and forestry machinery, Forestry implements and equipment, Workshop tools, GPS devices,

	5.4 Explain maintenance procedures for forest structures. 5.5 Explain the importance of forest structures in forestry operations	- Identify types and functions of forest structures. - Describe maintenance procedures for forest structures. - Outline the importance of forest structures in forestry operations	forestry manuals, GIS and remote sensing manuals, LiDAR and satellite imagery guides, Whiteboard and markers, Charts and diagrams, Multimedia projector and slides, Forestry journals and technical reports Safety manuals, etc.	procedures in field conditions. - Assess structural conditions of forestry facilities. - Record construction and maintenance observations accurately	- Demonstrate simple construction procedures in field conditions. - Assess structural conditions of forestry facilities. Record construction and maintenance observations accurately	LiDAR datasets and satellite imagery, GIS software and computers, Surveying equipment, Measuring tapes and clinometers, PPE, Construction materials, Digital mapping tools, Engineering measuring instruments.
General Objective 6.0: Understand field measurements and evaluate engineering solutions for sustainable forest management						
12-13	6.1 Explain field measurement techniques used in forest engineering. 6.2 Describe engineering solutions applied in sustainable forest management. 6.3 Identify instruments used in engineering	- Describe field measurement techniques used in forest engineering. - Discuss engineering solutions applied in sustainable forest management. - Identify	Textbooks Forestry machinery manuals, Engineering drawing materials, Forest harvesting manuals,	- Use engineering instruments for field measurements in forestry operations. - Carry out engineering measurements during field exercises. - Assess engineering solutions used in forestry operational	Guide students to: - Use engineering instruments for field measurements in forestry operations. - Carry out engineering	Tractors and forestry machinery, Forestry implements and equipment, Workshop tools, GPS devices,

	measurements for forestry operations. 6.4 Explain procedures for evaluating engineering solutions in forest management. 6.5 Highlight the effectiveness of engineering solutions in sustainable forestry	instruments used in engineering measurements for forestry operations. - Describe procedures for evaluating engineering solutions in forest management. - Outline the effectiveness of engineering solutions in sustainable forestry	Precision forestry manuals, GIS and remote sensing manuals, LiDAR and satellite imagery guides, Whiteboard and markers, Charts and diagrams, Multimedia projector and slides, Forestry journals and technical reports Safety manuals, etc.	sites. - Evaluate field measurement results using standard procedures. - Record engineering measurements and observations accurately	measurements during field exercises. - Assess engineering solutions used in forestry operational sites. - Evaluate field measurement results using standard procedures. Record engineering measurements and observations accurately	LiDAR datasets and satellite imagery, GIS software and computers, Surveying equipment, Measuring tapes and clinometers, PPE, Construction materials, Digital mapping tools, Engineering measuring instruments.
General Objective 7.0: Apply precision forestry technologies including LiDAR and high-resolution satellite imagery for operational planning and resource assessment						
14-15	7.1 Explain principles of precision forestry technologies in forest management. 7.2 Describe applications of LiDAR and satellite imagery in forestry operations.	- Discuss principles of precision forestry technologies in forest management. - Describe applications of LiDAR and	Textbooks Forestry machinery manuals, Engineering drawing materials, Forest	- Operate geospatial tools used in precision forestry applications. - Interpret LiDAR and satellite imagery for forestry resource assessment.	Guide students to: - Operate geospatial tools used in precision forestry applications. - Interpret LiDAR	Tractors and forestry machinery, Forestry implements and equipment, Workshop

	7.3 Identify geospatial tools used in operational planning and resource assessment. 7.4 Explain procedures for processing and interpreting geospatial data in forestry. 7.5 State the importance of precision forestry technologies in sustainable forest management	satellite imagery in forestry operations. - Identify geospatial tools used in operational planning and resource assessment. - Describe procedures for processing and interpreting geospatial data in forestry. - Outline the importance of precision forestry technologies in sustainable forest management	harvesting manuals, Precision forestry manuals, GIS and remote sensing manuals, LiDAR and satellite imagery guides, Whiteboard and markers, Charts and diagrams, Multimedia projector and slides, Forestry journals and technical reports Safety manuals, etc.	- Carry out digital mapping exercises using geospatial technologies. - Assess forest resources using precision tools. - Present the recorded geospatial data accurately during field exercises.	and satellite imagery for forestry resource assessment. - Carry out digital mapping exercises using geospatial technologies. - Assess forest resources using precision tools. - Record and present geospatial data accurately during field exercises.	tools, GPS devices, LiDAR datasets and satellite imagery, GIS software and computers, Surveying equipment, Measuring tapes and clinometers, PPE, Construction materials, Digital mapping tools, Engineering measuring instruments.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

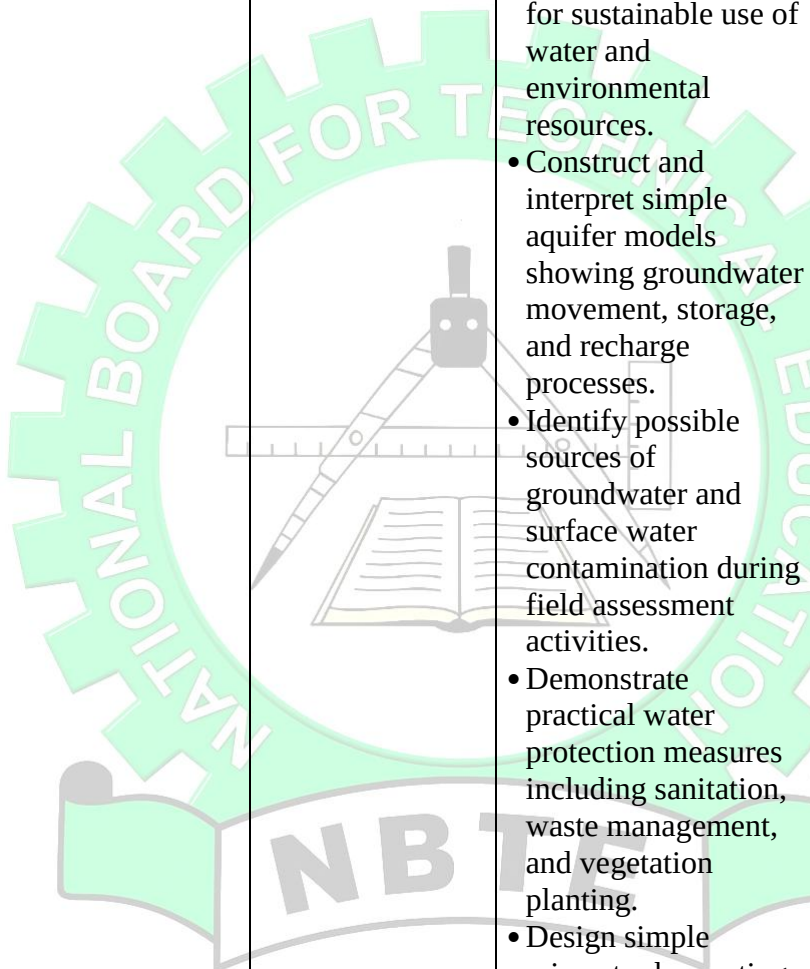
WATERSHED AND SOIL CONSERVATION

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: WATERSHED AND SOIL CONSERVATION	COURSE CODE: FET 314	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 2 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 1 HOURS/WEEK
GOAL: This course is designed to equip student with the knowledge and practical skills in watershed management, soil conservation, erosion control, and sustainable land and water resource management for environmental protection and ecosystem restoration.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1. 0 Understand the principles of watershed and soil conservation in environmental management; 2. 0 Know the causes and effects of soil erosion, runoff, flooding, and watershed degradation; 3. 0 Apply watershed management techniques for sustainable utilization of land and water resources; 4. 0 Understand the use of mechanical and biological soil conservation measures in field operations; 5. 0 Apply climate-resilient watershed and soil conservation strategies for ecosystem restoration and sustainable resource management; 6. 0 Know how to perform field assessment and monitoring of watershed conditions, soil characteristics and erosion problems; 7. 0 Apply sustainable land management practices for erosion control and environmental protection.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: WATERSHED AND SOIL CONSERVATION			COURSE CODE: FET 314		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 1 HOUR/WEEK	
YEAR: 1 SEMESTER: 1			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and practical skills in watershed management, soil conservation, erosion control, sustainable land and water resource management for environmental protection and ecosystem restoration.						
GENERAL OBJECTIVE 1. 0: Understand the principles of watershed and soil conservation in environmental management.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the concepts of watershed and soil conservation. 1.2 Describe components and functions of watershed systems. 1.3 Explain importance of soil and water conservation. 1.4 Explain land use and ecosystem stability relationships. 1.5 Analyse watershed	• Discuss the concepts of watershed and soil conservation. • Discuss components and functions of watershed systems. • Describe importance of soil and water conservation. • Discuss land use and ecosystem stability relationships. • State watershed management in sustainable development.	Textbooks, Manuals, Charts, Computers, Multimedia projector, etc.	• Identify watershed features in field conditions. • Inspect watershed components. • Carryout watershed delineation. • Observe land-use impacts. • Record watershed data.	Guide students to: • Identify watershed features in field conditions. • Classify watershed components. • Carryout watershed delineation. • Observe land-use impacts. • Record watershed data.	Watershed field sites, Soil sampling tools, Measuring tapes, GPS devices, Clinometers, Soil augers, Rain gauges, Flow meters, Water sampling containers, Erosion control materials, Hoes and cutlasses, Surveying equipment, Cameras,

	management in sustainable development.					PPE.
General Objective 2. 0: Know the causes and effects of soil erosion, runoff, flooding, and watershed degradation.						
4-5	2.1 Explain causes of erosion 2.2 Describe erosion types 2.3 Explain flooding effects 2.4 Discuss human impacts 2.5 Analyse socio-economic impacts	• Explain causes of erosion • Describe erosion types • Explain flooding effects • Discuss human impacts • Analyse socio-economic impacts	Textbooks, Manuals, Charts, Computers, Multimedia projector, etc.	• Identify visible causes of erosion during field assessment activities. • Classify erosion types. • Use field observations and environmental indicators to • Assess flood-prone area using standard field procedures and environmental observations. • Record erosion and flooding data using standard field formats and notebooks. • Identify human activities contributing to erosion and watershed degradation in field conditions. • Measure effects of erosion on soil and vegetation during field exercises. • Evaluate socio-economic impacts of	Guide students to: • Identify visible causes of erosion during field assessment activities. • Classify erosion types using field observations and environmental indicators. • Assess flood-prone areas using standard field procedures and environmental observations. • Record erosion and flooding data using standard field formats and notebooks. • Identify human activities contributing to erosion and watershed degradation in field	Watershed field sites, Soil sampling tools, Measuring tapes, GPS devices, Clinometers, Soil augers, Rain gauges, Flow meters, Water sampling containers, Erosion control materials, Hoes and cutlasses, Surveying equipment, Cameras, PPE.

				erosion and flooding. • Use community and environmental data to: • Prepare field reports on erosion, flooding, and watershed degradation assessment activities.	conditions. • Measure effects of erosion on soil and vegetation during field exercises. • Evaluate socio-economic impacts of erosion and flooding using community and environmental data. Prepare field reports on erosion, flooding, and watershed degradation assessment activities.	
General Objective 3. 0: Apply watershed management techniques for sustainable utilization of land and water resources						
6-7	3.1 Explain watershed management principles. 3.2 Describe integrated management. 3.3 Describe water aquifers 3.4 Explain protection measures. 3.5 Discuss water harvesting. 3.6 Analyse	• Explain watershed management principles. • Describe integrated management. • Describe water aquifers • Explain protection measures. • Discuss water harvesting. Analyse ecosystem	Textbooks, Manuals, Charts, Computers, Multimedia projector, etc.	• Identify watershed features and drainage patterns during environmental field observation activities. • Demonstrate watershed management practices such as erosion control, afforestation, and proper land use during practical exercises.	Guide students to: • Identify watershed features and drainage patterns during environmental field observation activities. • Demonstrate watershed management practices such as erosion control, afforestation, and proper land use during practical exercises.	Watershed field sites, Soil sampling tools, Measuring tapes, GPS devices, Clinometers, Soil augers, Rain gauges, Flow meters, Water sampling containers, Erosion control materials, Hoes and

	ecosystem conservation.	conservation.	 • Prepare simple integrated management plans for sustainable use of water and environmental resources. • Construct and interpret simple aquifer models showing groundwater movement, storage, and recharge processes. • Identify possible sources of groundwater and surface water contamination during field assessment activities. • Demonstrate practical water protection measures including sanitation, waste management, and vegetation planting. • Design simple rainwater harvesting systems using locally available materials	• Prepare simple integrated management plans for sustainable use of water and environmental resources. • Construct and interpret simple aquifer models showing groundwater movement, storage, and recharge processes. • Identify possible sources of groundwater and surface water contamination during field assessment activities. • Demonstrate practical water protection measures including sanitation, waste management, and vegetation planting. • Design simple rainwater harvesting systems using locally available materials and environmental	cutlasses, Surveying equipment, Cameras, PPE.
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				and environmental measurements	measurements	
General Objective 4.0: Understand the use of mechanical and biological soil conservation measures in field operations						
8-9	4.1 Explain mechanical soil conservation. 4.2 Describe biological methods. 4.3 Differentiate between mechanical and biological soil conservation 4.4 Explain contouring and terracing. 4.5 Describe vegetation cover	- Describe mechanical soil conservation methods using diagrams, charts, and field examples. - Describe biological soil conservation methods with examples from vegetation-based land protection practices. - Discuss mechanical and biological soil conservation methods using relevant conservation examples. - Illustrate contouring and terracing	Textbooks, Manuals, Charts, Computers, Multimedia projector, etc.	- Identify mechanical soil conservation structures such as terraces, bunds, and contour ridges during field observation activities. - Construct simple models of mechanical soil conservation structures using soil, sticks, and available materials. - Identify biological soil conservation practices such as mulching, cover cropping, and afforestation in field environments. - Compare	Guide students to: - Identify mechanical soil conservation structures such as terraces, bunds, and contour ridges during field observation activities. - Construct simple models of mechanical soil conservation structures using soil, sticks, and available materials. - Identify biological soil conservation practices such as mulching, cover cropping, and afforestation in field environments. - Compare mechanical and biological soil conservation methods based on field observations and	Watershed field sites, Soil sampling tools, Measuring tapes, GPS devices, Clinometers, Soil augers, Rain gauges, Flow meters, Water sampling containers, Erosion control materials, Hoes and cutlasses, Surveying equipment, Cameras, PPE.

		techniques with sketches, pictures, or land-slope diagrams. Describe the role of vegetation cover in reducing erosion and improving soil stability.		mechanical and biological soil conservation methods based on field observations and recorded data. - Demonstrate contouring techniques using simple field exercises on sloped land or models. - Demonstrate terracing methods using soil models or school garden plots. - Assess the effectiveness of vegetation cover in reducing soil erosion through field observation. - Establish simple vegetation cover (grass planting or mulching) in school garden or demonstration plots. - Prepare field	recorded data. - Demonstrate contouring techniques using simple field exercises on sloped land or models. - Demonstrate terracing methods using soil models or school garden plots. - Assess the effectiveness of vegetation cover in reducing soil erosion through field observation. - Establish simple vegetation cover (grass planting or mulching) in school garden or demonstration plots. Prepare field reports on soil conservation practices and their effectiveness in controlling erosion.	
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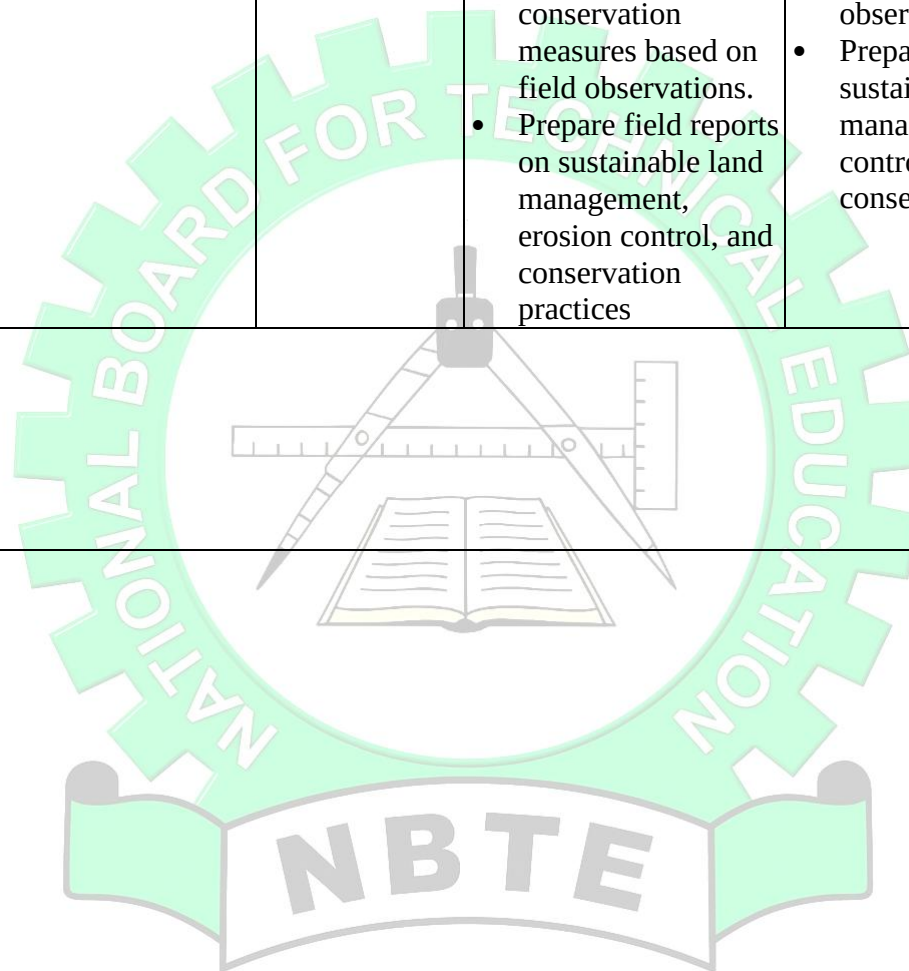
				reports on soil conservation practices and their effectiveness in controlling erosion.		
General Objective 5.0: Apply climate-resilient watershed and soil conservation strategies for ecosystem restoration and sustainable resource management.						
10-11	5.1 Explain climate-resilient concepts. 5.2 Describe climate impacts. 5.3 Explain restoration techniques. 5.4 Discuss climate-smart strategies. 5.5 Analyse adaptation methods.	• Discuss climate-resilient concepts. • Describe climate impacts. • Discuss restoration techniques. • Describe climate-smart strategies. • Analyse adaptation methods.	Textbooks, Manuals, Charts, Computers, Multimedia projector, etc.	• Identify signs of climate change and variability during environmental observation activities. • Record climate-related impacts such as erosion, flooding, and drought effects in field settings. • Demonstrate environmental restoration activities such as tree planting, soil improvement, and waste management in school or community projects. • Apply climate-smart practices such	Guide students to: • Identify signs of climate change and variability during environmental observation activities. • Record and interpret climate-related impacts such as erosion, flooding, and drought effects in field settings. • Demonstrate environmental restoration activities such as tree planting, soil improvement, and waste management in school or community projects. • Apply climate-smart practices such as water conservation, mulching, and efficient	Watershed field sites, Soil sampling tools, Measuring tapes, GPS devices, Clinometers, Soil augers, Rain gauges, Flow meters, Water sampling containers, Erosion control materials, Hoes and cutlasses, Surveying equipment, Cameras, PPE.

				as water conservation, mulching, and efficient land use in practical exercises. • Assess adaptation strategies used by communities to cope with climate change through field visits and interviews. • Prepare field reports on climate impacts, restoration activities, and adaptation measures observed in the environment.	land use in practical exercises. • Assess adaptation strategies used by communities to cope with climate change through field visits and interviews. Prepare field reports on climate impacts, restoration activities, and adaptation measures observed in the environment.	
General Objective 6. 0: Know how to perform field assessment and monitoring of watershed conditions, soil characteristics and erosion problems						
12-13	6.1 Explain watershed assessment methods. 6.2 Describe soil properties. 6.3 Explain monitoring techniques. 6.4 Discuss data	• Describe watershed assessment methods using maps, charts, field reports, and environmental case examples. • Explain soil properties such as	Textbooks, Manuals, Charts, Computers, Multimedia projector, etc.	• Conduct basic watershed assessment using field observation, mapping, and identification of drainage patterns. • Test soil properties using simple field methods such as	Guide students to: • Conduct basic watershed assessment using field observation, mapping, and identification of drainage patterns. • Test soil properties using simple field	Watershed field sites, Soil sampling tools, Measuring tapes, GPS devices, Clinometers, Soil augers, Rain gauges, Flow meters,

	collection to carry out field assessment and monitoring of understand soil and erosion conditions	texture, structure, moisture, permeability, organic matter, and fertility. • Illustrate monitoring techniques used in watershed and soil conservation activities. • Discuss data collection procedures using standard field records, observation sheets, and assessment formats.		texture (feel method), water infiltration tests, and soil sampling. • Demonstrate basic environmental monitoring techniques using observation logs, simple instruments, and repeated measurements. • Collect environmental data using structured field sheets, notebooks, and sampling procedures. • Record environmental data using structured field sheets, notebooks, and sampling procedures. • Interpret collected watershed and soil data to identify environmental conditions and potential problems.	methods such as texture (feel method), water infiltration tests, and soil sampling. • Demonstrate basic environmental monitoring techniques using observation logs, simple instruments, and repeated measurements. • Collect environmental data using structured field sheets, notebooks, and sampling procedures. • Record environmental data using structured field sheets, notebooks, and sampling procedures. • Interpret collected watershed and soil data to identify environmental conditions and potential problems. Prepare field reports on watershed assessment, soil properties, monitoring activities, and data collection exercises.	Water sampling containers, Erosion control materials, Hoes and cutlasses, Surveying equipment, Cameras, PPE.
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				• Prepare field reports on watershed assessment, soil properties, monitoring activities, and data collection exercises		
General Objective 7. 0: Apply sustainable land management practices for erosion control and environmental protection.						
14-15	7.1 Explain sustainable land management. 7.2 Describe erosion control practices. 7.3 Explain conservation approaches.	• Discuss sustainable land management concepts using relevant land-use and environmental examples. • Describe erosion control practices with the aid of diagrams, pictures, and field examples. • Outline conservation approaches for protecting soil, water, vegetation, and watershed resources.	Textbooks, Manuals, Charts, Computers, Multimedia projector, etc.	• Identify sustainable land management practices during field observation activities. • Demonstrate basic sustainable land use practices in school gardens or demonstration plots. • Identify erosion control structures and techniques in real-life or simulated environments. • Apply simple erosion control practices such as mulching, planting cover crops, and contour marking in practical exercises.	Guide students to: • Identify sustainable land management practices during field observation activities. • Demonstrate basic sustainable land use practices in school gardens or demonstration plots. • Identify erosion control structures and techniques in real-life or simulated environments. • Apply simple erosion control practices such as mulching, planting cover crops, and contour marking in practical exercises. • Assess land degradation	Watershed field sites, Soil sampling tools, Measuring tapes, GPS devices, Clinometers, Soil augers, Rain gauges, Flow meters, Water sampling containers, Erosion control materials, Hoes and cutlasses, Surveying equipment, Cameras, PPE.

				- Assess land degradation and suggest appropriate conservation measures based on field observations. - Prepare field reports on sustainable land management, erosion control, and conservation practices	and suggest appropriate conservation measures based on field observations. Prepare field reports on sustainable land management, erosion control, and conservation practices	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						



GEOGRAPHIC INFORMATION SYSTEM (GIS) AND REMOTE SENSING IN FORESTRY

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: GEOGRAPHIC INFORMATION SYSTEM (GIS) AND REMOTE SENSING IN FORESTRY	COURSE CODE: FET 315	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL:1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills in the application of Geographic Information System (GIS) and Remote Sensing in Forestry		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand applications of GIS and remote sensing in forestry and environmental management; 2.0 Know the basic concepts of GIS and remote sensing application in forestry and environmental management; 3.0 Know how to perform spatial and raster data collection, processing, analysis, and interpretation for forestry applications; 4.0 Understand the use of satellite imagery, drones, GPS, and geospatial software in forest resource assessment; 5.0 Know how to perform Land Use Land Cover (LULC) analysis in sustainable forest management.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: GEOGRAPHIC INFORMATION SYSTEM (GIS) AND REMOTE SENSING IN FORESTRY			COURSE CODE: FET 315		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 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 the knowledge and skills in the application of Geographic Information System (GIS) and Remote Sensing in Forestry						
GENERAL OBJECTIVE 1.0: Understand applications of GIS and remote sensing in forestry and environmental management.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the concepts of GIS and remote sensing in forestry. 1.2 Describe the components of GIS in spatial data management. 1.3 Explain applications of remote sensing in forest inventory and environmental monitoring. 1.4 Differentiate between spatial and non-spatial data in forestry applications. 1.5 Explain importance of geospatial technologies in	- Discuss the concepts of GIS and remote sensing in forestry. - Describe the components of GIS in spatial data management. - Discuss applications of remote sensing in forest inventory and environmental monitoring. - Differentiate between spatial and non-spatial data in forestry applications. - Discuss importance	GIS analysis textbooks, Spatial analysis manuals, Charts, Multimedia projector, Forestry datasets, Multimedia presentations, etc.	- Identify GIS and remote sensing tools used in forestry operations. - Operate GIS software interfaces for spatial analysis. - Process satellite images and spatial datasets. - Use GPS for location referencing. - Carryout record and organizing of geospatial field data.	Guide students to: - Identify GIS and remote sensing tools used in forestry operations. - Operate GIS software interfaces for spatial analysis. - Process satellite images and spatial datasets. - Demonstrate GPS use for location	Computers, GIS software, GPS devices, Satellite imagery datasets, Internet-enabled geospatial platforms, Measuring tapes, Cameras, Safety gear.

	sustainable forest management.	of geospatial technologies in sustainable forest management.			referencing. • Record and organize geospatial field data.	
General Objective 2.0: Know the basic concepts of GIS and remote sensing application in forestry and environmental management.						
4-6	2.1 Explain coordinate systems and map projections. 2.2 Describe raster and vector data models. 2.3 Explain image resolution and spectral characteristics. 2.4 Describe sources of remotely sensed data. 2.5 Explain image acquisition and processing principles.	- Describe coordinate systems and map projections. - Discuss raster and vector data models. - Discuss image resolution and spectral characteristics. - Describe sources of remotely sensed data. Explain image acquisition and processing principles.	GIS analysis textbooks, Spatial analysis manuals, Charts, Multimedia projector, Forestry datasets, Multimedia presentations, etc.	- Identify map projections and coordinate systems. - Differentiate raster and vector datasets. - Examine satellite images based on resolution. - Import geospatial datasets. - Perform simple image processing operations.	Guide students to: - Identify map projections and coordinate systems. - Differentiate raster and vector datasets. - Examine satellite images based on resolution. - Import and organize geospatial datasets. - Perform simple image processing operations	GIS software, computers, GPS devices, Topographic maps, Satellite imagery, Printers, Plotters, External drives.
General Objective 3.0: Know how to perform spatial and raster data collection, processing, analysis, and interpretation for forestry applications						
7-9	3.1 Explain spatial data collection methods.	• Present spatial data collection methods.	GIS analysis textbooks,	• Collect spatial data using GPS.	Guide students to:	GIS software, Computers,

	3.2 Describe raster processing techniques. 3.3 Explain spatial analysis procedures. 3.4 Describe geospatial data interpretation methods. 3.5 Explain importance of spatial analysis in decision-making.	• Illustrate raster processing techniques. • Outline spatial analysis procedures. • Describe geospatial data interpretation methods. • Highlight importance of spatial analysis in decision-making.	Spatial analysis manuals, Charts, Multimedia projector, Forestry datasets, Multimedia presentations, etc.	• Process raster datasets. • Perform spatial analysis. • Interpret thematic maps. • Prepare spatial reports.	• Collect spatial data using GPS. • Process raster datasets. • Perform spatial analysis. • Interpret thematic maps. • Prepare spatial reports.	GPS receivers, Satellite imagery datasets, Field survey equipment, Printers, Plotters, External drives.
General Objective 4.0: Understand the use of satellite imagery, drones, GPS, and geospatial software in forest resource assessment.						
10-12	4.1 Explain satellite image interpretation. 4.2 Describe GIS applications in forestry. 4.3 Describe geospatial software applications. 4.4 Explain advantages of geospatial technologies in sustainable forest management	• Discuss satellite image interpretation. • Describe GIS applications in forestry. • Describe geospatial software applications. • Discuss advantages of geospatial technologies in sustainable forest management	GIS analysis textbooks, Spatial analysis manuals, Charts, Multimedia projector, Forestry datasets, Multimedia presentations, etc.	• Interpret satellite imagery. • Operate drones for aerial surveys. • Use GPS devices for mapping. • Generate forest maps using GIS software. • Assess forest resources using integrated geospatial tools.	Guide students to: • Interpret satellite imagery. • Operate drones for aerial surveys. • Use GPS devices for mapping. • Generate forest maps using GIS software. • Assess forest resources using integrated geospatial	Drones/UAVs, GPS devices, GIS software, Computers, Satellite imagery, Mapping platforms, Cameras, Batteries, Safety equipment.

					tools.	
General Objective 5.0: Know how to perform Land Use Land Cover (LULC) analysis in sustainable forest management.						
13-15	5.1 Explain Land Use Land Cover (LULC) concepts. 5.2 Describe classification methods in LULC mapping. 5.3 Explain importance of LULC in forest management. 5.4 Analyse land use and vegetation changes. 5.5 Explain role of LULC in environmental sustainability and climate monitoring.	• Discuss Land Use Land Cover (LULC) concepts. • Describe classification methods in LULC mapping. • Outline importance of LULC in forest management. • Analyse land use and vegetation changes. • Describe role of LULC in environmental sustainability and climate monitoring.	LULC manuals, GIS analysis textbooks, Spatial analysis manuals, Charts, Multimedia projector, Forestry datasets, Multimedia presentations, etc.	• Classify land use and land cover categories. • Generate LULC maps. • Analyse temporal changes in land cover. • Interpret LULC outputs. • Prepare LULC reports.	Guide students to: • Classify land use and land cover categories. • Generate LULC maps. • Analyse temporal changes in land cover. • Interpret LULC outputs. • Prepare LULC reports.	GIS and remote sensing software, Computers, Satellite imagery datasets, GPS devices, Plotters, Geospatial databases, Storage devices.

COURSE ASSESSMENT

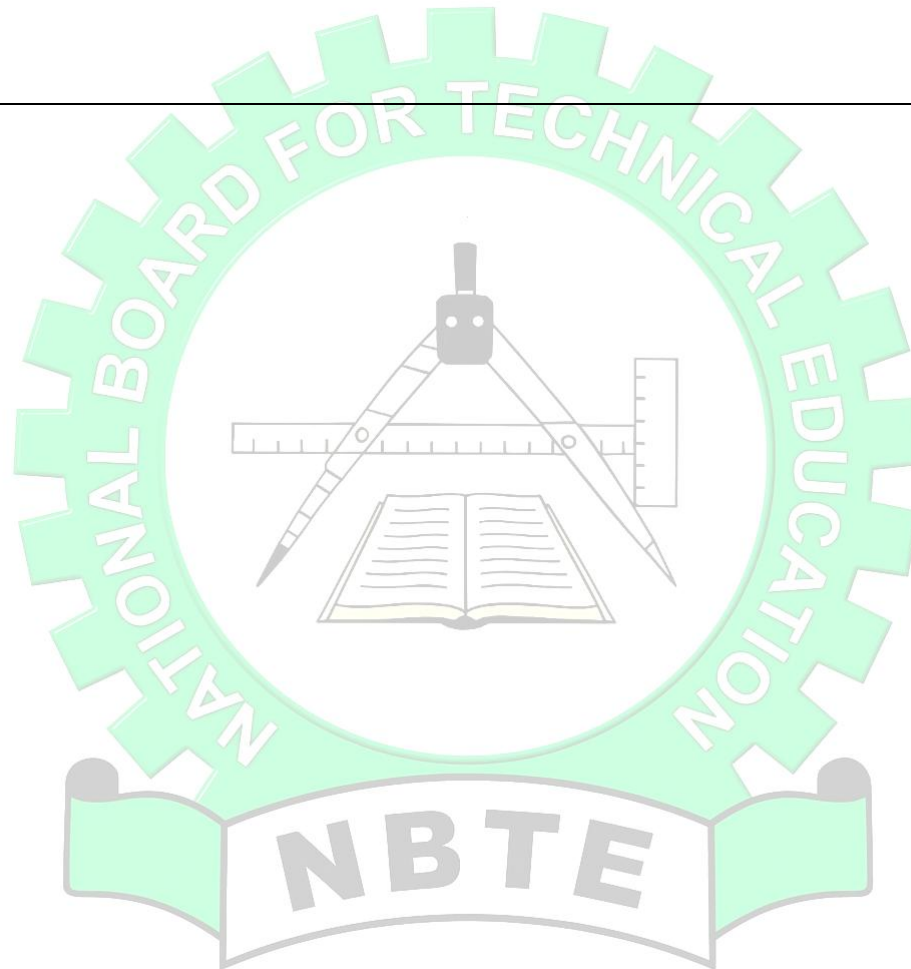
Course Work: 10%

Tests: 10%

Practical: 40%

Examination: 40%

Total: 100%



FOREST ECOLOGY

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST ECOLOGY	COURSE CODE: FET 316	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students' knowledge and skills in forest ecology and ecosystem dynamics and develop their ability to conduct ecological assessments, biodiversity monitoring, and ecosystem management for sustainable forestry practices.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the concepts of forest ecology and ecosystem dynamics; 2.0 Know how to conduct ecological field studies to monitor biodiversity and ecosystem; 3.0 Apply ecological sampling and monitoring techniques in forest environments; 4.0 Understand data collection and interpretation of forest ecosystem parameters; 5.0 Know how to evaluate ecological interactions and impacts of human activities in forests; 6.0 Apply biodiversity genetics principles to support genetic diversity in reforestation and conservation planning; 7.0 Apply landscape connectivity concepts for designing wildlife corridors under climate change scenarios.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: FOREST ECOLOGY		COURSE CODE: FET 316		CONTACT HOURS: 3 HOURS/WEEK		
		CREDIT UNIT: 3		THEORY: 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’ knowledge and skills in forest ecology and ecosystem dynamics and develop their ability to conduct ecological assessments, biodiversity monitoring, and ecosystem management for sustainable forestry practices.						
GENERAL OBJECTIVE 1.0: Understand the concepts of forest ecology and ecosystem dynamics.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Explain the concepts of forest ecology 1.2 Describe structure and functions of forest ecosystems 1.3 Explain ecosystem dynamics and ecological succession 1.4 Differentiate biotic and abiotic components 1.5 Analyse energy flow and nutrient cycling	• Explain the concepts of forest ecology • Describe structure and functions of forest ecosystems • Explain ecosystem dynamics and ecological succession • Differentiate biotic and abiotic components • Analyse energy flow and nutrient cycling	Forest ecology textbooks, Ecology charts and diagrams, Whiteboard and markers, Projector and slides, Multimedia presentations, Ecosystem models, Forestry journals, etc.	• Identify components of forest ecosystems • Classify biotic and abiotic factors • Observe ecological succession stages • Record ecosystem interactions and observations • Interpret ecological relationships in forest sites	Guide students to: • Identify components of forest ecosystems • Classify biotic and abiotic factors • Observe ecological succession stages • Record ecosystem interactions and observations • Interpret ecological relationships in forest sites	Plant identification manuals, Soil sampling tools, Measuring tapes, GPS devices, Cameras, Safety boots and gloves.
General Objective 2.0: Conduct ecological field studies to monitor biodiversity and ecosystem						

3-4	2.1 Explain biodiversity concepts in forest ecosystems 2.2 Describe methods used in ecological field studies 2.3 Explain biodiversity monitoring procedures 2.4 Analyse ecological indicators used in ecosystem monitoring 2.5 State the importance of biodiversity conservation	• Discuss biodiversity concepts in forest ecosystems • Discuss methods used in ecological field studies • Explain biodiversity monitoring procedures • Analyse ecological indicators used in ecosystem monitoring • Outline the importance of biodiversity conservation	Forest ecology textbooks, Ecology charts and diagrams, Whiteboard and markers, Projector and slides, Multimedia presentations, Ecosystem models, Forestry journals, etc.	• Conduct biodiversity surveys • Identify flora and fauna species • Apply ecological monitoring techniques • Record biodiversity data • Assess ecosystem conditions using indicators	Guide students to: • Conduct biodiversity surveys • Identify flora and fauna species • Apply ecological monitoring techniques • Record biodiversity data • Assess ecosystem conditions using indicators	Species identification guides, GPS devices, Cameras, Measuring tapes, Sampling equipment, Safety gear.
General Objective 3.0: Apply ecological sampling and monitoring techniques in forest environments						
5-7	3.1 Explain ecological sampling methods 3.2 Describe plot establishment procedures 3.3 Explain monitoring techniques for ecosystem evaluation 3.4 Analyse advantages and limitations of sampling techniques	• Discuss ecological sampling methods • Describe plot establishment procedures • Discuss monitoring techniques for ecosystem evaluation • Analyse advantages and	Forest ecology textbooks, Ecology charts and diagrams, Whiteboard and markers, Projector and slides, Multimedia presentations, Ecosystem models,	• Establish sample plots and transects • Apply ecological sampling procedures • Use monitoring tools for data collection • Record	Guide students to: • Establish sample plots and transects • Apply ecological sampling procedures • Use monitoring tools for data collection • Record ecological measurements	Measuring tapes, Quadrat frames, GPS devices, Soil sampling tools, Sampling datasheets, Cameras,

	3.5 Evaluate importance of accurate ecological sampling	limitations of sampling techniques • Discuss importance of accurate ecological sampling	Forestry journals, etc.	ecological measurements accurately • Interpret ecological sampling results	accurately • Interpret ecological sampling results	Safety boots and gloves.
General Objective 4.0: Understand data collection and interpretation of forest ecosystem parameters						
8-9	4.1 Explain methods of collecting ecological data 4.2 Describe ecosystem parameters used in assessment 4.3 Explain procedures for organizing and interpreting data 4.4 Analyse relationships among ecosystem parameters 4.5 Evaluate importance of ecological data in management decisions	• Discuss methods of collecting ecological data • Describe ecosystem parameters used in assessment • Describe procedures for organizing and interpreting data • Analyse relationships among ecosystem parameters • Outline importance of ecological data in management decisions	Forest ecology textbooks, Ecology charts and diagrams, Whiteboard and markers, Projector and slides, Multimedia presentations, Ecosystem models, Forestry journals, etc.	• Collect ecological data from field sites • Measure ecosystem parameters • Organize ecological data • Interpret ecological data for assessment • Prepare ecological field reports	Guide students to: • Collect ecological data from field sites • Measure ecosystem parameters • Organize ecological data • Interpret ecological data for assessment • Prepare ecological field reports	Measuring instruments, Soil sampling tools, GPS devices, Data recording sheets, Computers/laptops, Cameras, Safety gear.
General Objective 5.0: Know how to evaluate ecological interactions and impacts of human activities in forests						
10-11	5.1 Explain ecological interactions within forest ecosystems 5.2 Describe human	• Discuss ecological interactions within forest ecosystems • Describe human	Forest ecology textbooks, Ecology charts and diagrams,	• Identify ecological disturbances	Guide students to: • Identify ecological disturbances	Forest field sites, GPS devices,

	activities affecting forest ecosystems 5.3 Analyse effects of deforestation, fire, and pollution in forest ecosystem 5.4 Explain ecological consequences of habitat fragmentation 5.5 Evaluate conservation strategies for reducing degradation	activities affecting forest ecosystems • Discuss effects of deforestation, fire, and pollution in forest ecosystem • Discuss ecological consequences of habitat fragmentation • Outline conservation strategies for reducing degradation	Whiteboard and markers, Projector and slides, Multimedia presentations, Ecosystem models, Forestry journals, etc.	• Assess impacts of human activities • Apply environmental assessment techniques • Record environmental observations systematically • Evaluate conservation measures	• Assess impacts of human activities • Apply environmental assessment techniques • Record environmental observations systematically • Evaluate conservation measures	Cameras, Measuring tapes, Soil sampling tools, Conservation maps, Safety boots and gloves.
General Objective 6.0: Apply biodiversity genetics principles to support genetic diversity in reforestation and conservation planning						
12-13	6.1 Explain principles of biodiversity genetics 6.2 Describe genetic variation and its importance 6.3 Explain role of genetic diversity in conservation 6.4 Analyse threats to forest genetic resources 6.5 Evaluate strategies for conserving genetic diversity	• Explain principles of biodiversity genetics • Describe genetic variation and its importance • Explain role of genetic diversity in conservation • Analyse threats to forest genetic resources • Evaluate strategies for conserving genetic diversity	Forest ecology textbooks, Ecology charts and diagrams, Whiteboard and markers, Projector and slides, Multimedia presentations, Ecosystem models, Forestry journals, etc.	• Identify variations among forest species • Assess genetic diversity indicators • Collect genetic resource data • Organize genetic resource data • Apply conservation planning procedures • Interpret biodiversity	Guide students to • Identify variations among forest species • Assess genetic diversity indicators • Collect genetic resource data • Organize genetic resource data • Apply conservation planning procedures • Interpret biodiversity genetics observations.	Forest field sites, Species identification guides, GPS devices, Measuring tapes, Data sheets, Cameras, Safety gear.

				genetics observations		
General Objective 7.0: Apply landscape connectivity concepts for designing wildlife corridors under climate change scenarios						
14-15	7.1 Explain landscape connectivity concepts 7.2 Describe wildlife corridors and ecological importance 7.3 Explain effects of climate change on habitat connectivity 7.4 Analyse methods used in corridor design 7.5 Evaluate strategies for maintaining ecological connectivity	• Explain landscape connectivity concepts • Describe wildlife corridors and ecological importance • Explain effects of climate change on habitat connectivity • Analyse methods used in corridor design • Evaluate strategies for maintaining ecological connectivity	Forest ecology textbooks, Ecology charts and diagrams, Whiteboard and markers, Projector and slides, Multimedia presentations, Ecosystem models, Forestry journals, etc.	• Identify fragmented habitats and corridors • Assess landscape features influencing wildlife movement • Apply mapping techniques for corridor planning • Record habitat connectivity observations • Evaluate suitability of wildlife corridors	Guide students to: • Identify fragmented habitats and corridors • Assess landscape features influencing wildlife movement • Apply mapping techniques for corridor planning • Record habitat connectivity observations • Evaluate suitability of wildlife corridors	GIS software, GPS devices, Habitat maps, Measuring tapes, Cameras, Computers/laptops, Safety boots and gloves.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) APPLICATIONS IN FORESTRY

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) APPLICATIONS IN FORESTRY	COURSE CODE: FET 317	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and practical skills required for the application of Information and Communication Technology (ICT) in sustainable forest resources management.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the concept of Information and Communication Technology (ICT) in sustainable forest management. 2.0 Apply Geographic Information Systems (GIS) and remote sensing technologies in sustainable forest resources management. 3.0 Know how to perform digital data collection, storage, analysis, and presentation for forest resource management using digital tools. 4.0 Apply database management and information systems for sustainable forest planning and administration. 5.0 Understand the effectiveness of ICT tools in improving productivity, precision, and environmental sustainability in forestry operations.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) APPLICATIONS IN FORESTRY			COURSE CODE: FET 317		CONTACT HOURS: 3HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 1HOUR/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 the knowledge and practical skills required for the application of Information and Communication Technology (ICT) in sustainable forest resources management.						
GENERAL OBJECTIVE 1. 0: Understand the concept of Information and Communication Technology (ICT) in sustainable forest management.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Explain the concept of ICT in forestry operations. 1.2 Describe the roles of ICT in sustainable forest management. 1.3 Explain the applications of ICT tools in forest inventory, monitoring, and planning. 1.4 Differentiate between conventional and ICT-based forestry management systems. 1.5 Analyse the importance of ICT in environmental sustainability and decision-making.	- Discuss the concept of ICT in forestry operations using relevant digital forestry examples. - Discuss the roles of ICT in sustainable forest management, resource monitoring, data storage, and decision-making.	ICT textbooks, Forestry information systems manuals, Whiteboard, Markers, Charts and diagrams, Projector, Slides, Multimedia presentations, Environmental journals, Internet resources, etc.	- Identify ICT tools used in forestry operations and environmental management activities. - Operate digital devices used in forest inventory and monitoring activities. - Use GIS and GPS tools during forestry field assessment exercises.	Guide students to: - Identify ICT tools used in forestry operations and environmental management activities. - Operate digital devices used in forest inventory and monitoring activities. - Use GIS and GPS tools during forestry	Laptops, Printers, Scanners, Internet facilities, Storage devices, Smartphones, Tablets, Computer, Safety equipment.

		making. • Illustrate the applications of ICT tools in forest inventory, monitoring, and planning. • Compare conventional forestry management systems with ICT-based forestry management systems. • Analyse the importance of ICT in environmental sustainability and forestry decision-making.		• Collect forest inventory data using digital data collection devices and software applications. • Record forestry data • Organize forestry data using ICT applications and database systems. • Compare conventional and ICT-based forestry management procedures using practical exercises. • Apply ICT tools in forest monitoring and planning activities using digital platforms. • Evaluate effectiveness of ICT applications in sustainable forest management and environmental decision-making.	field assessment exercises. • Collect forest inventory data using digital data collection devices and software applications. • Record and organize forestry data using ICT applications and database systems. • Organize forestry data using ICT applications and database systems. • Compare conventional and ICT-based forestry management procedures using practical exercises. • Apply ICT tools in forest	
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					monitoring and planning activities using digital platforms. Evaluate effectiveness of ICT applications in sustainable forest management and environmental decision-making.	
General Objective 2. 0: Apply Geographic Information Systems (GIS) and remote sensing technologies in sustainable forest resources management						
4-6	2.1 Explain the principles and components of GIS in forestry. 2.2 Describe remote sensing technologies used in forest management. 2.3 Explain spatial data acquisition and analysis techniques. 2.4 Analyse applications of GIS and remote sensing in forest resource assessment. 2.5 Explain the importance of	- Discuss the principles and components of GIS in forestry using maps, diagrams, and geospatial data examples. - Describe remote sensing technologies used in forest management, including	ICT textbooks, Forestry information systems manuals, Whiteboard, Markers, Charts and diagrams, Projector, Slides, Multimedia presentations, Environmental	- Identify GIS and remote sensing tools used in forestry operations. - Operate GPS devices and geospatial data collection instruments during field exercises. - Acquire spatial data using GPS, satellite imagery,	Guide students to: - Identify GIS and remote sensing tools used in forestry operations. - Operate GPS devices and geospatial data collection instruments during field exercises. - Acquire spatial	GIS software, Computers/laptops, GPS devices, Satellite images, Digital maps, Printers and plotters, Internet facilities.

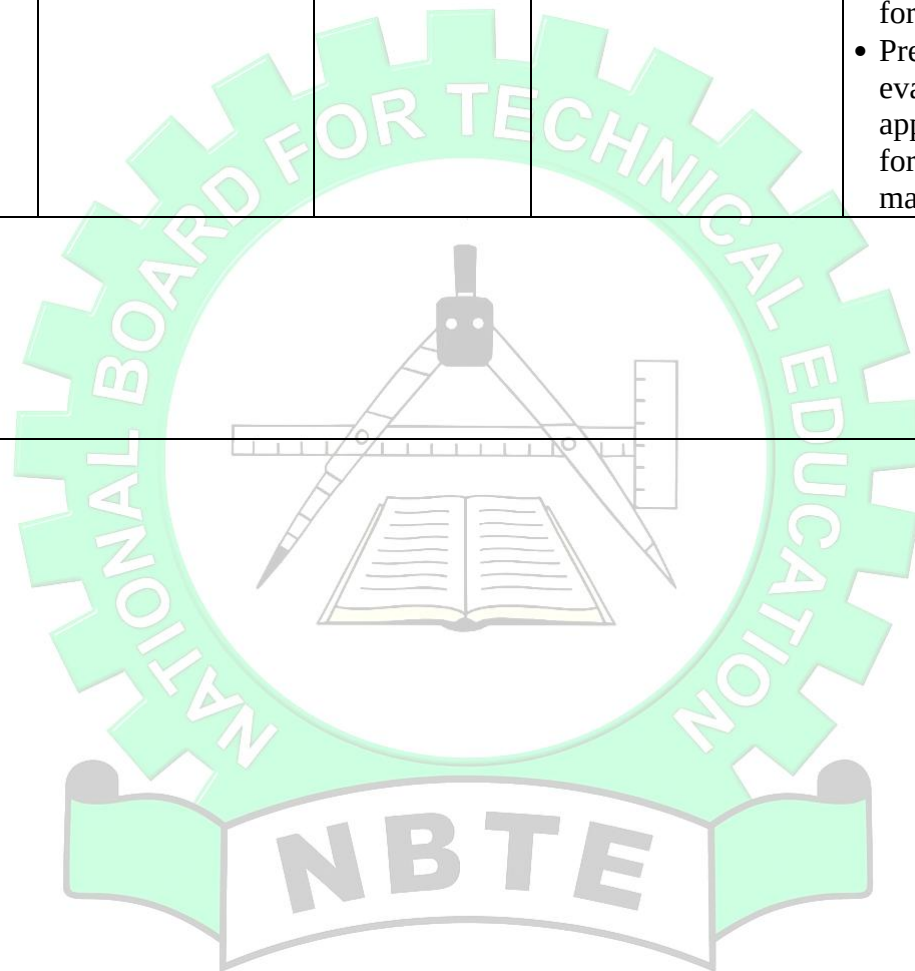
	geospatial technologies in sustainable forestry.	satellite imagery, aerial photography, drones, and LiDAR. • Outline spatial data acquisition and analysis techniques used in forestry operations. • Discuss applications of GIS and remote sensing in forest resource assessment. • Explain the importance of geospatial technologies in sustainable forestry.	journals, Internet resources, etc.	and remote sensing tools. • Import spatial data into GIS software applications for analysis. • Produce maps and geospatial outputs using GIS software and field data. • Analyse spatial information for forest resource assessment and monitoring activities. • Interpret satellite imagery and geospatial data for forestry applications. • Evaluate the effectiveness of geospatial technologies in sustainable forest management and environmental planning.	data using GPS, satellite imagery, and remote sensing tools. • Import spatial data into GIS software applications for analysis. • Produce maps and geospatial outputs using GIS software and field data. • Analyse spatial information for forest resource assessment and monitoring activities. • Interpret satellite imagery and geospatial data for forestry applications. • Evaluate the effectiveness of geospatial technologies in sustainable	
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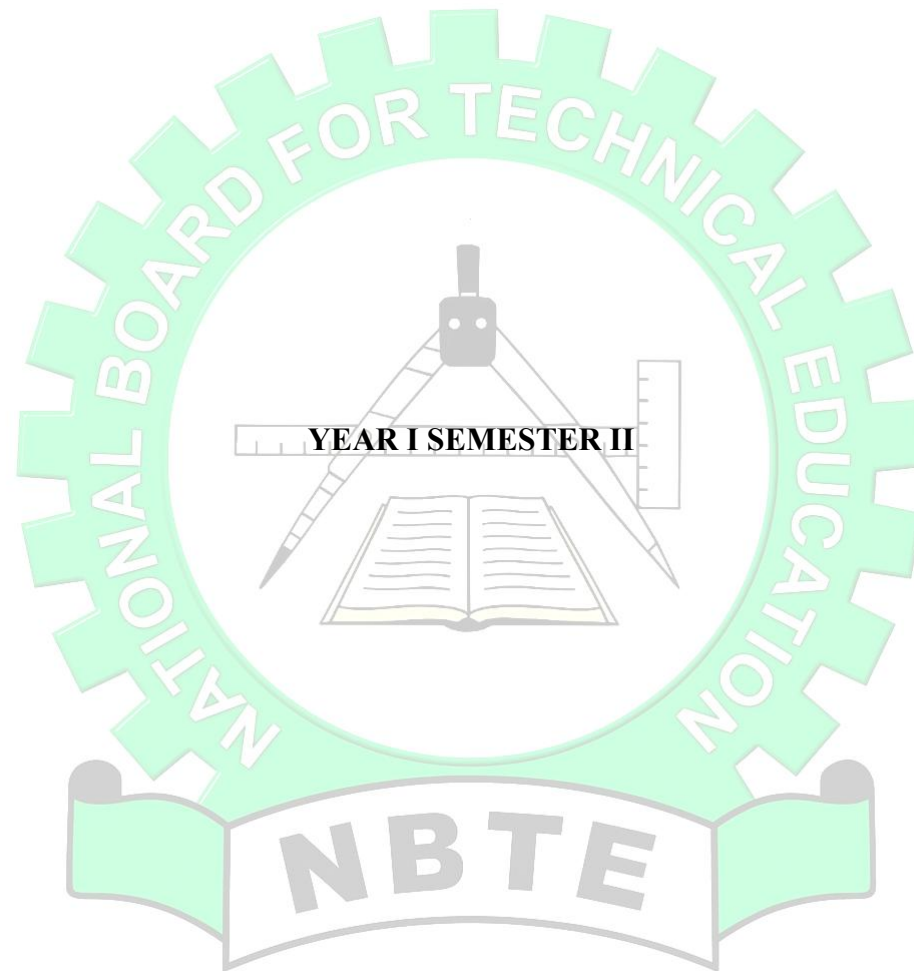
					forest management and environmental planning.	
General Objective 3. 0: Know how to perform digital data collection, storage, analysis, and presentation for forest resource management using digital tools						
7-9	3.1 Explain digital methods of forestry data collection and storage. 3.2 Describe procedures for organizing and managing forestry datasets. 3.3 Explain digital tools used in forest data analysis and presentation. 3.4 Explain methods of data visualization and reporting in forestry. 3.5 Outline the role of digital technologies in forest information management.	• Discuss digital methods of forestry data collection and storage using examples such as mobile data forms, GPS devices, spreadsheets, cloud storage, and forestry databases. • Outline procedures for organizing and managing forestry datasets using standard data formats and classification methods. • Describe digital tools used in forest data analysis and presentation, including Excel, GIS software, statistical packages, and data	ICT textbooks, Forestry information systems manuals, Whiteboard, Markers, Charts and diagrams, Projector, Slides, Multimedia presentations, Environmental journals, Internet resources, etc.	• Collect forestry data using digital devices and applications. • Use spreadsheet software. • Organize forestry datasets using spreadsheet software to store forestry dataset • Analyse forestry data using statistical and digital tools. • Prepare digital presentations and reports for forestry management. • Demonstrate accurate data entry and file management procedures.	Guide students to: • Collect forestry data using digital devices and applications. • Store forestry datasets using spreadsheet software. • Organize forestry datasets using spreadsheet software • Analyse forestry data using statistical and digital tools. • Prepare digital presentations and reports for forestry management.	Laptops, Spreadsheet software, Database software, GPS devices, Smartphones, Tablets, Internet facilities, Projectors.

		dashboards. • Describe methods of data visualization and reporting in forestry using charts, maps, tables, and digital reports. • Explain the role of digital technologies in forest information management, planning, monitoring, and decision-making.			• Demonstrate accurate data entry and file management procedures.	
General Objective 4. 0: Apply database management and information systems for sustainable forest planning and administration.						
10-12	4.1 Explain the principles of database management systems in forestry. 4.2 Describe forestry information systems used for planning and administration. 4.3 Explain procedures for database creation, storage, and retrieval. 4.4 Outline the role of information systems in forestry decision-making. 4.5 Explain database security and management practices in forestry operations.	• Describe database management procedures using software applications. • Explain forestry planning systems using practical examples. • Discuss information management and security. • Describe digital forestry administration	ICT textbooks, Forestry information systems manuals, Whiteboard, Markers, Charts and diagrams, Projector, Slides, Multimedia presentations, Environmental journals, Internet resources, etc.	• Create simple forestry databases. • Carryout Storage and retrieved of forestry information using database software. • Apply information systems in forest planning and administration tasks. • Generate reports from forestry databases. • Maintain digital	Guide students to: • Create simple forestry databases. • Store and retrieve forestry information using database software. • Apply information systems in forest planning and administration	Laptops, Spreadsheet software, Database software, GPS devices, Smartphones, Tablets, Internet facilities, Projectors, Printer.

		systems.		records for forestry management operations.	• Generate reports from forestry databases. • Maintain digital records for forestry management operations.	
General Objective 5. 0: Understand the effectiveness of ICT tools in improving productivity, precision, and environmental sustainability in forestry operations.						
13-15	5.1 Explain the role of ICT in improving forestry productivity and efficiency. 5.2 Describe precision forestry technologies used in sustainable forest management. 5.3 Explain environmental benefits of ICT applications in forestry operations. 5.4 Analyse challenges affecting ICT implementation in forestry sectors. 5.5 Explain emerging ICT innovations for sustainable forestry development.	• Discuss applications of drones, sensors, and digital monitoring tools. • Discuss ICT challenges and opportunities in forestry. • Discuss smart forestry technologies. • Explain ICT-based forestry systems.	ICT textbooks, Forestry information systems manuals, Whiteboard, Markers, Charts and diagrams, Projector, Slides, Multimedia presentations, Environmental journals, Internet resources, etc.	• Operate digital forestry tools for precision forest management. • Assess productivity improvements achieved through ICT applications. • Evaluate environmental monitoring systems used in forestry operations. • Demonstrate the use of digital technologies for sustainable forest practices. • Prepare reports evaluating ICT	Guide students to: • Operate digital forestry tools for precision forest management. • Assess productivity improvements achieved through ICT applications. • Evaluate environmental monitoring systems used in forestry operations. • Demonstrate the	Laptops, Spreadsheet software, Database software, GPS devices, Smartphones, Tablets, Internet facilities, Projectors, Printer, Digital camera.

				applications in forestry management.	use of digital technologies for sustainable forest practices. • Prepare reports evaluating ICT applications in forestry management.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						





GROUND AND AERIAL SURVEY

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: GROUND AND AERIAL SURVEY	COURSE CODE: FET 321	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: 1 SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with the necessary knowledge and skills required in ground and aerial survey on different features and scales.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles and terminologies of ground and aerial surveying; 2.0 Apply GIS and mapping techniques in forest survey operations; 3.0 Understand capturing, processing and interpretation of aerial imageries in forest management; 4.0 Know how to conduct tree measurements and resource assessments using aerial photograph; 5.0 Understand how to produce maps and survey reports from aerial survey data to support decision-making in forest resource management; 6.0 Know the principles and methods of ground surveying in forestry operations.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: GROUND AND AERIAL SURVEY		COURSE CODE: FET 321		CONTACT HOURS: 3 HOURS/WEEK		
		CREDIT UNIT: 3		THEORY: 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 the necessary skills required in ground and aerial survey on different features and scales.						
GENERAL OBJECTIVE 1.0: Understand the principles and terminologies of ground and aerial surveying						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain concepts and scope of ground and aerial surveying 1.2 Describe surveying terminologies, principles, and classifications 1.3 Explain principles of photogrammetry and aerial photography 1.4 Differentiate between ground and aerial survey methods 1.5 Explain applications in forestry and environmental management 1.6 Analyse factors	• Discuss concepts and scope of ground and aerial surveying • Describe surveying terminologies, principles, and classifications • Discuss principles of photogrammetry and aerial photography • Explain ground and aerial survey methods • Discuss	Surveying textbooks, Photogrammetry manuals, Aerial photography guides, Topographic maps, GIS maps and satellite imagery, Surveying charts and diagrams, Projector and multimedia slides, Environmental case studies, Whiteboard and markers,	• Identify survey instruments and aerial equipment • Interpret aerial photographs and features • Apply surveying terminologies in field exercises • Record field observations accurately • Classify aerial photographs by scale, orientation, coverage	Guide students to: • Identify survey instruments and aerial equipment • Interpret aerial photographs and features • Apply surveying terminologies in field exercises • Record field observations accurately • Classify aerial photographs by scale, orientation, coverage	Compasses, GPS devices, Drones and aerial cameras, Surveying tapes and chains, Levels and ranging poles, Theodolites, Clinometers, Field notebooks and data sheets, GIS software applications, Safety boots and gloves.

	affecting accuracy of survey measurements and aerial images	applications in forestry and environmental management Analyse factors affecting accuracy of survey measurements and aerial images	Forestry and surveying journals.			
General Objective 2.0: Apply GIS and mapping techniques in forest survey operations						
4-6	2.1 Explain GIS principles and components 2.2 Describe coordinate systems and projections 2.3 Explain spatial data acquisition and management 2.4 Differentiate raster and vector systems 2.5 Explain GIS applications in forestry 2.6 Analyse importance of GIS in decision-making	- Explain GIS principles and components - Describe coordinate systems and projections - Explain spatial data acquisition and management - Differentiate raster and vector systems - Explain GIS applications in forestry - Analyse importance of GIS in decision-making	Surveying textbooks, Photogrammetry manuals, Aerial photography guides, Topographic maps, GIS maps and satellite imagery, Surveying charts and diagrams, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and surveying	- Operate GIS software - Manage spatial data - Produce thematic maps - Apply GPS data in mapping - Interpret GIS outputs	Guide students to: - Operate GIS software - Input and manage spatial data - Produce thematic maps - Apply GPS data in mapping - Interpret GIS outputs	Compasses, GPS devices, Drones and aerial cameras, Surveying tapes and chains, Levels and ranging poles, Theodolites, Clinometers, Field notebooks and data sheets, GIS software applications, Safety boots and gloves.

			journals.			
General Objective 3.0: Understand capturing, processing and interpretation of aerial imageries in forest management						
7-9	3.1 Explain principles of aerial image acquisition 3.2 Describe aerial cameras and sensors 3.3 Explain image processing techniques 3.4 Distinguish aerial photos from satellite imagery 3.5 Explain image interpretation methods 3.6 Analyse the factors affecting image quality	• Discuss principles of aerial image acquisition • Describe aerial cameras and sensors • Describe image processing techniques • Differentiate between aerial photos and satellite imagery • Describe image interpretation methods • Analyse the factors affecting image quality	Surveying textbooks, Photogrammetry manuals, Aerial photography guides, Topographic maps, GIS maps and satellite imagery, Surveying charts and diagrams, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and surveying journals.	• Capture aerial images • Process images using software • Interpret vegetation and land use • Identify forest features • Organize image data • Store image data.	Guide students to: • Capture aerial images • Process images using software • Interpret vegetation and land use • Identify forest features • Organize image data • Store image data.	Compasses, GPS devices, Drones and aerial cameras, Surveying tapes and chains, Levels and ranging poles, Theodolites, Clinometers, Field notebooks and data sheets, GIS software applications, Safety boots and gloves.
General Objective 4.0: Know how to conduct tree measurements and resource assessment using aerial photographs						
10-11	4.1 Explain tree measurement using aerial photos 4.2 Describe estimation of forest resources	• Describe tree measurement using aerial photos • Explain	Surveying textbooks, Photogrammetry manuals, Aerial	• Measure tree and stand parameters • Calculate photo scale and area • Use stereoscopes	Guide students to: • Measure tree and stand parameters • Calculate photo scale	Aerial photographs Stereoscopes, Drones and aerial cameras,

	4.3 Explain photo scale, overlap and stereoscopy 4.4 Distinguish direct from indirect measurement 4.5 Explain sampling procedures 4.6 Analyse reliability of aerial data	estimation of forest resources • Discuss photo scale, overlap and stereoscopy • Differentiate direct vs indirect measurement • Explain sampling procedures • Analyse reliability of aerial data.	photography guides, Topographic maps, GIS maps and satellite imagery, Surveying charts and diagrams, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and surveying journals.	• Assess forest resources • Record inventory data	and area • Use stereoscopes • Assess forest resources • Record inventory data	Surveying tapes and chains, Levels and ranging poles, Theodolites, Clinometers, Field notebooks and data sheets, GIS software applications, Safety boots and gloves.
General Objective 5.0: Know how to produce maps and survey reports from aerial survey data						
12-13	5.1 Explain map production procedures 5.2 Describe survey report formats 5.3 Explain cartographic principles 5.4 Analyse spatial presentation methods 5.5 Explain role of survey reports 5.6 Discuss importance	• Describe map production procedures • Describe survey report formats • Discuss cartographic principles • Analyse spatial presentation methods • Describe role of survey reports • Outline	Surveying textbooks, Photogrammetry manuals, Aerial photography guides, Topographic maps, GIS maps and satellite imagery, Surveying charts and diagrams, Projector and	• Prepare maps using GIS data • Produce survey reports • Present spatial data visually • Interpret survey findings • Compile survey records	Guide students to: • Prepare maps using GIS data • Produce survey reports • Present spatial data visually • Interpret survey findings • Compile survey records	Compasses, GPS devices, Drones and aerial cameras, Surveying tapes and chains, Levels and ranging poles, Theodolites, Clinometers, Field notebooks and data sheets, GIS software applications,

	of accurate reporting	importance of accurate reporting	multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and surveying journals.			Safety boots and gloves.
General Objective 6.0: Know the principles and methods of ground surveying in forestry operations						
14-15	6.1 Explain ground survey in forestry operations. 6.2 Describe the principles and methods used in ground surveying for forest resource management. 6.3 Explain instruments and equipment used in ground surveying 6.4 Explain procedures for measuring distances, angles, bearings, and elevations in forestry surveys. 6.5 Outline the importance of	• Explain ground survey in forestry operations. • Describe the principles and methods used in ground surveying for forest resource management. • Identify the instruments and equipment used in ground surveying • Explain procedures for measuring distances, angles, bearings, and elevations in forestry surveys. • Explain the	Surveying textbooks, Photogrammetry manuals, Aerial photography guides, Topographic maps, GIS maps and satellite imagery, Surveying charts and diagrams, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and surveying journals.	• Use ground survey instruments and equipment correctly during forestry field exercises. • Carry out distance, angle, bearing, and elevation measurements in forest survey operations. • Demonstrate the use of standard ground surveying methods in forest boundary demarcation. • Prepare field sketches • Survey records from ground survey activities.	Guide students to: • Use ground survey instruments and equipment correctly during forestry field exercises. • Carry out distance, angle, bearing, and elevation measurements in forest survey operations. • Demonstrate the use of standard ground surveying methods in forest boundary demarcation. • Prepare field sketches • Survey records from ground survey activities. • Conduct ground survey exercises for forest mapping and resource	Compasses, GPS devices, Drones and aerial cameras, Surveying tapes and chains, Levels and ranging poles, Theodolites, Clinometers, Field notebooks and data sheets, GIS software applications, Safety boots and gloves.

	ground surveying in forestry operations 6.6 Analyse the applications of ground surveying in forest mapping, boundary demarcation, and resource assessment.	importance of ground surveying in forestry operations • Analyse the applications of ground surveying in forest mapping, boundary demarcation, and resource assessment.		• Conduct ground survey exercises for forest mapping and resource assessment.	assessment.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

PLANTATION MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: PLANTATION MANAGEMENT	COURSE CODE: FET 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 the knowledge and practical skills required for the establishment, management, monitoring, and evaluation of rain forest and savanna plantations for sustainable forest productivity and environmental conservation.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles of rain forest and savanna plantation management 2.0 Understand the establishment and management of rain forest and savanna plantations stands using appropriate silvicultural techniques. 3.0 Know sustainable plantation maintenance techniques in rain forest and savanna ecosystems 4.0 Know the monitoring and evaluation techniques for plantation growth and productivity. 5.0 Apply adaptive silvicultural strategies for climate resilience in plantation systems		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: PLANTATION MANAGEMENT			COURSE CODE: FET 322		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 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 the knowledge and practical skills required for the establishment, management, monitoring, and evaluation of rain forest and savanna plantations for sustainable forest productivity and environmental conservation.						
GENERAL OBJECTIVE 1.0: Understand plantation management principles						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain plantation concepts 1.2 Describe ecological characteristics 1.3 Outline the economic and ecological importance of plantation	• Discuss plantation concepts. • Outline ecological characteristics of plantations. • Explain economic and ecological importance of plantations.	Plantation forestry textbooks, Forest ecology manuals, Environmental management guides, Plantation establishment charts, Forest ecosystem diagrams, Projector and multimedia slides, Environmental case studies, Forest	• Identify plantation types based on species or purpose • Assess ecological conditions • Record observations • Evaluate plantation conditions	Guide students to: • Identify plantation types based on species/purpose • Assess ecological conditions • Record observations • Evaluate plantation conditions	Tree seedlings, Plantation field sites, Measuring tapes, GPS devices, Soil sampling tools, Field notebooks and data sheets, Plant identification guides, Plantation maps, Digital cameras, Safety boots and gloves.

			management reports, Whiteboard and markers, Forestry journals, etc.			
General Objective 2.0: Understand the establishment and management of plantation stands using silvicultural techniques						
4-6	2.1 Explain plantation establishment procedures 2.2 Explain site preparation methods 2.3 Explain species selection criteria 2.4 Analyse silvicultural techniques (spacing, thinning, pruning, regeneration methods) 2.5 Explain suitability of silvicultural practices	- Describe plantation establishment procedures - Describe site preparation methods - Explain species selection criteria - Analyse silvicultural techniques (spacing, thinning, pruning, regeneration methods) - Evaluate suitability of silvicultural practices	Plantation forestry textbooks, Forest ecology manuals, Environmental management guides, Plantation establishment charts, Forest ecosystem diagrams, Projector and multimedia slides, Environmental case studies, Forest management reports, Whiteboard and markers, Forestry	- Prepare plantation sites - Establish plantation stands using spacing techniques - Apply thinning and pruning operations - Select suitable tree species - Maintain plantation stands	Guide students to: - Prepare plantation sites - Establish plantation stands using spacing techniques - Apply thinning and pruning operations - Select suitable tree species - Maintain plantation stands	Tree seedlings, Planting tools, Measuring tapes, Pruning tools, GPS devices, Soil sampling tools, Field notebooks and data sheets, Plantation field sites, Mulching materials, Safety boots and glove.

			journals.			
General Objective 3.0: Know sustainable plantation maintenance techniques in rainforest and savanna ecosystems						
7-9	3.1 Explain plantation maintenance principles 3.2 Describe maintenance operations 3.3 Explain pest and disease control 3.4 Analyse soil and water conservation methods 3.5 Explain fire prevention and protection 3.6 Explain sustainable management practices	• Discuss plantation maintenance principles. • Illustrate maintenance operations in plantation management. • Explain pest and disease control measures. • Describe soil and water conservation methods. • Describe fire prevention and protection practices. • Discuss sustainable management practices.	Plantation forestry textbooks, Forest ecology manuals, Environmental management guides, Plantation establishment charts, Forest ecosystem diagrams, Projector and multimedia slides, Environmental case studies, Forest management reports, Whiteboard and markers, Forestry journals.	• Carry out plantation maintenance • Apply pest and disease control • Demonstrate soil conservation techniques • Establish fire traces • Maintain plantation stands	Guide students to: • Carry out plantation maintenance • Apply pest and disease control • Demonstrate soil conservation techniques • Establish fire traces • Maintain plantation stands	Pruning tools, Knapsack sprayers, Fire beaters and extinguishers, Soil sampling tools, Watering cans and hoses, Measuring tapes, Field notebooks and data sheets, Tree seedlings and mulch materials, GPS devices, Safety boots and gloves.
General Objective 4.0: Know the monitoring and evaluation techniques for plantation growth and productivity						

10-12	4.1 Explain environmental impacts of plantations 4.2 Describe socio-economic benefits of plantation 4.3 Explain environmental assessment procedures	• Discuss environmental impacts of plantations. • Outline socio-economic benefits of plantations. • Discuss environmental assessment procedures.	Plantation forestry textbooks, Forest ecology manuals, Environmental management guides, Plantation establishment charts, Forest ecosystem diagrams, Projector and multimedia slides, Environmental case studies, Forest management reports, Whiteboard and markers, Forestry journals, etc.	• Assess environmental impacts • Evaluate socio-economic effects • Conduct biodiversity observations • Record field data • Prepare impact reports	Guide students to: • Assess environmental impacts • Evaluate socio-economic effects • Conduct biodiversity observations • Record field data • Prepare impact reports	GPS devices, Soil sampling tools, Field notebooks and data sheets, Digital cameras, Environmental assessment checklists, Measuring tapes, GIS software applications, Water quality testing kits, Safety boots and gloves.
General Objective 5.0: Apply adaptive silvicultural strategies for climate resilience in plantation systems						
13-15	5.1 Explain climate resilience concepts 5.2 Describe adaptive silvicultural practices	• Discuss climate resilience concepts. • Discuss adaptive silvicultural	Plantation forestry textbooks, Forest ecology manuals,	• Apply adaptive silvicultural practices • Assess plantation vulnerability	Guide students to: • Apply adaptive silvicultural practices • Assess plantation	Tree seedlings of diverse species, GPS devices, Soil sampling

	5.3 Analyse climate change effects on plantations 5.4 Explain adaptation strategies 5.5 Explain role of species diversity 5.6 Describe adaptive management practices	practices. • Explain climate change effects on plantations. • Explain adaptation strategies. • Explain role of species diversity. • Assess adaptive management practices.	Environmental management guides, Plantation establishment charts, Forest ecosystem diagrams, Projector and multimedia slides, Environmental case studies, Forest management reports, Whiteboard and markers, Forestry journals, etc.	• Monitor plantation stress • Evaluate resilience strategies • Record field observations	vulnerability • Monitor plantation stress • Evaluate resilience strategies • Record field observations	tools, Field notebooks and data sheet, Climate monitoring instruments, GIS software applications, Measuring tapes, Digital cameras Safety boots and gloves.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

FOREST PEST AND DISEASE MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST PEST AND DISEASE MANAGEMENT	COURSE CODE: FET 323	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and practical skills required for the identification, monitoring, prevention, and management of forest pests and diseases for sustainable forest health protection and productivity.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles of forest pest and disease management in sustainable forestry. 2.0 Know the biology and classification of forest pests and disease. 3.0 Apply pest and disease monitoring techniques. 4.0 Know how to perform field and laboratory assessment of pest infestations and forest diseases. 5.0 Apply Integrated Pest Management (IPM) strategies for sustainable forest health protection. 6.0 Understand the environmental and economic impacts of forest pests and diseases on forest productivity.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: FOREST PEST AND DISEASE MANAGEMENT			COURSE CODE: FET 323		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 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 the knowledge and practical skills required for the identification, monitoring, prevention, and management of forest pests and diseases for sustainable forest health protection and productivity						
GENERAL OBJECTIVE 1.0: Understand the principles of forest pest and disease management in sustainable forestry.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the concepts of forest pest and disease management. 1.2 Describe the relationship between forest health and sustainable forestry practices. 1.3 Explain the causes and spread of forest pests and diseases. 1.4 Differentiate between pests, pathogens, and beneficial organisms in forest ecosystems. 1.5 Analyse the effects of pest and disease outbreaks on forest	• Discuss concepts of forest pest and disease management. • Outline relationship between forest health and sustainable forestry practices. • Discuss causes and spread of forest pests and diseases. • Distinguish pests, pathogens, and beneficial organisms in forest ecosystems. • Assess effects of pest and disease outbreaks on forest	Forest pathology textbooks, Forest entomology manuals, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, Environmental reports, etc.	• Identify signs and symptoms of pest and disease attacks in forest stands. • Differentiate healthy forest stands from infected stands during field observations. • Observe pest and disease occurrences in forestry environments. • Record pest and disease observations accurately in field	Guide students to: • Identify signs and symptoms of pest and disease attacks in forest stands. • Differentiate healthy forest stands from infected stands during field observations. • Observe pest and disease occurrences in forestry environments. • Record pest and disease	Diseased plant specimens, Magnifying lenses, Cameras, Sample containers, Protective gloves, Safety boots.

	sustainability.	sustainability.		notebooks. Demonstrate safe handling of infected plant materials during fieldwork.	observations	
General Objective 2.0: Know the biology and classification of forest pests and disease.						
4-5	2.1 Describe the biology and life cycles of major forest pests. 2.2 Explain the characteristics of fungi, bacteria, viruses, and nematodes affecting forests. 2.3 Classify forest pests according to feeding habits and ecological importance. 2.4 Distinguish insect pests and disease-causing organisms. 2.5 Explain environmental factors influencing pest and disease development.	- Explain the biology and life cycles of major forest pests. - Discuss the characteristics of fungi, bacteria, viruses, and nematodes affecting forests. - Discuss forest pests according to feeding habits and ecological importance. - Differentiate between insect pests and disease-causing organisms. - Discuss environmental factors influencing pest and disease development.	Forest pathology textbooks, Forest entomology manuals, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, Environmental reports, etc.	- Identify major forest insect pests and disease-causing organisms. - Classify forest pests according to biological and ecological characteristics. - Examine pest specimens and diseased plant samples using laboratory tools. - Observe developmental stages of forest pests. - Record biological characteristics of pests and pathogens accurately.	Guide students to: - Identify major forest insect pests and disease-causing organisms. - Classify forest pests according to biological and ecological characteristics. - Examine pest specimens and diseased plant samples using laboratory tools. - Observe developmental stages of forest pests. - Record biological characteristics of pests and pathogens	Microscopes, Preserved insect specimens, Diseased plant samples, Collection bottles, Forceps, Magnifying lenses, Laboratory coats.

					accurately.	
General Objective 3.0: Apply pest and disease monitoring techniques.						
6-8	3.1 Explain principles of pest and disease monitoring. 3.2 Describe sampling techniques used in forest pest surveillance. 3.3 Explain procedures for early detection of pest and disease outbreaks. 3.4 Analyse the importance of monitoring in forest protection programs. 3.5 Evaluate monitoring tools used in pest and disease management.	- Discuss principles of pest and disease monitoring. - Explain sampling techniques used in forest pest surveillance. - Describe procedures for early detection of pest and disease outbreaks. - Assess importance of monitoring in forest protection programs. - Explain monitoring tools used in pest and disease management.	Forest pathology textbooks, Forest entomology manuals, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, Environmental reports, etc.	- Conduct pest and disease surveys in forest environments. - Apply sampling techniques for pest population assessment. - Use monitoring tools such as traps and observation sheets effectively. - Record pest and disease monitoring data accurately. - Prepare simple pest surveillance reports from field observations.	Guide students to: - Conduct pest and disease surveys in forest environments. - Apply sampling techniques for pest population assessment. - Use monitoring tools such as traps and observation sheets effectively. - Record pest and disease monitoring data accurately. - Prepare simple pest surveillance reports from field observations.	Insect traps, Sweep nets, Sampling sheets, GPS devices, Cameras, Collection containers, Protective clothing.
General Objective 4. 0: Know how to perform field and laboratory assessment of pest infestations and forest diseases						
9-10	4.1 Explain field assessment procedures for pest infestations and diseases. 4.2 Describe laboratory diagnostic techniques used in forest pathology.	- Outline field assessment procedures for pest infestations and diseases. - Explain laboratory diagnostic techniques	Forest pathology textbooks, Forest entomology manuals, Whiteboard and	- Collect pest and disease samples from field sites. - Examine diseased plant tissues and insect specimens	Guide students to: - Collect pest and disease samples from field sites. - Examine diseased plant tissues and	Microscopes, Diseased plant specimens, Collection bottles, Sample

	4.3 Explain procedures for collecting and preserving pest and disease samples. 4.4 Analyse infestation severity and disease incidence in forest stands.	used in forest pathology. - Explain procedures for collecting and preserving pest and disease samples. - Assess infestation severity and disease incidence in forest stands. - Explain how to interpret laboratory findings for forest health management decisions.	markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, Environmental reports, etc.	in the laboratory. - Assess severity levels of pest infestation and disease occurrence. - Preserve laboratory and field samples appropriately. - Prepare field and laboratory assessment reports accurately.	insect specimens in the laboratory. - Assess severity levels of pest infestation and disease occurrence. - Preserve laboratory and field samples appropriately. Prepare field and laboratory assessment reports accurately	containers, Forceps, Disinfectants, Laboratory coats.
General Objective 5.0: Apply Integrated Pest Management (IPM) strategies for sustainable forest health protection						
11-13	5.1 Explain the components of Integrated Pest Management (IPM). 5.2 Describe biological, cultural, mechanical, and chemical pest control methods. 5.3 Explain environmental-friendly approaches to forest pest management. 5.4 Analyse the advantages and limitations of IPM strategies in forestry. 5.5 Explain sustainable forest protection	- Discuss the components of Integrated Pest Management (IPM). - Discuss biological, cultural, mechanical, and chemical pest control methods. - Describe environmentally friendly approaches to forest pest management. - Analyse advantages and limitations of	Forest pathology textbooks, Forest entomology manuals, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia	- Identify components of Integrated Pest Management (IPM) in forestry practices. - Demonstrate biological pest control methods used in forest pest management. - Apply cultural pest control techniques for reducing pest infestation in	Guide students to: - Identify components of Integrated Pest Management in forestry practices. - Demonstrate biological pest control methods used in forest pest management. - Apply cultural pest control techniques for reducing pest infestation in	Sprayers, Protective clothing, Biological control materials, Pest control chemicals, Measuring cylinders, Gloves and masks, Safety equipment.

	approaches using IPM principles.	IPM strategies in forestry. Evaluate sustainable forest protection approaches using IPM principles.	presentations, Environmental reports, etc.	forest stands. - Demonstrate mechanical pest control methods used in forestry operations. - Apply safe chemical pest control practices in forest pest management. - Practice environmentally friendly approaches for sustainable forest pest management. - Compare advantages and limitations of different IPM strategies. - Assess effectiveness of IPM strategies in sustainable forest protection programmes	forest stands. - Demonstrate mechanical pest control methods used in forestry operations. - Apply safe chemical pest control practices in forest pest management. - Practice environmentally friendly approaches for sustainable forest pest management. - Compare advantages and limitations of different IPM strategies using practical case studies. - Assess effectiveness of IPM strategies in sustainable forest protection programmes	
General Objective 6.0: Understand the environmental and economic impacts of forest pests and diseases on forest productivity						

14-15	6.1 Explain the environmental impacts of forest pest and disease outbreaks. 6.2 Describe economic losses associated with pest infestations and forest diseases. 6.3 Explain the relationship between forest health and productivity. 6.4 Analyse the effects of pest outbreaks on biodiversity and ecosystem stability. 6.5 Explain forest protection strategies for minimizing economic and environmental losses.	• Discuss environmental impacts of forest pest and disease outbreaks. • Explain economic losses associated with pest infestations and forest diseases. • Explain relationship between forest health and productivity. • Assess effects of pest outbreaks on biodiversity and ecosystem stability. • Evaluate forest protection strategies for minimizing economic and environmental losses.	Forest pathology textbooks, Forest entomology manuals, Whiteboard and markers, Charts and diagrams, Projector and slides, Forestry journals, Multimedia presentations, Environmental reports, etc.	• Assess forest productivity losses caused by pests and diseases. • Evaluate environmental impacts of pest infestations in field sites. • Collect and analyse field data related to pest damage. • Prepare reports on economic and ecological impacts of forest health problems. • Recommend practical forest protection measures based on assessment results.	Guide students to: • Assess forest productivity losses caused by pests and diseases. • Evaluate environmental impacts of pest infestations in field sites. • Collect and analyse field data related to pest damage. • Prepare reports on economic and ecological impacts of forest health problems. • Recommend practical forest protection measures based on assessment results.	Damage assessment sheets, GPS devices, Cameras, Measuring tapes, Data analysis software, Safety gear.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

COMMUNITY FORESTRY AND EXTENSIONS

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: COMMUNITY FORESTRY AND EXTENSIONS	COURSE CODE: FET 324	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 the knowledge and skills in community forestry, participatory forest management, and forestry extension services for sustainable rural development and environmental conservation.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the concept of community forestry and extension services in sustainable forest management. 2.0 Know the roles of local communities, stakeholders, and extension agents in forestry development. 3.0 Apply participatory approaches and extension methods in community forestry programmes 4.0 Know how to perform community needs assessment, awareness campaigns, and forestry extension activities. 5.0 Understand communication, leadership, and conflict resolution skills in forestry extension practice. 6.0 Apply sustainable livelihood and community-based forest management strategies in rural development.		

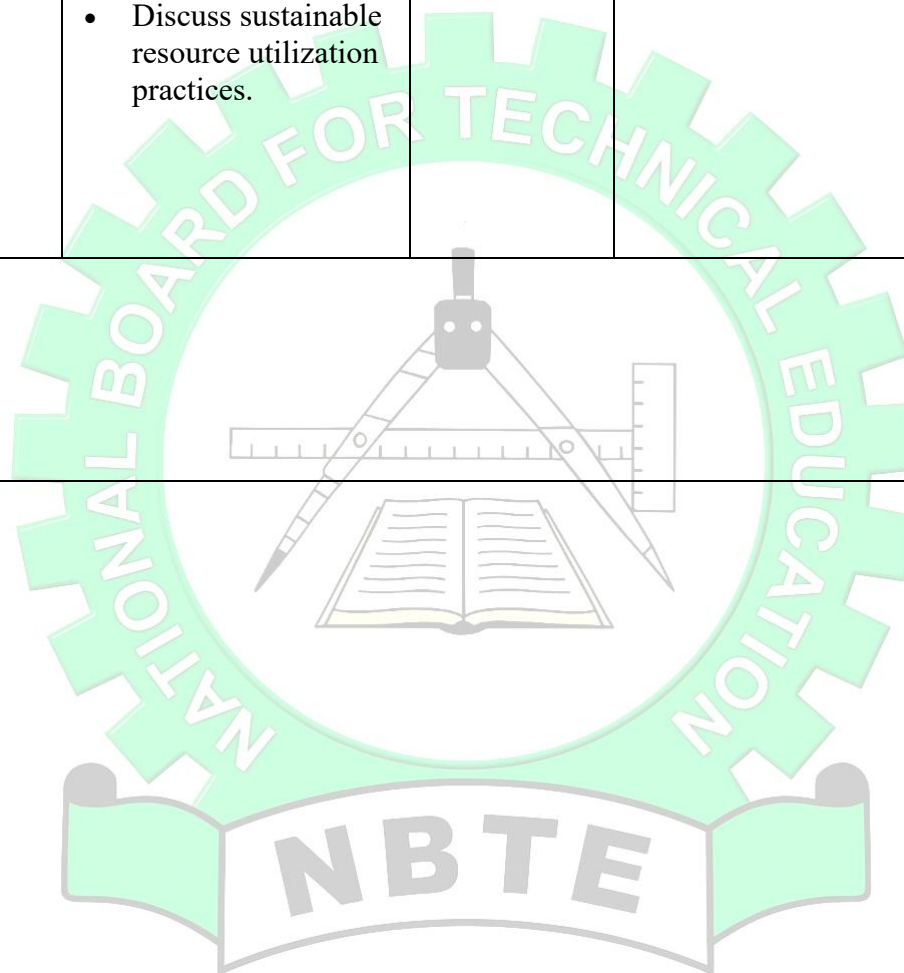
PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: COMMUNITY FORESTRY AND EXTENSION			COURSE CODE: FET 324		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE: NIL		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip student with the knowledge and skills in community forestry, participatory forest management, and forestry extension services for sustainable rural development and environmental conservation.						
GENERAL OBJECTIVE 1. 0: Understand the concept of community forestry and extension services in sustainable forest management.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the concepts of community forestry and forestry extension. 1.2 Describe objectives of community participation. 1.3 Explain functions of forestry extension services. 1.4 Differentiate community forestry from conventional forest management. 1.5 Explain the role of community forestry in environmental management.	• Discuss concepts of community forestry and forestry extension. • Outline objectives of community participation. • Discuss functions of forestry extension services. • Distinguish community forestry from conventional forest management. • Discuss role of community forestry in environmental	Textbooks, Manuals, Charts, Multimedia projector, Journals, Policy documents, etc.	• Identify community forestry practices. • Identify stakeholders in extension programmes. • Participate in field visits. • Observe forestry extension activities. • Record field observations accurately.	Guide students to: • Identify community forestry practices. • Identify stakeholders in extension programmes. • Participate in field visits. • Observe forestry extension activities. • Record field	GPS cameras, Stakeholder maps, Audio recorders, Safety gear.

		management.			observations accurately.	
General Objective 2. 0: Know the roles of local communities, stakeholders, and extension agents in forestry development.						
4-6	2.1 Explain roles of local communities in forest conservation. 2.2 Describe stakeholder functions in forestry programmes 2.3 Explain responsibilities of forestry extension agents. 2.4 Analyse community participation in decision-making. 2.5 Explain importance of stakeholder collaboration.	• Discuss roles of local communities in forest conservation. • Outline stakeholder functions in forestry programmes. • Explain responsibilities of forestry extension agents. • Explain community participation in decision-making. • Discuss importance of stakeholder collaboration.	Textbooks, Manuals, Charts, Multimedia projector, Journals, Policy documents, etc.	• Identify forestry stakeholders. • Conduct stakeholder mapping exercises. • Participate in community meetings. • Assess stakeholder contributions. • Prepare stakeholder analysis reports.	Guide students to: • Identify forestry stakeholders. • Conduct stakeholder mapping exercises. • Participate in community meetings. • Assess stakeholder contributions. • Prepare stakeholder analysis reports.	Community maps, Stakeholder directories, GPS cameras, Audio recorders, Survey forms, Safety equipment.
General Objective 3. 0: Apply participatory approaches and extension methods in community forestry programmes.						
7-9	3.1 Explain participatory approaches in forestry programmes. 3.2 Describe extension methods in forestry education. 3.3 Explain principles of	• Discuss participatory approaches in forestry programmes. • Discuss extension methods in forestry education.	Textbooks, Manuals, Charts, Multimedia projector, Journals, Policy	• Apply PRA techniques. • Conduct extension demonstrations. • Organize awareness campaigns. • Use communication	Guide students to: • Apply PRA techniques. • Conduct extension demonstrations	Flip charts, Public address systems, PRA materials, Cameras,

	PRA. 3.4 Analyse communication strategies in extension services. 3.5 Explain the importance of participatory decision-making	• Outline principles of PRA. • Facilitate discussion on communication strategies in extension services. • Outline importance of participatory decision-making.	documents, etc.	tools effectively. • Prepare extension reports and presentations.	• Organize awareness campaigns. • Use communication tools effectively. • Prepare extension reports and presentations.	Posters, Safety gear.
General Objective 4. 0: Know how to perform community needs assessment, awareness campaigns, and forestry extension activities.						
10-11	4.1 Explain methods of community needs assessment. 4.2 Describe procedures for awareness campaigns. 4.3 Explain techniques for forestry data collection. 4.4 Analyse the importance of environmental awareness. 4.5 Explain monitoring and evaluation procedures.	• Discuss methods of community needs assessment. • Outline procedures for awareness campaigns. • Discuss techniques for forestry data collection. • Discuss importance of environmental awareness. • Describe monitoring and evaluation procedures.	Textbooks, Manuals, Charts, Multimedia projector, Journals, Policy documents, etc.	• Conduct needs assessment surveys. • Organize awareness campaigns. • Collect and analyse forestry data. • Prepare extension activity reports. • Evaluate extension programme effectiveness.	Guide students to: • Conduct needs assessment surveys. • Organize awareness campaigns. • Collect and analyse forestry data. • Prepare extension activity reports. • Evaluate extension programme	Questionnaires, Audio recorders, Public address systems, Cameras, Data sheets, Computers.

					effectiveness	
General Objective 5. 0: Understand communication, leadership, and conflict resolution skills in forestry extension practice.						
12-13	5.1 Explain communication principles in extension services. 5.2 Describe leadership styles in extension services. 5.3 Explain causes of conflicts in forest management. 5.4 Analyse conflict resolution techniques. 5.5 Explain importance of teamwork and leadership.	• Discuss communication principles in extension services. • Discuss leadership styles in extension services. • Outline causes of conflicts in forest management. • Facilitate discussion on conflict resolution techniques. • Discuss importance of teamwork and leadership.	Textbooks, Manuals, Charts, Multimedia projector, Journals, Policy documents, etc.	• Demonstrate communication skills. • Apply leadership skills. • Resolve simple conflicts. • Conduct meetings effectively. • Prepare reports on leadership experiences.	Guide students to: • Demonstrate communication skills. • Apply leadership skills. • Resolve simple conflicts. • Conduct meetings effectively. • Prepare reports on leadership experiences.	Role-play materials, Audio recorders, Meeting venues, Cameras, Public address systems, Flip charts, Safety equipment.
General Objective 6. 0: Apply sustainable livelihood and community-based forest management strategies in rural development.						
14-15	6.1 Explain sustainable livelihood concepts. 6.2 Describe community-based forest management strategies. 6.3 Explain income-generating forestry activities. 6.4 Analyse forestry and	• Discuss sustainable livelihood concepts. • Discuss community-based forest management strategies. • Outline income-generating forestry activities.	Textbooks, Manuals, Charts, Multimedia projector, Journals, Policy documents, etc.	• Identify livelihood opportunities. • Participate in forestry development projects. • Assess sustainability of enterprises. • Prepare development plans. • Evaluate community-	Guide students to: • Identify livelihood opportunities. • Participate in forestry development projects.	Community sites survey instruments, GPS cameras, Community maps, Computers Safety gear.

	poverty reduction relationships. 6.5 Explain sustainable resource utilization practices.	• Explain relationship between forestry and poverty reduction. • Discuss sustainable resource utilization practices.		based forestry strategies.	• Assess sustainability of enterprises. • Prepare development plans. • Evaluate community-based forestry strategies.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						



CARBON AND CLIMATE CHANGE

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: CARBON AND CLIMATE CHANGE	COURSE CODE: FET 325	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 the knowledge and skills in carbon management, climate change mitigation and adaptation, and sustainable forest and environmental management		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the concepts of climate change, carbon cycles, and greenhouse gas emissions; 2.0 Know the causes, impacts, and mitigation strategies related to climate change in forestry and environmental systems; 3.0 Apply carbon measurement, monitoring, and accounting techniques in forestry and land-use systems; 4.0 Know how to perform field assessment of forest carbon stocks and greenhouse gas emissions using standard procedures; 5.0 Understand the use of climate data, carbon inventory tools, and environmental monitoring techniques in sustainable forest management; 6.0 Know the environmental and socio-economic impacts of climate change on forest resources and livelihoods; 7.0 Apply international climate frameworks, carbon financing mechanisms, and IPCC guidelines in forest carbon management and reporting.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: CARBON AND CLIMATE CHANGE			COURSE CODE: FET 325		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 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 the knowledge and skills in carbon management, climate change mitigation and adaptation, and sustainable forest and environmental management						
GENERAL OBJECTIVE 1.0: Understand the concepts of climate change, carbon cycles, and greenhouse gas emissions.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Explain climate change and global warming. 1.2 Describe the carbon cycle and its components. 1.3 Identify greenhouse gases and its sources. 1.4 Explain forestry activities and emissions relationships. 1.5 Explain the role of forests in carbon sequestration and climate regulation.	• Discuss climate change and global warming. • Describe the carbon cycle and its components. • Discuss greenhouse gases and their sources. • Describe relationships between forestry activities and emissions. • Discuss the role of forests in carbon sequestration and climate regulation.	Climate change textbooks, Carbon cycle diagrams, IPCC reports, Whiteboard, Charts, Projector, Climate data reports, Multimedia presentations, etc.	• Identify greenhouse gas emission sources. • Demonstrate carbon cycle processes. • Classify forest carbon pools. • Record climate observations accurately. • Assess vegetation roles in carbon sequestration.	Guide students to: • Identify greenhouse gas emission sources. • Demonstrate carbon cycle processes. • Classify forest carbon pools. • Record climate observations accurately. • Assess vegetation roles in carbon sequestration.	GPS devices, Soil sampling tools, Measuring tapes, Cameras, Plant identification guides, Safety boots and gloves.
General Objective 2.0: Know the causes, impacts, and mitigation strategies related to climate change in forestry and environmental systems.						

3-4	2.1 Explain natural and anthropogenic causes of climate change. 2.2 Describe climate change impacts on forests. 2.3 Discuss adaptation and mitigation strategies. 2.4 Explain afforestation and reforestation roles. 2.5 Analyse climate-resilient forest management practices.	- Discuss natural and anthropogenic causes of climate change. - Explain climate change impacts on forests. - Outline adaptation and mitigation strategies. - Discuss the roles of afforestation and reforestation. - Describe climate-resilient forest management practices.	Climate change textbooks, Carbon cycle diagrams, IPCC reports, Whiteboard, Charts, Projector, Climate data reports, Multimedia presentations, etc.	- Identify evidence of climate impacts in forests. - Assess climate-related disturbances. - Demonstrate climate adaptation practices. - Apply mitigation measures such as tree planting. - Record environmental observations related to climate impacts.	Guide students to: - Identify evidence of climate impacts in forests. - Assess climate-related disturbances. - Demonstrate climate adaptation practices. - Apply mitigation measures such as tree planting. - Record environmental observations related to climate impacts.	Tree seedlings, Soil sampling tools, GPS devices, Measuring tapes, Cameras, Safety gear.
General Objective 3.0: Apply carbon measurement, monitoring, and accounting techniques in forestry and land-use systems.						
5-7	3.1 Explain forest carbon measurement principles. 3.2 Explain carbon pools. 3.3 Explain greenhouse gas inventory methodologies. 3.4 Explain carbon accounting standards. 3.5 Analyse MRV procedures.	- Discuss forest carbon measurement principles. - Describe carbon pools. - Outline greenhouse gas inventory methodologies. - Describe carbon accounting standards. - Describe MRV	Climate change textbooks, Carbon cycle diagrams, IPCC reports, Whiteboard, Charts, Projector, Climate data reports, Multimedia	- Measure forest biomass using field procedures - Estimate carbon stocks. - Apply IPCC inventory methodologies. - Use carbon inventory tools and datasheets. - Record and	Guide students to: - Measure forest biomass using field procedures - Estimate carbon stocks. - Apply IPCC inventory methodologies. - Use carbon inventory tools and	Diameter tapes, Clinometers, Soil sampling tools, Biomass sampling equipment, GPS devices, Carbon inventory datasheets,

		(Measurement, Reporting, and Verification) procedures.	presentations, etc.	organize carbon assessment data.	• datasheets. • Record and organize carbon assessment data.	Calculators, Safety gear.
General Objective 4.0: Know how to perform field assessment of forest carbon stocks and greenhouse gas emissions using standard procedures.						
8-10	4.1 Explain procedures for carbon stock assessment. 4.2 Describe greenhouse gas measurement methods. 4.3 Explain carbon sampling techniques. 4.4 Discuss data collection and quality assurance. 4.5 Analyse factors affecting carbon stock variability.	• Discuss procedures for carbon stock assessment. • Explain greenhouse gas measurement methods. • Describe carbon sampling techniques. • Outline data collection and quality assurance procedures. • Discuss factors affecting carbon stock variability.	Climate change textbooks, Carbon cycle diagrams, IPCC reports, Whiteboard, Charts, Projector, Climate data reports, Multimedia presentations, etc.	• Conduct field sampling for carbon assessment. • Measure tree parameters for biomass estimation. • Assess greenhouse gas emission sources. • Analyse carbon inventory data. • Prepare carbon assessment reports.	Guide students to: • Conduct field sampling for carbon assessment. • Measure tree parameters for biomass estimation. • Assess greenhouse gas emission sources. • Organize and analyse carbon inventory data. • Prepare carbon assessment reports.	Diameter tapes, Clinometers, GPS devices, Soil sampling tools, Measuring tapes, Calculators, Safety boots and gloves.
General Objective 5.0: Understand the use of climate data, carbon inventory tools, and environmental monitoring techniques in sustainable forest management.						
11-12	5.1 Explain importance of climate data. 5.2 Describe climate monitoring instruments. 5.3 Explain digital tools in	• Discuss the importance of climate data. • Describe climate monitoring instruments.	Climate change textbooks, Carbon cycle diagrams, IPCC reports,	• Operate climate monitoring instruments. • Collect monitoring data. • Interpret monitoring	Guide students to: • Operate climate monitoring instruments. • Collect monitoring	Weather instruments, GPS devices, Computers/laptops, GIS software,

	carbon inventory. 5.4 Describe climate modelling and RCP scenarios. 5.5 Analyse monitoring technologies in forest management.	- Describe digital tools in carbon inventory. - Outline climate modelling and RCP scenarios. - Discuss monitoring technologies in forest management.	Whiteboard, Charts, Projector, Climate data reports, Multimedia presentations, etc.	data - Use digital tools for carbon inventory. - Apply GIS and climate datasets for sustainable environmental management. - Prepare environmental monitoring reports.	data. - Interpret monitoring data - Use digital tools for carbon inventory. - Apply GIS and climate datasets for sustainable environmental management. - Prepare environmental monitoring reports.	Environmental sensors, Cameras, Safety gear.
General Objective 6.0: Understand the environmental and socio-economic impacts of climate change on forest resources and livelihoods.						
13-14	6.1 Explain environmental impacts of climate change. 6.2 Describe socio-economic effects on communities. 6.3 Explain climate-related risks to biodiversity. 6.4 Analyse adaptation strategies for vulnerable communities. 6.5 Explain sustainable development approaches for resilience.	- Discuss environmental impacts of climate change. - Explain socio-economic effects on communities. - Outline climate-related risks to biodiversity. - Discuss adaptation strategies for vulnerable communities. - Discuss sustainable development approaches for	Climate change textbooks, Carbon cycle diagrams, IPCC reports, Whiteboard, Charts, Projector, Climate data reports, Multimedia presentations, etc.	- Assess climate change impacts on communities. - Conduct socio-economic vulnerability surveys. - Evaluate adaptation measures in communities. - Record socio-economic observations accurately. - Prepare field reports on resilience strategies.	Guide students to: - Assess climate change impacts on communities. - Conduct socio-economic vulnerability surveys. - Evaluate adaptation measures in communities. - Record socio-economic observations accurately.	Survey questionnaires, GPS devices, Cameras, Audio recorders, Measuring tools, Safety gear.

		resilience.			• Prepare field reports on resilience strategies.	
General Objective 7.0: Apply international climate frameworks, carbon financing mechanisms, and IPCC guidelines in forest carbon management and reporting.						
15	7.1 Explain international climate agreements. 7.2 Describe carbon financing mechanisms. 7.3 Explain concepts of additionality, leakage, and permanence. 7.4 Discuss carbon project development procedures. 7.5 Analyse IPCC reporting requirements and standards.	• Discuss international climate agreements. • Discuss carbon financing mechanisms. • Outline concepts of additionality, leakage, and permanence. • Describe carbon project development procedures. • Explain IPCC reporting requirements and standards.	Climate change textbooks, Carbon cycle diagrams, IPCC reports, Whiteboard, Charts, Projector, Climate data reports, Multimedia presentations, etc.	• Prepare simple carbon project proposals. • Apply project assessment procedures. • Conduct carbon market analysis exercises. • Prepare greenhouse gas reporting documents. • Present carbon project and compliance reports.	Guide students to: • Prepare simple carbon project proposals. • Apply project assessment procedures. • Conduct carbon market analysis exercises. • Prepare greenhouse gas reporting documents. • Present carbon project and compliance reports.	Computers/laptops, Spreadsheet software, Carbon project templates, Carbon market databases, Calculators, Internet-enabled devices, Safety gear.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

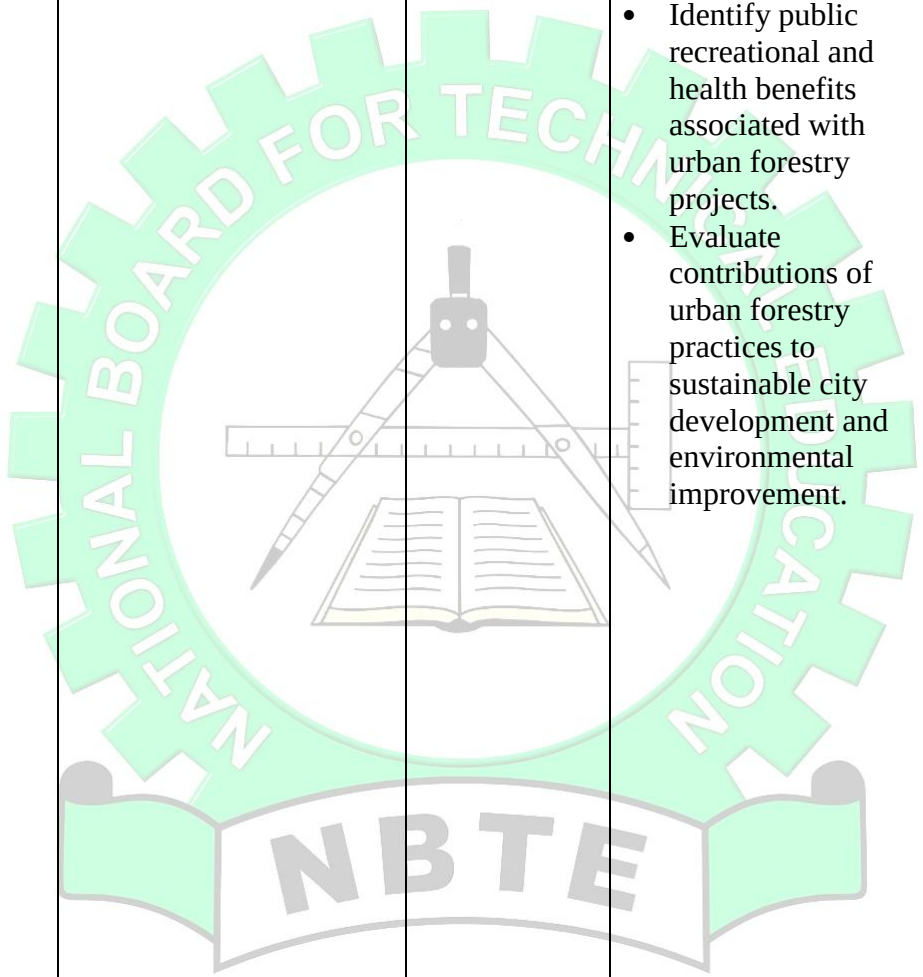
URBAN FORESTRY AND RECREATION

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: URBAN FORESTRY AND RECREATION	COURSE CODE: FET 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 the knowledge and practical skills required for planning, establishment, management, and monitoring of urban forests and recreational landscapes for environmental sustainability, climate resilience, and improved urban living conditions.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles of urban forestry and recreational landscape management; 2.0 Know the roles of urban forests in environmental protection, climate regulation, and urban sustainability; 3.0 Apply urban tree establishment, maintenance, and management techniques in recreational and urban environments; 4.0 Know how to perform field assessment and monitoring of urban green spaces, parks, and recreational landscapes; 5.0 Understand the use of urban forestry practices; 6.0 Understand the environmental, social, and economic benefits of urban forestry and recreation projects; 7.0 Apply smart urban forestry and green infrastructure strategies for climate resilience and sustainable city development.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: URBAN FORESTRY AND RECREATION		COURSE CODE: FET 326			CONTACT HOURS: 3 HOURS/WEEK	
		CREDIT UNIT: 3			THEORY: 1 HOUR/WEEK	
YEAR: SEMESTER:		PRE-REQUISITE: NIL			PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and practical skills required for planning, establishment, management, and monitoring of urban forests and recreational landscapes for environmental sustainability, climate resilience, and improved urban living conditions						
GENERAL OBJECTIVE 1. 0: Understand the principles of urban forestry and recreational landscape management.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the concept of urban forestry and recreation. 1.2 Describe the components of urban forest ecosystems. 1.3 Explain the principles of recreational landscape planning and management. 1.4 Explain urban forestry, amenity forestry, and recreational forestry. 1.5 Outline the importance of urban green spaces in sustainable urban development.	- Discuss the concept of urban forestry and recreation using examples from parks, gardens, green belts, and urban landscapes. - Explain the components of urban forest ecosystems with the aid of diagrams, pictures, and city landscape examples. - Outline the principles of recreational landscape planning and management. - Differentiate urban	Urban forestry textbooks, Recreational manuals, Whiteboard, Charts, Projector, Urban planning maps, Journals, etc.	- Identify urban forestry features and recreational spaces during field visits or observation exercises. - Classify components of urban forest ecosystems through field observation and environmental surveys. - Sketch a simple recreational landscape plan showing trees, walkways, lawns, and recreational	Guide students to: - Identify urban forestry features and recreational spaces during field visits or observation exercises. - Classify components of urban forest ecosystems through field observation and environmental surveys. - Sketch a simple recreational	Measuring tapes, GPS devices, Cameras, Plant guides, Landscape maps, Safety gear.

		forestry, amenity forestry, and recreational forestry using relevant examples. Discuss the importance of urban green spaces in sustainable urban development.		facilities and label them - Prepare presentation slides comparing urban forestry, amenity forestry, and recreational forestry using real-life examples from the community or school environment. - Assess the condition and benefits of urban green spaces through field-based environmental evaluation. - Prepare field reports on urban forestry systems, recreational landscapes, and green space management.	landscape plan showing trees, walkways, lawns, and recreational facilities and label them - Compare urban forestry, amenity forestry, and recreational forestry using real-life examples from the community or school environment. - Assess the condition and benefits of urban green spaces through field-based environmental evaluation. - Prepare field reports on urban forestry systems, recreational landscapes, and green space management.	
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General Objective 2. 0: Know the roles of urban forests in environmental protection, climate regulation, and urban sustainability.						
4-5	2.1 Explain environmental functions of urban forests. 2.2 Describe role of trees in climate regulation and pollution control. 2.3 Explain contribution to biodiversity conservation. 2.4 Analyse green infrastructure in sustainable cities. 2.5 Explain the role of urban forestry in public health.	• Discuss the environmental functions of urban forests in relation to shade, air quality, soil protection, water regulation, and habitat provision. • Discuss the role of trees to climate regulation and pollution control using urban environmental examples. • Discuss the contribution of urban forests to biodiversity conservation with examples of birds, insects, plants, and urban wildlife habitats. • Discuss green infrastructure as a component of sustainable city development. • Discuss the role of urban forestry in improving public health, recreation,	Urban forestry textbooks, Recreational manuals, Whiteboard, Charts, Projector, Urban planning maps, Journals, etc.	• Identify environmental functions of urban forests during field assessment activities. • Assess effects of urban trees on temperature regulation and air quality in urban environments. • Identify biodiversity components supported by urban green spaces during field observations. • Evaluate green infrastructure features used in sustainable urban environments. • Record environmental and ecological data from urban forestry sites using standard field procedures. • Assess pollution control functions of urban trees using	Guide students to: • Identify environmental functions of urban forests during field assessment activities. • Assess effects of urban trees on temperature regulation and air quality in urban environments. • Identify biodiversity components supported by urban green spaces during field observations. • Evaluate green infrastructure features used in sustainable urban environments. • Record environmental	GPS devices, Tree identification guides, Air quality monitoring devices, Field notebooks and data sheets, Measuring tapes, Urban green space maps, Digital cameras, Tree seedlings and planting tools, GIS software application, Safety boots and

		mental wellbeing, and environmental comfort.		field observations and environmental indicators. • Identify public recreational and health benefits associated with urban forestry projects. • Evaluate contributions of urban forestry practices to sustainable city development and environmental improvement.	and ecological data from urban forestry sites using standard field procedures. • Assess pollution control functions of urban trees using field observations and environmental indicators. • Identify public recreational and health benefits associated with urban forestry projects. • Evaluate contributions of urban forestry practices to sustainable city development and environmental improvement.	gloves.
General Objective 3. 0: Apply urban tree establishment, maintenance, and management techniques in recreational and urban environments.						

6-7	3.1 Explain urban tree establishment procedures. 3.2 Describe maintenance practices. 3.3 Explain pruning, watering, mulching, fertilization. 3.4 Analyse urban tree management challenges. 3.5 Explain safety procedures.	• Describe urban tree establishment procedures. • Describe maintenance practices. • Describe pruning, watering, mulching, fertilization. • Explain urban tree management challenges. • Explain safety procedures.	Urban forestry textbooks, Recreational manuals, Whiteboard, Charts, Projector, Urban planning maps, Journals, etc.	• Select suitable sites for urban tree establishment using standard field procedures. • Establish urban trees using appropriate planting techniques and spacing methods. • Apply watering and mulching practices during urban tree maintenance activities. • Perform pruning operations using appropriate forestry tools and safety procedures. • Apply fertilization techniques for urban tree growth and maintenance. • Identify challenges affecting urban tree growth and management in field conditions. • Use personal protective equipment during urban forestry operations. • Carryout maintenance	Guide students to: • Select suitable sites for urban tree establishment using standard field procedures. • Establish urban trees using appropriate planting techniques and spacing methods. • Apply watering and mulching practices during urban tree maintenance activities. • Perform pruning operations using appropriate forestry tools and safety procedures. • Apply fertilization techniques for urban tree growth and	Seedlings, Hoes, Cutlasses, Watering cans, Pruning tools, Mulch, Measuring tapes, Safety gloves.
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				practices on in urban and tree reactional	maintenance. - Identify challenges affecting urban tree growth and management in field conditions. - Use personal protective equipment during urban forestry operations. - Evaluate maintenance practices used in urban tree management using field observations and performance indicators.	
General Objective 4. 0: Know how to perform field assessment and monitoring of urban green spaces, parks, and recreational landscapes.						
8-9	4.1 Explain urban green space assessment methods. 4.2 Describe monitoring procedures. 4.3 Explain tree health evaluation techniques. 4.4 Analyse environmental	Describe urban green space assessment methods using maps, checklists, photographs, and sample assessment formats.	Urban forestry textbooks, Recreational manuals, Whiteboard, Charts,	- Identify assessment tools and instruments used in urban green space evaluation activities. - Assess urban green spaces using standard	Guide students to: Identify assessment tools and instruments used in urban green space	Diameter tapes, GPS, Cameras, Datasheets , Measuring

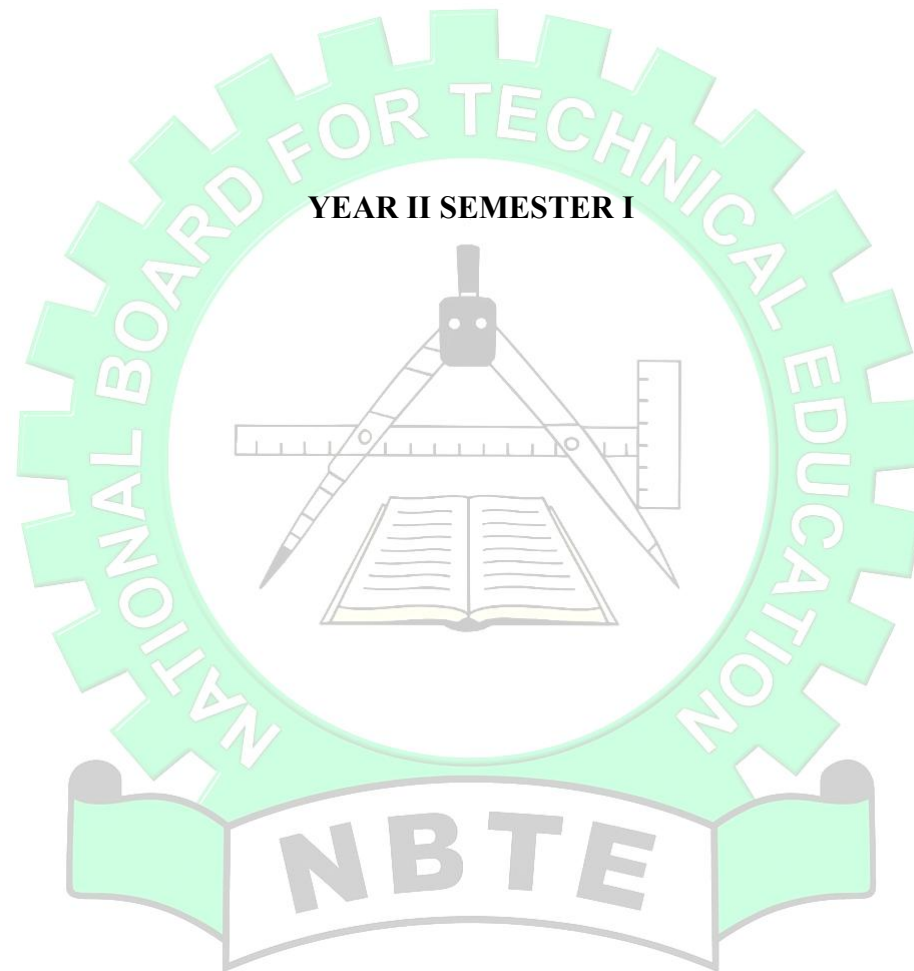
	indicators. 4.5 Outline the importance monitoring in urban green areas	• Outline monitoring procedures for urban green areas, including observation, data recording, inspection, and reporting. • Illustrate tree health evaluation techniques using indicators such as crown condition, leaf colour, stem damage, pest attack, disease symptoms, and root condition. • Discuss environmental indicators such as air quality, shade cover, biodiversity, soil condition, temperature, and recreational use. • Discuss the importance of monitoring in maintaining healthy, safe, and functional urban green areas.	Projector, Urban planning maps, Journals, etc.	environmental monitoring procedures. • Evaluate tree health conditions using visual assessment techniques and field observations. • Record environmental data from urban green areas using standard field formats. • Identify environmental indicators associated	evaluation activities. • Assess urban green spaces using standard environmental monitoring procedures. • Evaluate tree health conditions using visual assessment techniques and field observations. • Record environmental data from urban green areas using standard field formats. • Identify environmental indicators associated	tapes.
General Objective 5. 0: Understand the use of urban forestry practices						
10-11	5.1 Explain urban forestry practices 5.2 Describe the role of shade in thermal comfort	• Describe urban forestry practices using examples from parks, streetscapes, gardens,	Urban forestry textbooks, Recreational	• Identify urban forestry practices used in parks, streets, and recreational	Guide students to: • Identify urban forestry practices used in parks,	Tree seedlings and ornamental

	5.3 Explain landscape improvement techniques. 5.4 Analyse environmental quality contributions. 5.5 Describe aesthetics in urban design.	green belts, and institutional landscapes. • Discuss the role of shade to thermal comfort, heat reduction, and improved outdoor living conditions. • Illustrate landscape improvement techniques using diagrams, photographs, or urban design examples. • Discuss the contributions of urban forestry to environmental quality. • Discuss aesthetics in urban design with reference to tree form, colour, spacing, landscape harmony, and visual appeal.	manuals, Whiteboard, Charts, Projector, Urban planning maps, Journals, etc.	landscapes. • Assess shade effects of urban trees on thermal comfort in field conditions. • Apply landscape improvement techniques during urban forestry field	streets, and recreational landscapes. • Assess shade effects of urban trees on thermal comfort in field conditions. • Apply landscape improvement techniques during urban forestry field •	plants, Pruning tools, Watering cans and hoses, Measuring tapes, Landscape design tools, GPS devices, Field notebooks and data sheets, Digital cameras, Mulching materials, Safety boots and gloves.
General Objective 6. 0: Understand the environmental, social, and economic benefits of urban forestry and recreation projects.						
12-13	6.1 Explain environmental benefits of urban forestry and recreation projects. 6.2 Describe social benefits of urban forestry and	• Discuss the environmental benefits of urban forestry and recreation projects,	Urban forestry textbooks, Recreational manuals,	• Identify environmental benefits associated with urban forestry and recreational green spaces during field	Guide students to: • Identify environmental benefits associated with	Parks; Questionnaires, GPS, Cameras,

	recreation projects. 6.3 Differentiate between environmental and social benefits of urban forestry and recreation projects.	such as improved air quality, temperature regulation, erosion control, biodiversity support, and stormwater management. • Discuss the social benefits of urban forestry and recreation projects, including recreation, public health, social interaction, community wellbeing, and aesthetic value. • Compare environmental and social benefits of urban forestry and recreation projects using relevant urban landscape examples.	Whiteboard, Charts, Projector, Urban planning maps, Journals, etc.	observations. • Assess social benefits provided by urban forestry and recreation project.	urban forestry and recreational green spaces during field observations. • Assess social benefits provided	Data sheets.
General Objective 7.0: Apply smart urban forestry and green infrastructure strategies for climate resilience and sustainable city development						
14-15	7.1 Explain smart urban forestry. 7.2 Describe climate resilience strategies.	• Discuss smart urban forestry. • Describe climate resilience strategies.		• Identify smart technologies used in urban forestry and green infrastructure	Guide students to: • Identify smart technologies used in urban forestry	GPS devices, GIS software

	7.3 Explain GIS and smart tools. 7.4 Analyse green infrastructure. 7.5 Explain climate adaptation role.	• Describe GIS and smart tools. • Explain green infrastructure. Explain climate adaptation role.	management. • Use GIS and digital mapping tools during urban forestry assessment activities. • Assess climate resilience features in urban green spaces using field observations. • Identify green infrastructure components used in sustainable urban environments. • Record spatial and environmental data using digital tools and standard field procedures. • Apply GIS techniques in mapping urban forestry and recreational sites. • Evaluate climate adaptation functions of urban forestry projects. • Use environmental indicators and field data to • Analyse case studies to assess contributions of	and green infrastructure management. • Use GIS and digital mapping tools during urban forestry assessment activities. • Assess climate resilience features in urban green spaces using field observations. • Identify green infrastructure components used in sustainable urban environments. • Record spatial and environmental data using digital tools and standard field procedures. • Apply GIS techniques in mapping urban forestry and recreational sites. • Evaluate climate adaptation	application , Drones and remote sensing tools, Computers and tablets, Digital cameras, Urban green space maps, Field notebooks and data sheets, Environmental monitoring instruments, Measuring tapes, Safety boots and gloves.
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				green infrastructure to sustainable city development and environmental resilience.	functions of urban forestry projects using environmental indicators and field data. ● Assess contributions of green infrastructure to sustainable city development and environmental resilience.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						



FOREST CONSERVATION

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST CONSERVATION	COURSE CODE: FET 411	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 the knowledge and skills in forest conservation, biodiversity protection and develop their ability to apply sustainable conservation practices, ecosystem monitoring, and environmental management strategies in forest ecosystems		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles of forest conservation and biodiversity protection; 2.0 Know conservation techniques used in sustainable forest resources management; 3.0 Know field monitoring of forest biodiversity and ecosystem integrity; 4.0 Apply sustainable forest management practices in conservation area; 5.0 Understand the effectiveness of conservation interventions using field data; 6.0 Apply Integrated Pest Management (IPM) for emerging pest threats driven by climate change; 7.0 Understand invasive species risk assessment using GIS and predictive mapping tools; 8.0 Apply international forest governance frameworks in community-based forest management;		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: FOREST CONSERVATION		COURSE CODE: FET 411			CONTACT HOURS: 3 HOURS/WEEK	
		CREDIT UNIT: 3			THEORY: 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 the knowledge and skills in forest conservation, biodiversity protection and develop their ability to apply sustainable conservation practices, ecosystem monitoring, and environmental management strategies in forest ecosystems.						
GENERAL OBJECTIVE 1.0: Understand the principles of forest conservation and biodiversity protection.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Explain the concepts of forest conservation. 1.2 Describe components of biodiversity in forest ecosystems. 1.3 State the importance of biodiversity protection in sustainable forestry. 1.4 Explain conservation approaches in forest management. 1.5 Explain threats to forest biodiversity and ecosystem stability.	• Discuss the concepts of forest conservation. • Describe components of biodiversity in forest ecosystems. • Discuss the importance of biodiversity protection in sustainable forestry. • Describe conservation approaches in forest management. • Explain threats to forest biodiversity and ecosystem stability.	Forest conservation textbooks, Biodiversity manuals, Charts and diagrams, Whiteboard and markers, Projector and slides, Environmental reports, etc.	• Identify biodiversity components within forest ecosystems. • Classify forest species based on ecological zones. • Assess conservation features in protected areas. • Record biodiversity observations. • Interpret ecological relationships supporting conservation.	Guide students to: • Identify biodiversity components within forest ecosystems. • Classify forest species based on ecological zones. • Assess conservation features in protected areas. • Record biodiversity observations. • Interpret ecological relationships supporting	Plant and animal identification guides, GPS devices, Measuring tapes, Cameras, Sampling equipment, Safety boots and gloves.

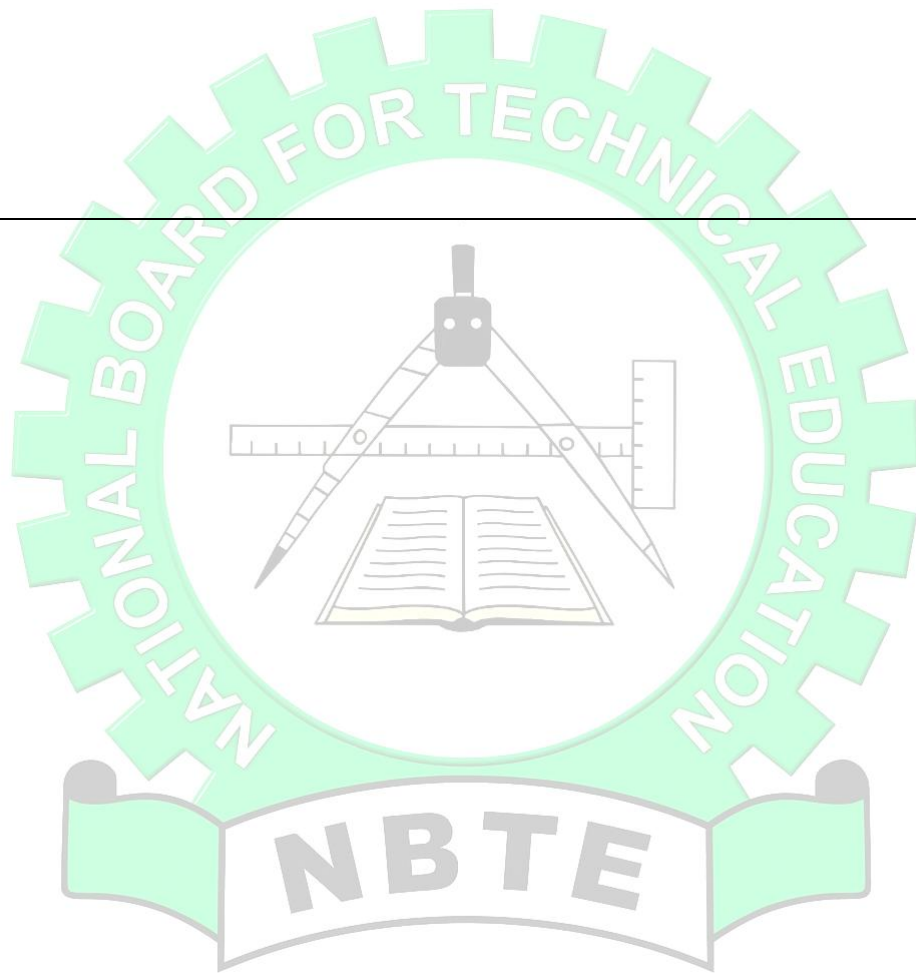
					conservation.	
General Objective 2.0: Know conservation techniques used in sustainable forest resources management						
3-4	2.1 Explain conservation techniques in forest management. 2.2 Describe sustainable forest resource management practices. 2.3 Explain restoration and rehabilitation approaches in forest management practice 2.4 Explain conservation strategies in protected areas.	• Discuss conservation techniques in forest management. • Describe sustainable forest resource management practices. • Discuss restoration and rehabilitation approaches in forest management practice. • Discuss conservation strategies in protected areas.	Sustainable forestry textbooks, Forest management manuals, Charts and diagrams, Whiteboard and markers, Computer, projector and slides, Forestry journals, etc.	• Demonstrate forest conservation techniques in the field. • Apply soil and water conservation practices. • Assess restoration measures in degraded forests. • Record conservation activities. • Evaluate conservation outcomes.	Guide student to: • Demonstrate forest conservation techniques in the field. • Apply soil and water conservation practices. • Assess restoration measures in degraded forests. • Record conservation activities. Evaluate conservation outcomes.	Soil sampling tools, Water conservation equipment, Measuring tapes, GPS devices, Cameras, Safety gear.
General Objective 3.0: Know field monitoring of forest biodiversity and ecosystem integrity						
5-6	3.1 Explain biodiversity monitoring principles. 3.2 Describe ecosystem integrity indicators. 3.3 Explain ecological monitoring procedures. 3.4 Explain ecosystem health assessment methods. 3.5 Explain role of monitoring in	• Discuss biodiversity monitoring principles. • Describe ecosystem integrity indicators. • Discuss ecological monitoring procedures. • Explain ecosystem health assessment	Ecological monitoring manuals, Biodiversity guides, Charts and diagrams, Computer, Projector and slides, Environmental	• Conduct biodiversity monitoring in forest estates • Assess ecosystem integrity using indicators. • Apply ecological sampling techniques.	Guide student to: • Conduct biodiversity monitoring in forest estates • Assess ecosystem integrity using indicators. • Apply ecological sampling	Monitoring plots, Quadrat frames, GPS devices, Measuring tapes, Sampling datasheets, Cameras, safety boots

	conservation planning.	methods. • Explain role of monitoring in conservation planning	reports, Computers, etc.	• Record biodiversity data. • Interpret monitoring results.	techniques. • Record biodiversity data. • Interpret monitoring results.	and gloves.
General Objective 4.0: Apply sustainable forest management practices in conservation areas						
7-8	4.1 Explain principles of sustainable forest management. 4.2 Describe forest management practices in conservation areas. 4.3 Explain community participation in forestry. 4.4 Explain the different roles of protected areas. 4.5 Explain sustainability strategies.	• Discuss principles of sustainable forest management. • Describe forest management practices in conservation areas. • Discuss community participation in forestry. • Discuss the different roles of protected areas. • Discuss sustainability strategies.	Sustainable forest management textbooks, Conservation policy documents, Charts and diagrams, Computers, Projector and slides, Forestry journals, etc.	• Apply sustainable management practices. • Assess forest conditions in protected areas. • Demonstrate participatory conservation methods. • Record field observations. • Evaluate sustainability practices.	Guide students in: • Apply sustainable management practices. • Assess forest conditions in protected areas. • Demonstrate participatory conservation methods. • Record field observations. Evaluate sustainability practices.	GPS devices, measuring tapes, Cameras, Mapping tools, Conservation equipment, safety gear, PPE.
General Objective 5.0: Understand effectiveness of conservation interventions using field data						
9-10	5.1 Explain evaluation methods for conservation interventions. 5.2 Describe field data collection procedures.	• Introduce evaluation methods for conservation interventions. • Illustrate field data collection	Conservation evaluation manuals, Ecological assessment reports,	• Collect field data for conservation evaluation. • Analyse conservation outcomes using	• Collect field data for conservation evaluation. • Analyse conservation outcomes using	Field datasheets, laptops, GPS devices, Measuring tapes,

	5.3 Explain conservation indicators. 5.4 Explain ecosystem response relationships. 5.5 Explain conservation outcomes.	procedures. • Present conservation indicators. • Explain ecosystem response relationships. • Highlight conservation outcomes.	Charts and diagrams, Computers and projector, Spreadsheets, forestry journals, etc.	indicators. • Organize field datasets. • Prepare conservation reports. • Present evaluation findings.	indicators. • Organize field datasets. • Prepare conservation reports. • Present evaluation findings.	Cameras, Statistical software, Safety gear, PPE.
General Objective 6.0: Apply Integrated Pest Management for emerging pest threats						
11-12	6.1 Explain principles of IPM in forestry. 6.2 Describe climate-driven pest threats. 6.3 Explain biological, cultural, chemical and mechanical control methods. 6.4 Explain pest impacts on ecosystems. 6.5 Explain IPM strategies.	• Introduce principles of IPM in forestry. • Illustrate climate-driven pest threats. • Present biological, cultural, chemical and mechanical control methods. • Explain pest impacts on ecosystems. • Highlight IPM strategies.	Forest entomology textbooks, IPM manuals, Charts and diagrams, Climate change reports, Projector and slides, Forestry journals, etc.	• Identify pest infestations in forests. • Apply IPM techniques in field. • Assess pest control effectiveness. • Record pest observations. • Evaluate pest management outcomes.	Guide students to: • Identify pest infestations in forest stands. • Supervise students in applying IPM techniques in the field. • Assist students in assessing pest control effectiveness. • Instruct students on recording pest observations accurately. • Guide students in evaluating pest management	Insect traps, Sweep nets, Pest guides, GPS devices, Sampling tools, Protective clothing, Gloves.

					outcomes.	
General Objective 7.0: Understand invasive species risk assessment using GIS tools						
13-14	7.1 Explain invasive species concepts. 7.2 Describe ecological impacts of invasive. 7.3 Explain GIS applications in assessment. 7.4 Explain predictive mapping methods. 7.5 Explain management strategies.	• Introduce invasive species concepts. • Illustrate ecological impacts of invasive species. • Present GIS applications in assessment. • Explain predictive mapping methods. • Highlight management strategies.	GIS manuals, invasive species guides, Charts and diagrams, Computers and projector, Multimedia presentations, Forestry journals ,etc.	• Identify invasive species in forests. • Apply GIS mapping techniques. • Assess ecological risks. • Record spatial data. Evaluate control measures using GIS outputs.	Guide students to: • Identify invasive species in forests. • Apply GIS mapping techniques. • Assess ecological risks. • Record spatial data. Evaluate control measures using GIS outputs.	GIS software, Laptops, GPS devices, Mapping datasets, Cameras, Sampling tools, Safety gear.
General Objective 8.0: Apply international forest governance frameworks in community-based forest management						
15	8.1 Explain international forest governance frameworks. 8.2 Describe community-based forest management principles. 8.3 Explain stakeholder roles in forestry governance. 8.4 Explain forestry policies and laws. 8.5 Explain community participation approaches.	• Discuss international forest governance frameworks. • Describe community-based forest management principles. • Discuss stakeholder roles in forestry governance. • Discuss forestry policies and laws. • Discuss community	Forest governance policy documents, community forestry manuals, Charts and diagrams, Multimedia presentations, Computers, Projector and slides,	• Assess community participation in forest management. • Apply participatory conservation approaches. • Interpret governance policies. • Record stakeholder practices. • Evaluate community-based management systems.	Guide students to: • Assess community participation in forest management. • Apply participatory conservation approaches. • Interpret governance policies. • Record stakeholder practices. • Evaluate community-based	GPS devices, Cameras, Policy documents, interview guides, mapping tools, Safety boots and gloves.

		participation approaches.	Forestry journals, etc.		management systems.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						



AGROFORESTRY

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: AGRO FORESTRY	COURSE CODE: FET 412	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 the knowledge and practical skills required for the establishment, management, monitoring, and evaluation of integrated agroforestry systems for sustainable agricultural and environmental productivity.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles and benefits of agroforestry systems; 2.0 Know how to establish tree-crop-livestock systems in integrated agroforestry plots; 3.0 Know how to perform soil, crop, and tree assessments for productivity optimization; 4.0 Apply sustainable agroforestry management techniques in field practice; 5.0 Know how to monitor growth, soil, and ecosystem interactions in agroforestry systems; 6.0 Understand system dynamics in agroforestry; 7.0 Apply economic models in agroforestry enterprises.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: AGROFORESTRY		COURSE CODE: FET 412		CONTACT HOURS: 3 HOURS/WEEK		
		CREDIT UNIT: 3		THEORY: 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 the knowledge and practical skills required for the establishment, management, monitoring, and evaluation of integrated agroforestry systems for sustainable agricultural and environmental productivity.						
GENERAL OBJECTIVE 1.0: Understand the principles and benefits of agroforestry system						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain agroforestry concepts 1.2 Describe components of agroforestry systems 1.3 Discuss agroforestry systems 1.4 Explain ecological, economic, and social benefits of agroforestry	• Discuss agroforestry concepts. • Explain components of agroforestry systems. • Describe agroforestry systems. • Discuss ecological, economic, and social benefits of agroforestry.	Agroforestry textbooks, Sustainable land management manuals, Soil conservation guides, Climate-smart agriculture reports, Tree-crop interaction charts, Environmental management	• Identify agroforestry systems. • Prepare presentation slides on agroforestry practices. • Assess site suitability. • Record observations • Demonstrate field identification techniques.	Guide students to: • Identify agroforestry systems • Classify agroforestry practices • Assess site suitability • Record observations • Demonstrate field identification techniques	Tree seedlings, Crop seeds and planting materials, Soil sampling tools, Measuring tapes, GPS devices, Pruning tools, Field notebooks and data

			case studies, Projector and multimedia slides, GIS maps and land use maps, Whiteboard and markers, Forestry and agroforestry journals, etc.			sheets, Watering cans and hoses, Safety boots and gloves.
General Objective 2.0: Know how to establish tree–crop–livestock systems						
4-5	2.1 Explain establishment procedures 2.2 Describe site selection criteria 2.3 Explain spacing and integration techniques 2.4 Analyse tree–crop–livestock interactions 2.5 Explain management practices 2.6 Explain species selection effects	• Describe establishment procedures. • Describe site selection criteria. • Discuss spacing and integration techniques. • Explain tree–crop–livestock interactions. • Explain management practices. • Highlight species selection effects.	Agroforestry textbooks, Sustainable land management manuals, Soil conservation guides, Climate-smart agriculture reports, Tree-crop interaction charts, Environmental management case studies,	• Select suitable sites • Establish integrated systems • Apply spacing techniques • Maintain agroforestry plots • Assess field performance	Guide students to: • Select suitable sites • Establish integrated systems • Apply spacing techniques • Maintain agroforestry plots • Assess field performance	Tree seedlings, Crop seeds and planting materials, Soil sampling tools, Measuring tapes, GPS devices, Pruning tools, Field notebooks and data sheets,

			Projector and multimedia slides, GIS maps and land use maps, Whiteboard and markers, Forestry and agroforestry journals, etc.			Watering cans and hoses, Safety boots and gloves.
General Objective 3.0: Know how to perform soil, crop, and tree assessments						
6-7	3.1 Describe soil assessment methods 3.2 Explain crop/tree growth assessment 3.3 Analyse nutrient cycling 3.4 Explain productivity improvement methods 3.5 Describe environmental effects	• Explain soil assessment methods. • Discuss crop and tree growth assessment methods. • Explain nutrient cycling processes. • Describe productivity improvement methods. • Explain environmental effects.	Agroforestry textbooks, Sustainable land management manuals, Soil conservation guides, Climate-smart agriculture reports, Tree-crop interaction charts, Environmental management case studies, Projector and	• Collect soil samples • Measure growth parameters • Assess soil fertility • Record data • Interpret results	Guide students to: • Collect soil samples • Measure growth parameters • Assess soil fertility • Record data • Interpret results	Tree seedlings, Crop seeds and planting materials, Soil sampling tools, Measuring tapes, GPS devices, Pruning tools, Field notebooks and data sheets, Watering

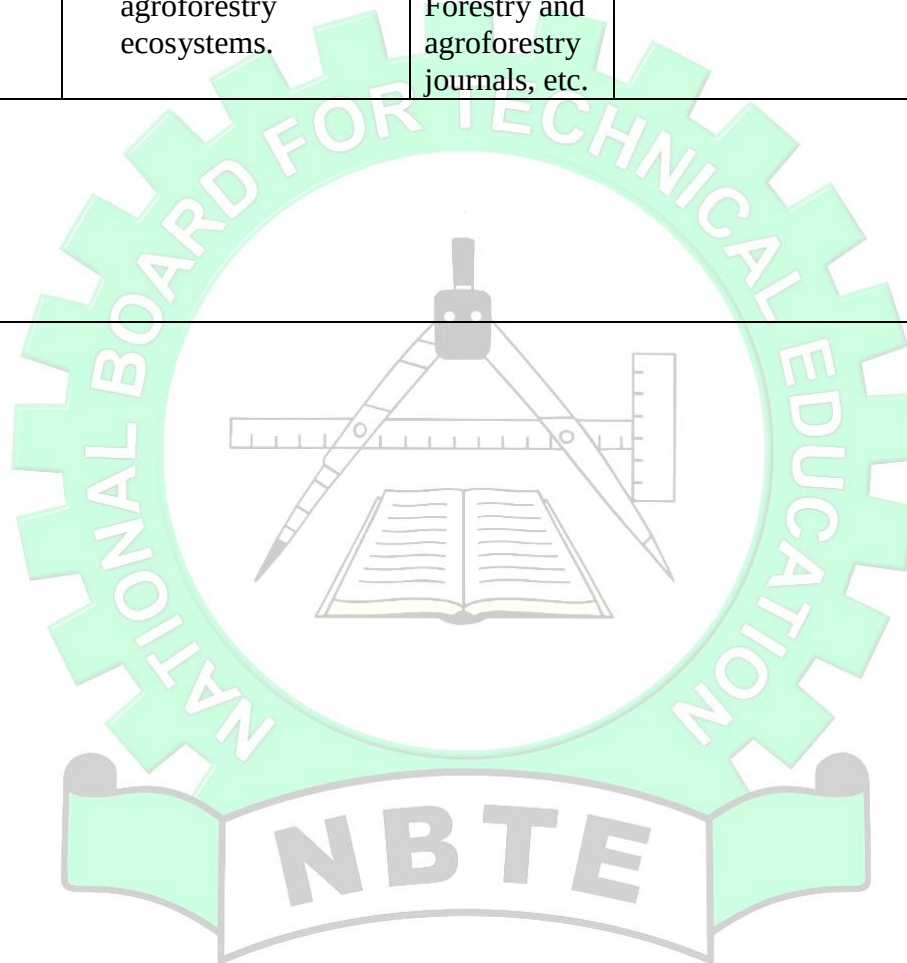
			multimedia slides, GIS maps and land use maps, Whiteboard and markers, Forestry and agroforestry journals, etc.			cans and hoses, Safety boots and gloves.
General Objective 4.0: Apply sustainable agroforestry management techniques						
8-9	4.1 Explain the principles of sustainability in agroforestry management 4.2 Describe conservation practices 4.3 Explain erosion control methods 4.4 Analyse climate mitigation role 4.5 Explain pest and diseases management	• Discuss principles of sustainability in agroforestry management. • Illustrate conservation practices. • Demonstrate erosion control methods. • Explain climate mitigation role of agroforestry. • Present pest and disease management practices.	Agroforestry textbooks, Sustainable land management manuals, Soil conservation guides, Climate-smart agriculture reports, Tree-crop interaction charts, Environmental management case studies, Projector and multimedia	• Apply conservation practices • Demonstrate erosion control • Apply pest management • Maintain agroforestry plots	Guide students to: • Apply conservation practices • Demonstrate erosion control • Apply pest management • Maintain agroforestry plots	Tree seedlings, Crop seeds and planting materials, Soil sampling tools, Measuring tapes, GPS devices, Pruning tools, Field notebooks and data sheets, Watering cans and

			slides, GIS maps and land use maps, Whiteboard and markers, Forestry and agroforestry journals, etc.			hoses, Safety boots and gloves.
General Objective 5.0: Know how to monitor ecosystem interactions in agroforestry systems						
10-11	5.1 Explain ecosystem interactions 5.2 Describe monitoring methods 5.3 Explain soil–vegetation relationships 5.4 Analyse system interactions 5.5 Explain ecological indicators 5.6 Explain ecosystem stability	• Discuss ecosystem interactions. • Explain monitoring methods. • Discuss soil–vegetation relationships. • Explain system interactions. • Describe ecological indicators. • Explain ecosystem stability.	Agroforestry textbooks, Sustainable land management manuals, Soil conservation guides, Climate-smart agriculture reports, Tree-crop interaction charts, Environmental management case studies, Projector and multimedia slides,	• Monitor agroforestry systems growth • Assess ecosystems in interactions • Record observations • Evaluate ecosystem performance • Analyse field data	Guide students to: • Monitor growth • Assess interactions • Record observations • Evaluate ecosystem performance • Analyse field data	Tree seedlings, Crop seeds and planting materials, Soil sampling tools, Measuring tapes, GPS devices, Pruning tools, Field notebooks and data sheets, Watering cans and hoses,

			GIS maps and land use maps, Whiteboard and markers, Forestry and agroforestry journals, etc.			Safety boots and gloves.
General Objective 6.0: Understand system dynamics in agroforestry						
12-13	6.1 Explain the concepts of system dynamics in agroforestry 6.2 Describe component interactions in agroforestry 6.3 Explain competition processes 6.4 Analyse nutrient flow 6.5 Explain feedback mechanisms	• Discuss system dynamics concepts. • Discuss component interactions. • Explain competition processes. • Describe nutrient flow patterns. • Describe feedback mechanisms.	Agroforestry textbooks, Sustainable land management manuals, Soil conservation guides, Climate-smart agriculture reports, Tree-crop interaction charts, Environmental management case studies, Projector and multimedia slides, GIS maps and	• Observe interactions • Monitor nutrient cycling • Record system behaviour • Evaluate system performance • Analyse field indicators	Guide students to: • Observe interactions • Monitor nutrient cycling • Record system behaviour • Evaluate system performance • Analyse field indicators	Tree seedlings, Crop seeds and planting materials, Soil sampling tools, Measuring tapes, GPS devices, Pruning tools, Field notebooks and data sheets, Watering cans and hoses, Safety

			land use maps, Whiteboard and markers, Forestry and agroforestry journals, etc.			boots and gloves.
General Objective 7.0: Apply economic models in agroforestry enterprises						
14-15	7.1 Explain agroforestry economics 7.2 Describe cost-benefit analysis 7.3 Explain production cost estimation 7.4 Analyse profitability and risk 7.5 Explain investment appraisal	- Discuss concepts of system dynamics in agroforestry systems and their importance in ecosystem functioning. - Discuss interactions among system components such as trees, crops, livestock, soil, and climate factors. - Explain competition processes between species for light, water, nutrients, and space within agroforestry systems. - Explain patterns of nutrient flow and cycling within integrated agroforestry systems. - Describe feedback	Agroforestry textbooks, Sustainable land management manuals, Soil conservation guides, Climate-smart agriculture reports, Tree-crop interaction charts, Environmental management case studies, Projector and multimedia slides, GIS maps and land use	- Prepare budgets - Conduct cost-benefit analysis - Organize financial records - Apply economic models	Guide students to: - Prepare budgets - Conduct cost-benefit analysis - Organize financial records - Apply economic models	Tree seedlings, Crop seeds and planting materials, Soil sampling tools, Measuring tapes, GPS devices, Pruning tools, Field notebooks and data sheets, Watering cans and hoses, Safety boots and

		mechanisms that regulate stability and productivity in agroforestry ecosystems.	maps, Whiteboard and markers, Forestry and agroforestry journals, etc.			gloves.
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COURSE ASSESSMENT**Course Work: 10%****Tests: 10%****Practical: 40%****Examination: 40%****Total: 100%**

SAND DUNE FIXATION TECHNIQUES

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: SAND DUNE FIXATION TECHNIQUES	COURSE CODE: FET 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 the knowledge and skills in sand dune fixation, erosion control, desertification prevention, and sustainable land restoration practices.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles of sand dune fixation and erosion control 2.0 Know vegetation-based and mechanical sand dune stabilization techniques. 3.0 Understand monitoring of soil, vegetation, and erosion control measures. 4.0 Apply sustainable practices to prevent desertification and land degradation. 5.0 Understand field evaluation of dune fixation success.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: SAND DUNE FIXATION TECHNIQUES			COURSE CODE: FET 414		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORY: 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 the knowledge and skills in sand dune fixation, erosion control, desertification prevention, and sustainable land restoration practices.						
GENERAL OBJECTIVE 1.0: Understand the principles of sand dune fixation and erosion control						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the concept of sand dune fixation in environmental management. 1.2 Identify types and characteristics of sand dunes 1.3 Describe the causes and effects of wind erosion and sand movement. 1.4 Explain the concept of erosion control in arid and semi-arid environments. 1.5 Explain the importance of sand	• Discuss the concept of sand dune fixation in environmental management. • Explain types and characteristics of sand dunes. • Explain causes and effects of wind erosion and sand movement. • Discuss erosion control concepts in arid and semi-arid environments. • Discuss importance	Sand dune fixation textbooks, Soil erosion control manuals, Desertification management guides, Environmental conservation reports, Wind erosion charts and diagrams, Climate adaptation	• Identify different types of sand dunes in field conditions. • Assess erosion problems associated with sand movement. • Demonstrate basic erosion control measures in sandy environments. • Record observations on sand dune characteristics accurately.	Guide students to: • Identify different types of sand dunes in field conditions. • Assess erosion problems associated with sand movement. • Demonstrate basic erosion control measures in sandy environments. • Record observations on sand dune characteristics accurately.	Tree seedlings and grasses, Mulching materials, Fencing materials, Soil sampling tools, Measuring tapes, GPS devices, Shovels and hoes, Field notebooks and data sheets, Environmental monitoring instruments,

	dune fixation in environmental protection.	of sand dune fixation in environmental protection.	manuals, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.	• Evaluate erosion conditions in dune-prone areas.		Safety boots and gloves.
General Objective 2.0: Know vegetation-based and mechanical sand dune stabilization techniques.						
4-6	2.1 Explain vegetation-based sand dune stabilization techniques. 2.2 Describe mechanical methods used in sand dune stabilization. 2.3 Identify plant species suitable for sand dune fixation. 2.4 Explain the importance of vegetation cover in erosion control. 2.5 Explain the effectiveness of vegetation-based and mechanical stabilization methods.	• Discuss vegetation-based sand dune stabilization techniques. • Describe mechanical methods used in sand dune stabilization. • Describe plant species suitable for sand dune fixation. • Explain importance of vegetation cover in erosion control. • Discuss effectiveness of vegetation-based and mechanical stabilization methods.	Sand dune fixation textbooks, Soil erosion control manuals, Desertification management guides, Environmental conservation reports, Wind erosion charts and diagrams, Climate adaptation manuals, Projector and	• Demonstrate the establishment of vegetation for sand dune stabilization in field sites. • Demonstrate mechanical stabilization methods in sandy environments. • Identify suitable plant species for dune fixation. • Apply mulching and fencing techniques for sand stabilization. • Assess the effectiveness of stabilization techniques in field	Guide students to: • Demonstrate the establishment of vegetation for sand dune stabilization in field sites. • Demonstrate mechanical stabilization methods in sandy environments. • Identify suitable plant species for dune fixation. • Apply mulching and fencing techniques for sand stabilization. • Assess the effectiveness of	Tree seedlings and grasses, Mulching materials, Fencing materials, Soil sampling tools, Measuring tapes, GPS devices, Shovels and hoes, Field notebooks and data sheets, Environmental monitoring instruments, Safety boots and gloves.

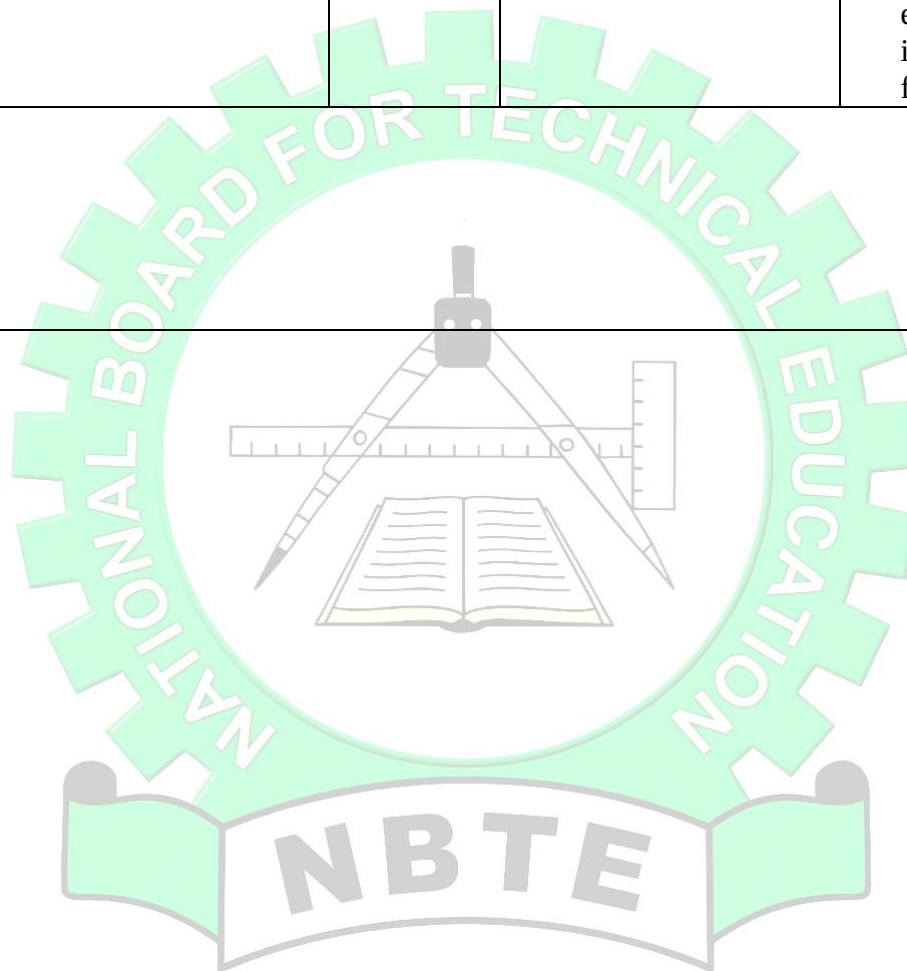
			multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.	conditions.	stabilization techniques in field conditions.	
General Objective 3.0: Understand monitoring of soil, vegetation, and erosion control measures.						
7-9	3.1 Explain methods used in monitoring soil and vegetation conditions. 3.2 Describe indicators of erosion and land degradation in sandy environments. 3.3 Identify instruments used for soil and vegetation monitoring. 3.4 Explain procedures for collecting and recording environmental data. 3.5 Analyse monitoring data for evaluating erosion	• Discuss methods used in monitoring soil and vegetation conditions. • Describe indicators of erosion and land degradation in sandy environments. • Identify instruments used for soil and vegetation monitoring. • Explain procedures for collecting and recording environmental data. • Explain monitoring data for evaluating erosion control measures.	Sand dune fixation • textbooks, • Soil erosion control manuals, • Desertification management guides, • Environmental conservation reports, • Wind erosion charts and diagrams, • Climate adaptation manuals, • Projector and multimedia slides,	• Measure soil and vegetation parameters in field conditions. • Identify indicators of erosion and land degradation in sandy areas. • Use environmental monitoring instruments correctly during field exercises. • Record soil and vegetation data accurately in field notebooks. • Evaluate erosion control measures using field monitoring data.	Guide students to: • Measure soil and vegetation parameters in field conditions. • Identify indicators of erosion and land degradation in sandy areas. • Use environmental monitoring instruments correctly during field exercises. • Record soil and vegetation data accurately in field notebooks.	Tree seedlings and grasses, Mulching materials, Fencing materials, Soil sampling tools, Measuring tapes, GPS devices, Shovels and hoes, Field notebooks and data sheets, Environmental monitoring instruments, Safety boots and gloves.

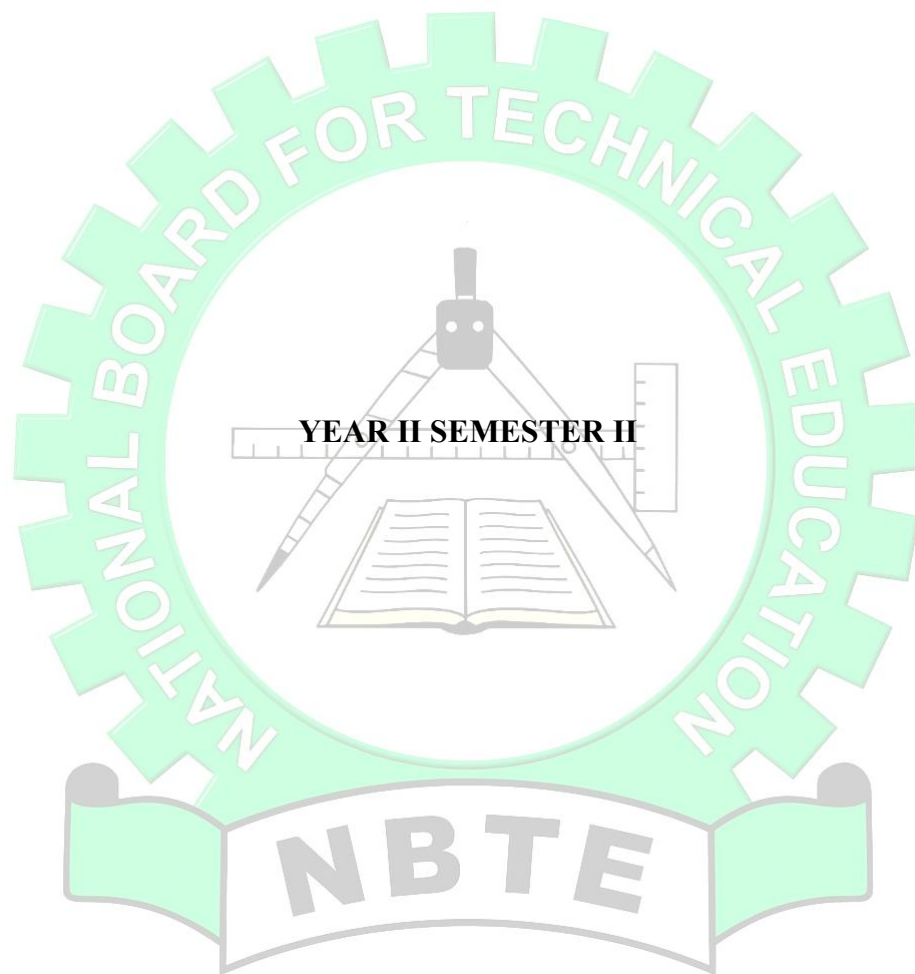
	control measures.		Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.			
General Objective 4.0: Apply sustainable practices to prevent desertification and land degradation.						
10-12	4.1 Explain the causes and effects of desertification and land degradation. 4.2 Describe sustainable land management practices used in erosion control. 4.3 Explain afforestation and revegetation practices in degraded lands. 4.4 Explain conservation practices for preventing desertification. 4.5 Explain the role of sustainable practices in environmental protection.	• Discuss causes and effects of desertification and land degradation. • Describe sustainable land management practices used in erosion control. • Discuss afforestation and revegetation practices in degraded lands. • Discuss conservation practices for preventing desertification. • Explain role of sustainable practices in environmental protection.	Sand dune fixation textbooks, Soil erosion control manuals, Desertification management guides, Environmental conservation reports, Wind erosion charts and diagrams, Climate adaptation manuals, Projector and multimedia	• Apply afforestation techniques in degraded sandy environments. • Demonstrate revegetation practices for erosion control. • Carry out conservation practices for preventing land degradation. • Assess degraded lands requiring restoration measures. • Record field observations on sustainable land management practices accurately.	Guide students to: • Apply afforestation techniques in degraded sandy environments. • Demonstrate revegetation practices for erosion control. • Carry out conservation practices for preventing land degradation. • Assess degraded lands requiring restoration measures. • Record field observations on sustainable land management practices	Tree seedlings and grasses, Mulching materials, Fencing materials, Soil sampling tools, Measuring tapes, GPS devices, Shovels and hoes, Field notebooks and data sheets, Environmental monitoring instruments, Safety boots and gloves.

			slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.		accurately.	
General Objective 5.0: Understand field evaluation of dune fixation success.						
13-15	5.1 Explain criteria used in evaluating dune fixation projects. 5.2 Describe methods used for assessing stabilization success in sandy environments. 5.3 Identify indicators of successful dune stabilization. 5.4 Explain procedures for evaluating vegetation establishment and erosion control measures. 5.5 Analyse field	• Discuss criteria used in evaluating dune fixation projects. • Describe methods used for assessing stabilization success in sandy environments. • Identify indicators of successful dune stabilization. • Explain procedures for evaluating vegetation establishment and erosion control measures. • Explain field evaluation reports on dune fixation projects.	Sand dune fixation textbooks, Soil erosion control manuals, Desertification management guides, Environmental conservation reports, Wind erosion charts and diagrams, Climate adaptation	• Identify indicators of successful dune stabilization during field assessment activities. • Assess vegetation establishment in stabilized dune areas using standard field procedures. • Measure erosion control performance in sandy environments using monitoring techniques. • Apply procedures for evaluating vegetation cover and erosion control measures in field conditions.	Guide students to: • Identify indicators of successful dune stabilization during field assessment activities. • Assess vegetation establishment in stabilized dune areas using standard field procedures. • Measure erosion control performance in sandy environments using	Tree seedlings and grasses, Mulching materials, Fencing materials, Soil sampling tools, Measuring tapes, GPS devices, Shovels and hoes, Field notebooks and data sheets, Environmental monitoring instruments, Safety boots and gloves.

	evaluation reports on dune fixation projects.		manuals, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.	• Record field evaluation data accurately using standard environmental assessment formats. • Interpret stabilization assessment results using field observations and monitoring data. • Identify challenges affecting dune fixation success during field evaluation exercises. • Evaluate effectiveness of dune fixation projects using standard environmental indicators and field reports.	monitoring techniques. • Apply procedures for evaluating vegetation cover and erosion control measures in field conditions. • Record field evaluation data accurately using standard environmental assessment formats. • Interpret stabilization assessment results using field observations and monitoring data. • Identify challenges affecting dune fixation success during field evaluation exercises. • Evaluate effectiveness of	
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					dune fixation projects using standard environmental indicators and field reports.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						





FOREST AND SAVANNA ECOSYSTEM

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST AND SAVANNA ECOSYSTEM	COURSE CODE: FET 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 the knowledge and skills in rain forest and savanna ecology and develop their ability to conduct ecological assessments, biodiversity monitoring, and sustainable ecosystem management for environmental conservation and productivity		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the ecological principles governing savanna ecosystem; 2.0 Know how to perform biodiversity surveys and ecological monitoring in rain forest and savanna ecosystem; 3.0 Apply sustainable management techniques to maintain ecosystem productivity; 4.0 Understand soil, vegetation, and climate interactions; 5.0 Know human impacts and mitigation strategies.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: FOREST AND SAVANNA ECOSYSTEM		COURSE CODE: FET 421		CONTACT HOURS: 3 HOURS/WEEK		
		CREDIT UNIT: 3		THEORY: 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 student with the knowledge and skills in rain forest and savanna ecosystem ecology and develop their ability to conduct ecological assessments, biodiversity monitoring, and sustainable ecosystem management for environmental conservation and productivity						
GENERAL OBJECTIVE 1.0: Understand the ecological principles governing savanna ecosystems						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the ecological principles of rain forest and savanna ecosystems. 1.2 Describe the structural and functional characteristics of rain forest and savanna ecosystems. 1.3 Explain interactions between biotic and abiotic components in ecosystem processes. 1.4 Differentiate ecological features of rain forest and	• Discuss the ecological principles of rain forest and savanna ecosystems using relevant ecological examples. • Discuss the structural and functional characteristics of rain forest and savanna ecosystems with diagrams or vegetation-zone illustrations. • Describe biotic and abiotic components	Ecology textbooks, Vegetation maps, Ecosystem charts and diagrams, Whiteboard and markers, Projector and slides, Multimedia presentations, Forestry	• Identify ecological features of rain forest and savanna ecosystems in the field. • Write a term paper on classification of vegetation zones based on ecological characteristics. • Assess biotic and abiotic components within ecosystems. • Record ecological observations accurately during fieldwork.	Guide students to: • Identify ecological features of rain forest and savanna ecosystems in the field. • Classify vegetation zones based on ecological characteristics. • Assess biotic and abiotic components within ecosystems. • Record ecological observations accurately during	Plant identification manuals, GPS devices, Measuring tapes, Soil sampling tools, Cameras, Safety boots and

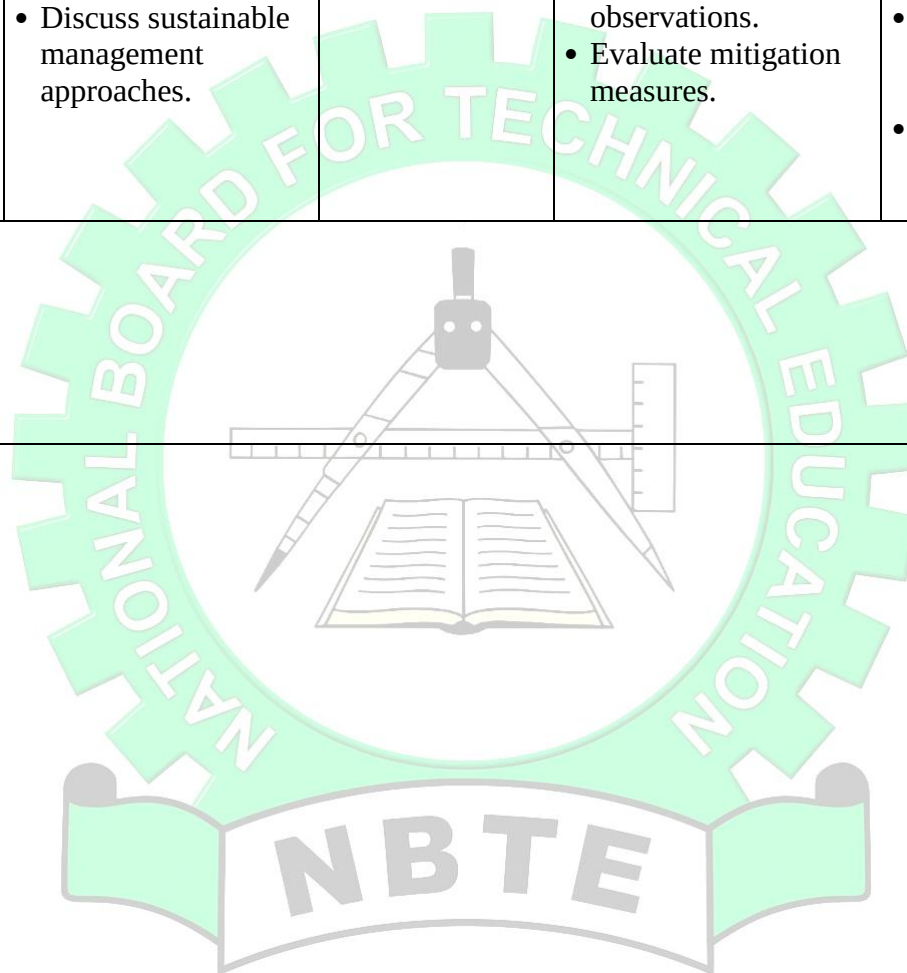
	savanna vegetation zones. 1.5 Describe ecological factors influencing ecosystem productivity and stability.	to ecosystem processes such as nutrient cycling, energy flow, growth, and regeneration. - Discuss the ecological features of rain forest and savanna vegetation zones using charts, maps, or case examples. - Discuss ecological factors influencing ecosystem productivity and stability.	journals, etc.	Interpret ecosystem relationships observed in field environments.	fieldwork. Interpret ecosystem relationships observed in field environments.	gloves.
General Objective 2.0: Know how to perform biodiversity surveys and ecological monitoring in rain forest and savanna ecosystems						
4-6	2.1 Explain biodiversity concepts in forest and savanna ecosystems. 2.2 Describe ecological survey and biodiversity monitoring techniques. 2.3 Explain procedures for ecological sampling and field data collection. 2.4 Analyse indicators	- Discuss the ecological principles of rain forest and savanna ecosystems using relevant ecological examples. - Explain the structural and functional characteristics of rain forest and savanna ecosystems with diagrams or	Biodiversity manuals, Ecological monitoring guides, Whiteboard, Charts and diagrams, Projector, Multimedia presentations,	- Conduct biodiversity surveys in ecosystems - Apply ecological sampling techniques during field monitoring. - Identify flora and fauna species in study areas. - Record biodiversity data accurately using field datasheets.	Guide students to: - Conduct biodiversity surveys in ecosystems - Apply ecological sampling techniques during field monitoring. - Identify flora and fauna species in study areas.	Quadrat frames, Sampling tools, GPS devices, Species guides, Measuring tapes, Cameras, Safety gear.

	used in biodiversity and ecosystem monitoring. 2.5 Explain the importance of biodiversity conservation in ecosystem management.	vegetation-zone illustrations. - Describe biotic and abiotic components to ecosystem processes such as nutrient cycling, energy flow, growth, and regeneration. - Discuss the ecological features of rain forest and savanna vegetation zones using charts, maps, or case examples. - Discuss ecological factors influencing ecosystem productivity and stability.	Environmental reports, etc.	Assess ecosystem conditions using ecological indicators.	- Record biodiversity data accurately using field datasheets. - Assess ecosystem conditions using ecological indicators.	
General Objective 3.0: Apply sustainable management techniques to maintain ecosystem productivity						
7-9	3.1 Explain sustainable management principles. 3.2 Describe ecosystem management techniques. 3.3 Explain methods for maintaining vegetation	- Discuss sustainable management principles using relevant ecosystem and forest management examples. - Describe ecosystem management	Maps, Projector, Reports, Ecology textbooks, Soil science manuals, Climatology	- Apply sustainable management practices in ecosystems. - Demonstrate soil and vegetation conservation techniques. - Assess vegetation	- Guide students in applying sustainable management practices in ecosystems. - Demonstrate soil and vegetation conservation	Soil sampling tools, Thermometers and rain gauges, GPS devices, Plant identification

	productivity and soil fertility. 3.4 Discuss environmental challenges affecting ecosystem sustainability. 3.5 Discuss conservation strategies for ecosystem productivity.	techniques with reference to vegetation, soil, water, biodiversity, and land-use practices. • Outline methods for maintaining vegetation productivity and soil fertility in forest and savanna ecosystems. • Discuss environmental challenges affecting ecosystem sustainability. • Discuss conservation strategies for improving ecosystem productivity.	guides, Vegetation ecology reports, Environmental interaction charts, GIS maps and climate data charts, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and ecology journals, etc.	productivity under management systems. • Record environmental data accurately. • Carryout simulation studies to evaluate ecosystem management effectiveness.	techniques during field exercises. • Assist students in assessing vegetation productivity under management systems. • Instruct students on recording environmental data accurately. • Supervise students in evaluating ecosystem management effectiveness.	guides, Environmental monitoring instruments, Field notebooks and data sheets, Measuring tapes, Digital cameras, GIS software applications, Safety boots and gloves.
General Objective 4.0: Understand soil, vegetation, and climate interactions						
10-12	4.1 Explain relationships among soil, vegetation, and climate. 4.2 Describe climatic factors affecting vegetation growth. 4.3 Explain soil properties	• Discuss relationships among soil, vegetation, and climate. • Describe climatic factors affecting vegetation growth. • Explain soil	Maps, Projector, Reports, Ecology textbooks, Soil science manuals,	• Assess soil conditions affecting vegetation. • Measure climatic parameters in the field using NIMET records of 35 years. • Evaluate vegetation responses.	Guide students to: • Assess soil conditions affecting vegetation. • Measure climatic parameters in the field using NIMET	Soil sampling tools, Thermometers and rain gauges, GPS devices, Plant

	influencing productivity. 4.4 Analyse environmental interactions. 4.5 Describe ecosystem responses to environmental change.	properties influencing productivity. • Explain environmental interactions. • Describe ecosystem responses to environmental change.	Climatology guides, Vegetation ecology reports, Environmental interaction charts, GIS maps and climate data charts, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and ecology journals, etc.	• Record environmental data. • Interpret field relationships.	records of 35 years. • Evaluate vegetation responses. • Record environmental data. • Interpret field relationships.	identification guides, Environmental monitoring instruments, Field notebooks and data sheets, Measuring tapes, Digital cameras, GIS software applications, Safety boots and gloves.
General Objective 5.0: Know human impacts and mitigation strategies						
13-15	5.1 Explain degradation processes. 5.2 Explain human activities affecting ecosystems (deforestation, grazing, farming etc) 5.3 Analyse mitigation	• Describe degradation processes. • Discuss human activities affecting ecosystems (deforestation, grazing, farming	Environmental texts, Charts, Whiteboard, Projector, Journals, etc.	• Identify environmental degradation signs. • Assess human impacts on ecosystems. • Demonstrate restoration	Guide students to: • Identify environmental degradation signs. • Assess human impacts on ecosystems.	Degraded sites, Soil tools; GPS, Cameras, Safety gear.

	strategies. 5.4 Explain sustainable management approaches.	etc). • Explain mitigation strategies. • Discuss sustainable management approaches.		techniques. • Record environmental observations. • Evaluate mitigation measures.	• Demonstrate restoration techniques. • Record environmental observations. • Evaluate mitigation measures	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						



ENVIRONMENTAL FORESTRY

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: ENVIRONMENTAL FORESTRY	COURSE CODE: FET 422	CONTACT HOURS: 2HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is designed to equip students with the knowledge and skills in environmental forestry, ecosystem management, environmental restoration, and sustainable forest resource management		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the theoretical principles of environmental forestry and ecosystem management; 2.0 Understand environmental management practices for forests and ecosystems; 3.0 Know how to perform field assessments and monitoring for ecosystem health; 4.0 Apply reforestation, afforestation, and rehabilitation techniques; 5.0 Know the use of GIS and environmental monitoring tools in forestry; 6.0 Apply carbon accounting methodologies aligned with IPCC standards for forest and ecosystem carbon monitoring.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: ENVIRONMENTAL FORESTRY			COURSE CODE: FET 422		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORY: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			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 in environmental forestry, ecosystem management, environmental restoration, and sustainable forest resource management						
GENERAL OBJECTIVE 1.0: Understand the theoretical principles of environmental forestry and ecosystem management						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the principles of environmental forestry in sustainable resource management. 1.2 Describe components and functions of forest ecosystems. 1.3 Explain relationships between forestry and environmental management. 1.4 Discuss factors affecting ecosystem stability and productivity.	• Discuss the principles of environmental forestry in sustainable resource management using relevant forestry and environmental examples. • Explain the components and functions of forest ecosystems with the aid of diagrams, charts, or ecosystem	Environmental forestry textbooks, Forest ecology manuals, Sustainable resource management guides, Ecosystem management reports, Environmental conservation			

	1.5 Explain the importance of environmental forestry in ecosystem sustainability.	models. • Relate forestry practices to environmental management in areas such as conservation, land use, biodiversity, soil protection, and climate regulation. • Discuss factors affecting ecosystem stability and productivity, including climate, soil condition, human activities, species diversity, pests, diseases, and land degradation. • Discuss the importance of environmental forestry in promoting ecosystem sustainability and environmental	charts, GIS maps and ecosystem maps, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.			
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		protection.				
General Objective 2.0: Understand environmental management practices for forests and ecosystems.						
4-6	2.1 Explain environmental management practices used in forestry operations. 2.2 Describe sustainable forest management approaches for ecosystem protection. 2.3 Explain pollution control and environmental protection measures in forestry. 2.4 Explain environmental policies and regulations guiding forest management. 2.5 Explain the role of environmental management practices in ecosystem	• Discuss environmental management practices used in forestry operations with relevant field examples. • Explain sustainable forest management approaches for ecosystem protection. • Explain pollution control and environmental protection measures applicable to forestry activities. • Review environmental policies and regulations guiding forest management. • Discuss the role of	Environmental forestry textbooks, Forest ecology manuals, Sustainable resource management guides, Ecosystem management reports, Environmental conservation charts, GIS maps and ecosystem maps, Projector and multimedia slides, Environmental case studies, Whiteboard	• Apply environmental management practices in forest field operations. • Demonstrate pollution control measures in forestry activities. • Assess environmental impacts of forestry operations in field conditions. • Carry out environmental protection activities in forest ecosystems. • Record environmental management activities accurately during field	Guide students to: • Apply environmental management practices in forest field operations. • Demonstrate pollution control measures in forestry activities. • Assess environmental impacts of forestry operations in field conditions. • Carry out environmental protection activities in forest ecosystems. • Record environmental management activities accurately	Forest field sites, GPS devices, Soil sampling tools, Plant identification guides, Environmental monitoring instruments, Field notebooks and data sheets, Measuring tapes, Digital cameras, GIS software applications, Safety boots and gloves.

	conservation	environmental management practices in ecosystem conservation.	and markers, Forestry and environmental journals, etc.	exercises.	during field exercises.	
General Objective 3.0: Know how to perform field assessments and monitoring for ecosystem health						
7-9	3.1 Explain methods used in ecosystem health assessment and monitoring. 3.2 Describe indicators of ecosystem health in forest environments. 3.3 Identify instruments used for environmental monitoring in forestry. 3.4 Describe procedures for collecting and analysing ecosystem data. 3.5 Analyse monitoring data for evaluating ecosystem	• Discuss methods used in ecosystem health assessment and monitoring. • Explain indicators of ecosystem health in forest environments. • Describe instruments used for environmental monitoring in forestry. • Discuss procedures for collecting and analysing ecosystem data. • Analyse monitoring data for evaluating ecosystem	Environmental forestry textbooks, Forest ecology manuals, Sustainable resource management guides, Ecosystem management reports, Environmental conservation charts, GIS maps and ecosystem maps, Projector and	• Measure ecosystem parameters during field monitoring exercises. • Identify indicators of ecosystem health in forest environments. • Use environmental monitoring instruments correctly during field activities. • Record ecosystem monitoring data accurately in field notebooks. • Evaluate ecosystem conditions using field	Guide students to: • Measure ecosystem parameters during field monitoring exercises. • Identify indicators of ecosystem health in forest environments. • Use environmental monitoring instruments correctly during field activities. • Record ecosystem monitoring data accurately in field	GPS devices, Soil sampling tools, Plant identification guides, Environmental monitoring instruments, Field notebooks and data sheets, Measuring tapes, Digital cameras, GIS software applications, Safety boots

	conditions.	conditions.	multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.	monitoring results.	notebooks. Evaluate ecosystem conditions using field monitoring results.	and gloves.
General Objective 4.0: Apply reforestation, afforestation, and rehabilitation techniques.						
10-11	4.1 Explain reforestation and afforestation practices in environmental management. 4.2 Explain rehabilitation techniques used in degraded forest lands. 4.3 Explain site preparation and species selection procedures for restoration projects. 4.4 Identify factors affecting success of reforestation and rehabilitation	Discuss reforestation and afforestation practices in environmental management. Describe rehabilitation techniques used in degraded forest lands. Explain site preparation and species selection procedures for restoration projects. Describe factors	Environmental forestry textbooks, Forest ecology manuals, Sustainable resource management guides, Ecosystem management reports, Environmental conservation charts, GIS maps and ecosystem	- Establish tree seedlings during reforestation and afforestation exercises. - Apply rehabilitation techniques in degraded forest sites. - Carry out site preparation activities for forest restoration projects. - Assess survival and growth of planted tree species. - Record restoration	Guide students to: - Establish tree seedlings during reforestation and afforestation exercises. - Apply rehabilitation techniques in degraded forest sites. - Carry out site preparation activities for forest restoration projects. - Assess survival and growth of planted tree	Reforestation textbooks, Afforestation manuals, Forest restoration guides, Environmental rehabilitation reports, Species selection charts, Site preparation manuals, Projector and multimedia

	programmes. 4.5 Explain the importance of forest restoration in environmental sustainability.	affecting success of reforestation and rehabilitation programmes. Discuss the importance of forest restoration in environmental sustainability.	maps, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.	activities and field observations accurately.	species.	slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals.
General Objective 5.0: Know the use of GIS and environmental monitoring tools in forestry.						
12-13	5.1 Explain applications of GIS in environmental forestry and ecosystem management. 5.2 Explain the importance of GIS and monitoring tools in sustainable forest management. Explain procedures for collecting and processing geospatial data. Identify digital tools	• Discuss applications of GIS in environmental forestry and ecosystem management. • Discuss the importance of GIS and monitoring tools in sustainable forest management. • Discuss procedures for collecting and processing geospatial data.	Environmental forestry textbooks, Forest ecology manuals, Sustainable resource management guides, Ecosystem management reports, Environmental conservation charts, GIS maps and	• Demonstrate the use of GIS tools during field surveys. • Collect geospatial data for environmental monitoring activities. • Interpret GIS data and maps for environmental monitoring. • Produce environmental maps using GIS software applications.	Guide students to: • Demonstrate the use of GIS tools during field surveys. • Collect geospatial data for environmental monitoring activities. • Interpret GIS data and maps for environmental monitoring. • Produce environmental maps using GIS software	GPS devices, Computers and tablets, GIS software applications, Drones and aerial cameras, Satellite imagery datasets, Environmental monitoring instruments, Field notebooks and data sheets,

	used for environmental monitoring and mapping. Describe environmental monitoring tools used in forest management.	- Describe digital tools used for environmental monitoring and mapping. - Describe environmental monitoring tools used in forest management.	ecosystem maps, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.	Assess forest conditions using GIS and monitoring tools.	applications. Assess forest conditions using GIS and monitoring tools.	Digital cameras, Forest field sites, Safety boots and gloves.
General Objective 6.0: Apply carbon accounting methodologies aligned with IPCC standards for forest and ecosystem carbon monitoring						
14-15	6.1 Explain principles of carbon accounting in forestry and ecosystem management. 6.2 Describe IPCC guidelines used for forest carbon monitoring and reporting. 6.3 Explain methods for estimating above-ground, below-ground, soil, and	- Discuss principles of carbon accounting in forestry and ecosystem management. - Describe IPCC guidelines used for forest carbon monitoring and reporting. - Discuss methods for estimating above-ground, below-	Environmental forestry textbooks, Forest ecology manuals, Sustainable resource management guides, Ecosystem management reports, Environmental conservation charts,	- Measure forest biomass parameters for carbon estimation in field conditions. - Apply standard procedures for estimating forest carbon pools. - Use carbon monitoring instruments and data collection tools correctly. - Record carbon inventory data	Guide students to: - Measure forest biomass parameters for carbon estimation in field conditions. - Apply standard procedures for estimating forest carbon pools. - Use carbon monitoring instruments and data collection tools correctly. - Record carbon	Forest field sites GPS devices GIS software and computers Diameter tapes and clinometers Soil sampling tools Carbon measurement instruments, Tree seedlings, Environmental monitoring

	litter carbon pools. 6.4 Identify instruments and techniques used in carbon measurement and monitoring. 6.5 Explain the importance of carbon accounting in climate change mitigation and sustainable forest management.	ground, soil, and litter carbon pools. - Describe instruments and techniques used in carbon measurement and monitoring. - Discuss the importance of carbon accounting in climate change mitigation and sustainable forest management.	GIS maps and ecosystem maps, Projector and multimedia slides, Environmental case studies, Whiteboard and markers, Forestry and environmental journals, etc.	accurately during field exercises. Evaluate forest carbon stocks using standard carbon accounting procedures.	inventory data accurately during field exercises. Evaluate forest carbon stocks using standard carbon accounting procedures.	equipment, Measuring tapes, Cameras and drones, Safety boots and gloves, Data recording sheets, Satellite imagery and digital maps.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

SHELTERBELT ESTABLISHMENT AND MANAGEMENT

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: SHELTERBELT ESTABLISHMENT AND MANAGEMENT	COURSE CODE: FET 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 the knowledge and skills in shelterbelt establishment, management, environmental protection, and climate mitigation practices		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the purpose and ecological benefits of shelter belts; 2.0 Know how to establish shelterbelts using appropriate species and spacing techniques; 3.0 Know how to perform monitoring of plant growth, soil, and water conservation measures; 4.0 Apply integrated management practices for productivity and ecosystem benefits; 5.0 Understand field interventions to enhance microclimate and crop protection; 6.0 Apply climate mitigation principles through carbon sequestration in shelterbelt systems.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: SHELTERBELT ESTABLISHMENT AND MANAGEMENT		COURSE CODE: FET 423		CONTACT HOURS: 4 HOURS/WEEK		
		CREDIT UNIT: 4		THEORY: 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 the knowledge and skills in shelterbelt establishment, management, environmental protection, and climate mitigation practices						
GENERAL OBJECTIVE 1.0: Understand the purpose and ecological benefits of shelterbelts						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain the functions of shelterbelts in environmental management. 1.2 Describe the ecological benefits of shelterbelts in agricultural and forest landscapes. 1.3 Identify types and characteristics of shelterbelt systems. 1.4 Explain the role of	• Discuss the functions of shelterbelts in environmental management using relevant agricultural and forestry examples. • Discuss the ecological benefits of shelterbelts in agricultural and forest landscapes. • Discuss types and characteristics of shelterbelt systems	Shelterbelt management textbooks, Environmental conservation manuals, Agroforestry guides, Soil and water conservation reports, Climate protection	• Identify different types of shelterbelts in field conditions. • Assess ecological benefits of shelterbelts in agricultural environments. • Record observations on shelterbelt characteristics accurately. • Evaluate the	Guide students to: • Identify different types of shelterbelts in field conditions. • Assess ecological benefits of shelterbelts in agricultural environments. • Record	Tree seedlings, Shelterbelt field sites, GPS devices, Soil sampling tools, Measuring tapes, Field notebooks and data sheets,

	shelterbelts in soil and water conservation. 1.5 Explain the importance of shelterbelts in environmental sustainability and climate protection.	using diagrams, pictures, or field illustrations. • Relate shelterbelts to soil and water conservation, especially in erosion control, wind reduction, and moisture retention. • Discuss the importance of shelterbelts in environmental sustainability and climate protection.	manuals, Shelterbelt system charts, Projector and multimedia slides, Environmental case studies, Whiteboard and markers Forestry and agroforestry journals, etc.	effectiveness of shelterbelts in environmental protection.	observations on shelterbelt characteristics accurately. • Evaluate the effectiveness of shelterbelts in environmental protection.	Digital cameras, Plant identification guides, Environmental monitoring instruments, Safety boots and gloves.
General Objective 2.0: Know how to establish shelterbelts using appropriate tree species and spacing techniques						
4-6	2.1 Explain criteria for selecting species suitable for shelterbelt establishment. 2.2 Describe spacing techniques used in shelterbelt development. 2.3 Explain site preparation procedures for shelterbelt establishment. Identify factors affecting successful	• Describe criteria for selecting suitable tree species for shelterbelt establishment. • Explain spacing techniques used in shelterbelt development with the aid of diagrams or planting layout examples. • Outline site preparation procedures required for shelterbelt	Shelterbelt management textbooks, Environmental conservation manuals, Agroforestry guides, Soil and water conservation reports, Climate protection manuals, Shelterbelt system charts,	• Select suitable species for shelterbelt establishment in field conditions. • Carry out site preparation activities for shelterbelt establishment. • Apply spacing techniques during shelterbelt planting exercises. • Establish shelterbelts using recommended planting procedures.	• Guide students to: • Select suitable species for shelterbelt establishment in field conditions. • Carry out site preparation activities for shelterbelt establishment. • Apply spacing techniques during	Tree seedlings, Measuring tapes, Planting pegs and ropes, Hoes and cutlasses, GPS devices, Field notebooks and data sheets, Soil sampling tools, Shelterbelt

	establishment of shelterbelts. 2.4 Explain the importance of tree species selection and spacing in shelterbelt productivity.	establishment. • Discuss factors affecting successful shelterbelt establishment, such as soil condition, rainfall, wind direction, species adaptability, spacing, and management practices. • Relate tree species selection and spacing to shelterbelt productivity and environmental effectiveness.	Projector and multimedia slides, Environmental case studies, Whiteboard and markers Forestry and agroforestry journals, etc.	• Record establishment activities and field observations accurately.	shelterbelt planting exercises. • Establish shelterbelts using recommended planting procedures. • Record establishment activities and field observations accurately.	field sites, Watering cans Safety boots and gloves.
General Objective 3.0: Know how to perform monitoring of plant growth, soil, and water conservation measures.						
7-9	3.1 Explain methods used in monitoring plant growth and environmental conditions. 3.2 Describe indicators of	• Discuss methods used in monitoring plant growth and environmental conditions.	Shelterbelt management textbooks, Environmental conservation manuals,	• Measure plant growth parameters in shelterbelt systems. • Assess soil and water conservation	Guide students to: • Measure plant growth parameters in shelterbelt	GPS devices Soil moisture meters, Measuring tapes, Rain gauges,

	soil and water conservation in shelterbelt systems. 3.3 Identify instruments used for environmental monitoring in shelterbelt management. 3.4 Explain procedures for collecting and recording monitoring data. 3.5 Analyse monitoring data for evaluating shelterbelt performance.	• Explain indicators of soil and water conservation in shelterbelt systems. • Identify instruments used for environmental monitoring in shelterbelt management. • Explain procedures for collecting and recording monitoring data. • Discuss interpretation of monitoring data for evaluating shelterbelt performance.	Agroforestry guides, Soil and water conservation reports, Climate protection manuals, Shelterbelt system charts, Projector and multimedia slides, Environmental case studies, Whiteboard and markers Forestry and agroforestry journals, etc.	conditions in field sites. • Use environmental monitoring instruments correctly during field exercises. • Record monitoring data accurately in field notebooks. • Evaluate shelterbelt performance using monitoring results.	systems. • Assess soil and water conservation conditions in field sites. • Use environmental monitoring instruments correctly during field exercises. • Record monitoring data accurately in field notebooks. Evaluate shelterbelt performance using monitoring results.	Field notebooks and data sheets, Environmental monitoring instruments, Shelterbelt field sites, Digital cameras, Plant growth measuring tools, Safety boots and gloves.
General Objective 4.0: Apply integrated management practices for productivity and ecosystem benefits						
10-11	4.1 Explain integrated management practices used in shelterbelt systems. 4.2 Describe maintenance practices for improving shelterbelt productivity.	• Discuss integrated management practices used in shelterbelt systems. • Explain maintenance practices for improving shelterbelt productivity. • Describe methods for	Shelterbelt management textbooks, Environmental conservation manuals, Agroforestry guides,	• Apply maintenance practices in shelterbelt systems. • Carry out weed, pest, and disease control measures in field conditions. • Assess productivity conditions in	Guide students to: • Apply maintenance practices in shelterbelt systems. • Carry out weed, pest, and disease	Pruning tools, Knapsack sprayers, Weeding tools, GPS devices, Field notebooks

	4.3 Explain methods for controlling pests, diseases, and weeds in shelterbelts. 4.4 Identify ecosystem benefits associated with integrated shelterbelt management. 4.5 Outline the importance of integrated management practices in environmental sustainability.	controlling pests, diseases, and weeds in shelterbelts. - Identify ecosystem benefits associated with integrated shelterbelt management. - Outline the importance of integrated management practices in environmental sustainability.	Soil and water conservation reports, Climate protection manuals, Shelterbelt system charts, Projector and multimedia slides, Environmental case studies, Whiteboard and markers Forestry and agroforestry journals, etc.	shelterbelt systems. - Demonstrate environmental protection practices in shelterbelt management. - Record maintenance activities and productivity observations accurately.	control measures in field conditions. - Assess productivity conditions in shelterbelt systems. - Demonstrate environmental protection practices in shelterbelt management. - Record maintenance activities and productivity observations accurately.	and data sheets, Tree seedlings and mulch materials, Shelterbelt field sites, Digital cameras, Measuring tapes, Safety boots and gloves.
General Objective 5.0: Know field interventions to enhance microclimate and crop protection						
12-13	5.1 Explain the influence of shelterbelts on microclimate conditions. 5.2 Describe crop protection functions provided by shelterbelts. Explain methods used for reducing wind speed	- Discuss the influence of shelterbelts on microclimate conditions. - Explain crop protection functions provided by shelterbelts.	Shelterbelt management textbooks, Environmental conservation manuals, Agroforestry guides, Soil and water	- Measure microclimate conditions in shelterbelt environments. - Assess crop protection benefits provided by shelterbelts. - Demonstrate field	Guide students to: - Measure microclimate conditions in shelterbelt environments. - Assess crop protection	Wind meters, Thermometers, Soil moisture meters, GPS devices, Field notebooks and data

	and evapotranspiration. 5.3 Identify environmental factors influenced by shelterbelts in agricultural systems. 5.4 Outline the importance of shelterbelts in crop productivity and environmental protection.	• Discuss methods used for reducing wind speed and evapotranspiration. • Identify environmental factors influenced by shelterbelts in agricultural systems. • Discuss the importance of shelterbelts in crop productivity and environmental protection.	conservation reports, Climate protection manuals, Shelterbelt system charts, Projector and multimedia slides, Environmental case studies, Whiteboard and markers Forestry and agroforestry journals, etc.	interventions for reducing wind effects on crops. • Evaluate environmental conditions influenced by shelterbelts. • Record microclimate and crop protection observations accurately.	benefits provided by shelterbelts. • Demonstrate field interventions for reducing wind effects on crops. • Evaluate environmental conditions influenced by shelterbelts. • Record microclimate and crop protection observations accurately.	sheets, Shelterbelt field sites, Tree seedlings and grasses, Measuring tapes, Digital cameras, Safety boots and gloves.
General Objective 6.0: Apply climate mitigation principles through carbon sequestration in shelterbelt systems						
14-15	6.1 Explain the concept of carbon sequestration in shelterbelt systems. 6.2 Describe the role of shelterbelts in climate change mitigation. 6.3 Explain methods used for estimating carbon storage in shelterbelt vegetation.	• Discuss the concept of carbon sequestration in shelterbelt systems. • Explain the role of shelterbelts in climate change mitigation. • Describe methods used for estimating	Shelterbelt management textbooks, Environmental conservation manuals, Agroforestry guides, Soil and water conservation	• Measure vegetation parameters for estimating carbon storage in shelterbelt systems. • Apply standard procedures for estimating carbon sequestration in field conditions.	Guide students to: • Measure vegetation parameters for estimating carbon storage in shelterbelt systems. • Apply standard procedures for	GPS devices, Tree measurement instruments, Soil sampling tools, Field notebooks and data sheets,

	6.4 Identify factors affecting carbon sequestration in shelterbelt systems. 6.5 Explain the importance of shelterbelts in climate resilience and environmental sustainability.	carbon storage in shelterbelt vegetation. - Identify factors affecting carbon sequestration in shelterbelt systems. - Discuss the importance of shelterbelts in climate resilience and environmental sustainability.	reports, Climate protection manuals, Shelterbelt system charts, Projector and multimedia slides, Environmental case studies, Whiteboard and markers Forestry and agroforestry journals, etc.	- Assess vegetation growth related to carbon storage potential. - Record carbon monitoring data accurately during field exercises. - Evaluate carbon sequestration potential of shelterbelt systems.	estimating carbon sequestration in field conditions. - Assess vegetation growth related to carbon storage potential. - Record carbon monitoring data accurately during field exercises. - Evaluate carbon sequestration potential of shelterbelt systems.	Shelterbelt field sites, Digital cameras, Carbon estimation charts, Measuring tapes, Climate monitoring instruments, Safety boots and gloves.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

FOREST MECHANIZATION

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST MECHANIZATION	COURSE CODE: FET 424	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE: NIL	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip student with the knowledge and practical skills in the operation, maintenance, and application of mechanized systems and equipment for efficient, safe, and sustainable forestry operations		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles and importance of mechanization in forest operations; 2.0 Know forestry machinery and equipment safely and efficiently in field operations; 3.0 Apply mechanized harvesting, transportation, and processing techniques; 4.0 Understand proper maintenance and operational procedures for forestry equipment; 5.0 Apply field operations for productivity, efficiency, and safety; 6.0 Apply precision forestry tools and mechanized systems to improve harvesting efficiency and sustainability.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: FOREST MECHANIZATION			COURSE CODE: FET 424		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORY: 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 student with the knowledge and practical skills in the operation, maintenance, and application of mechanized systems and equipment for efficient, safe, and sustainable forestry operations.						
GENERAL OBJECTIVE 1.0: Understand the principles and importance of mechanization in forest operations						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1Explain the concept and scope of forest mechanization. 1.2Describe the importance of mechanization in forest operations. 1.3Discuss the advantages and limitations of mechanized forestry systems. 1.4Explain manual, semi-mechanized, and fully mechanized forestry operations. 1.5Explain the environmental and economic	• Discuss the concept and scope of forest mechanization. • Describe the importance of mechanization in forest operations. • Discuss the advantages and limitations of mechanized forestry systems. • Discuss manual, semi-mechanized, and fully mechanized forestry operations. • Discuss the environmental and	Forestry mechanization textbooks, Engineering manual, Charts and diagrams, Multimedia presentations, Computers, Projector, Forestry journals, etc.	• Identify different categories of forestry machinery and equipment. • Classify mechanized forestry systems based on operational functions. • Demonstrate mechanized operations during field practical • Record observations on forestry mechanization practices accurately.	• Guide students to Identify different categories of forestry machinery and equipment. • Classify mechanized forestry systems based on operational functions. • Demonstrate mechanized operations during field practical • Record observations on forestry mechanization practices accurately	Forestry machinery, Tractor units, Logging equipment, Cameras, Safety helmets, Safety boots, Gloves.

	implications of forestry mechanization.	economic implications of forestry mechanization.				
General Objective 2.0: Know forestry machinery and equipment safely and efficiently in field operations						
4-6	2.1 Describe the operational principles of forestry machinery. 2.2 Explain safety precautions in forestry mechanized operations. 2.3 Explain operational procedures for tractors and harvesting equipment. 2.4 Explain factors affecting machinery performance in forestry operations. 2.5 Explain risks associated with forestry machinery usage.	- Describe the operational principles of forestry machinery. - Discuss safety precautions in forestry mechanized operations. - Discuss operational procedures for tractors and harvesting equipment. - Discuss factors affecting machinery performance in forestry operations. - Discuss risks associated with forestry machinery usage.	Forestry engineering manuals, Safety manuals, Operational charts, Multimedia presentations, Computer, Projector, Whiteboard 	- Operate forestry machinery following standard safety procedures. - Perform basic operational checks on forestry equipment. - Demonstrate safe handling of mechanized forestry tools. - Apply safety measures during field operations. - Monitor machinery performance during field exercises.	Guide student to: - Operate forestry machinery following standard safety procedures. - Perform basic operational checks on forestry equipment. - Demonstrate safe handling of mechanized forestry tools. - Apply safety measures during field operations. Monitor machinery performance during field exercises.	Tractors; Chainsaws, Harvesters, Fuel, Lubricants, Maintenance kits, Safety gloves, Helmets, Ear protection devices.
General Objective 3.0: Apply mechanized harvesting, transportation, and processing techniques						
7-9	3.1 Explain mechanized harvesting systems used in forestry	Discuss mechanized harvesting systems used in forestry	Harvesting manuals, Transportation	Operate forestry machinery following standard	Guide student to: Operate forestry machinery	Logging trucks, Winches, Chainsaws,

	operations. 3.2 Describe mechanized transportation methods for forest products. Explain processing techniques used in forest industries. 3.3 Explain operational efficiency in mechanized harvesting systems. 3.4 Explain environmental impacts of mechanized harvesting activities.	operations. • Discuss mechanized transportation methods for forest products. • Describe processing techniques used in forest industries. • Describe operational efficiency in mechanized harvesting systems. • Discuss environmental impacts of mechanized harvesting activities.	charts, Forestry journals, Multimedia presentations, Computers, Projector, Whiteboard	safety procedures. • Perform basic operational checks on forestry equipment. • Demonstrate safe handling of mechanized forestry tools. • Apply safety measures during field operations. • Monitor machinery performance during field exercises.	following standard safety procedures. • Perform basic operational checks on forestry equipment. • Demonstrate safe handling of mechanized forestry tools. • Apply safety measures during field operations. • Monitor machinery performance during field exercises.	Timber processing machines, Harvesters, Measuring tapes, Safety gear.
General Objective 4.0: Understand proper maintenance and operational procedures for forestry equipment						
10-11	4.1 Explain preventive measures for forest machinery. 4.2 Describe servicing procedures for forestry equipment. 4.3 Explain lubrication and fuel management practices. 4.4 Explain causes of machinery breakdown	• Discuss preventive measures for forest machinery. • Describe servicing procedures for forestry equipment. • Discuss lubrication and fuel management practices. • Discuss causes of	Maintenance manuals, Machinery diagrams, Workshop charts, Multimedia presentations, Computers, Projector; Whiteboard	• Perform routine servicing of forest equipment. • Lubricate machinery components appropriately. • Detect faults in forestry machinery. • Carry out minor repairs and	Guide students in: • Perform routine servicing of forest equipment. • Lubricate machinery components appropriately. • Detect faults in forestry machinery. • Carry out minor	Tool kits; Lubricants; Spare parts, Workshop equipment, Cleaning materials, Forestry machinery, Safety gloves, Coveralls.

	in forestry operations. 4.5 Explain maintenance schedules for operational efficiency.	machinery breakdown in forestry operations. • Discuss maintenance schedules for operational efficiency.		adjustments. • Maintain machinery maintenance records accurately.	repairs and adjustments. Maintain machinery maintenance records accurately.	
General Objective 5.0: Apply field operations for productivity, efficiency, and safety						
12-13	5.1 Explain productivity concepts in mechanized forest operations. 5.2 Describe methods of evaluating operational efficiency. 5.3 Explain safety performance indicators. 5.4 Explain operational costs and productivity relationships. 5.5 Explain mechanized forestry systems using field data.	• Discuss productivity concepts in mechanized forest operations. • Discuss methods of evaluating operational efficiency. • Outline safety performance indicators. • Discuss relationships between operational costs and productivity. • Discuss mechanized forestry systems using field data.	Productivity manuals, Operational chart, Forestry journals, Multimedia presentations, Computers, Projector; Whiteboard.	• Measure operational productivity during field exercises. • Assess machinery efficiency using field observations. • Evaluate safety compliance during operations. • Record operational and productivity data. • Prepare field evaluation reports.	Guide students to: • Measure operational productivity during field exercises. • Assess machinery efficiency using field observations. • Evaluate safety compliance during operations. • Record operational and productivity data. • Prepare field evaluation reports.	Measuring tapes, Stopwatches, Datasheets, Forestry machinery, Calculators, Safety equipment.
General Objective 6.0: Apply precision forestry tools on mechanized systems to improve harvesting efficiency and sustainability						

14-15	6.1 Explain the concept of precision forestry and smart mechanization. 6.2 Describe applications of GPS, GIS, LiDAR, and remote sensing in forestry mechanization. 6.3 Explain automated and sensor-based harvesting systems. 6.4 Explain environmental benefits of precision forestry technologies. 6.5 Explain mechanized systems for sustainable forest management.	• Discuss the concept of precision forestry and smart mechanization. • Discuss applications of GPS, GIS, LiDAR, and remote sensing in forestry mechanization. • Discuss automated and sensor-based harvesting systems. • Discuss environmental benefits of precision forestry technologies. • Describe mechanized systems for sustainable forest management.	Precision forestry textbooks, GIS manuals, Remote sensing materials, Multimedia presentations, Computer, Projector, Forestry journals.	• Operate GPS devices during field operations. • Apply GIS tools for forestry planning. • Demonstrate precision mapping techniques. • Assess harvesting efficiency using digital tools. • Interpret precision forestry data.	Guide student to: • Operate GPS devices during field operations. • Apply GIS tools for forestry planning. • Demonstrate precision mapping techniques. • Assess harvesting efficiency using digital tools. • Record and interpret precision forestry data.	GPS devices, GIS software, Computers, Drones, Remote sensing imagery, Measuring tapes, Safety gear.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical: 40% Examination: 40% Total: 100%						

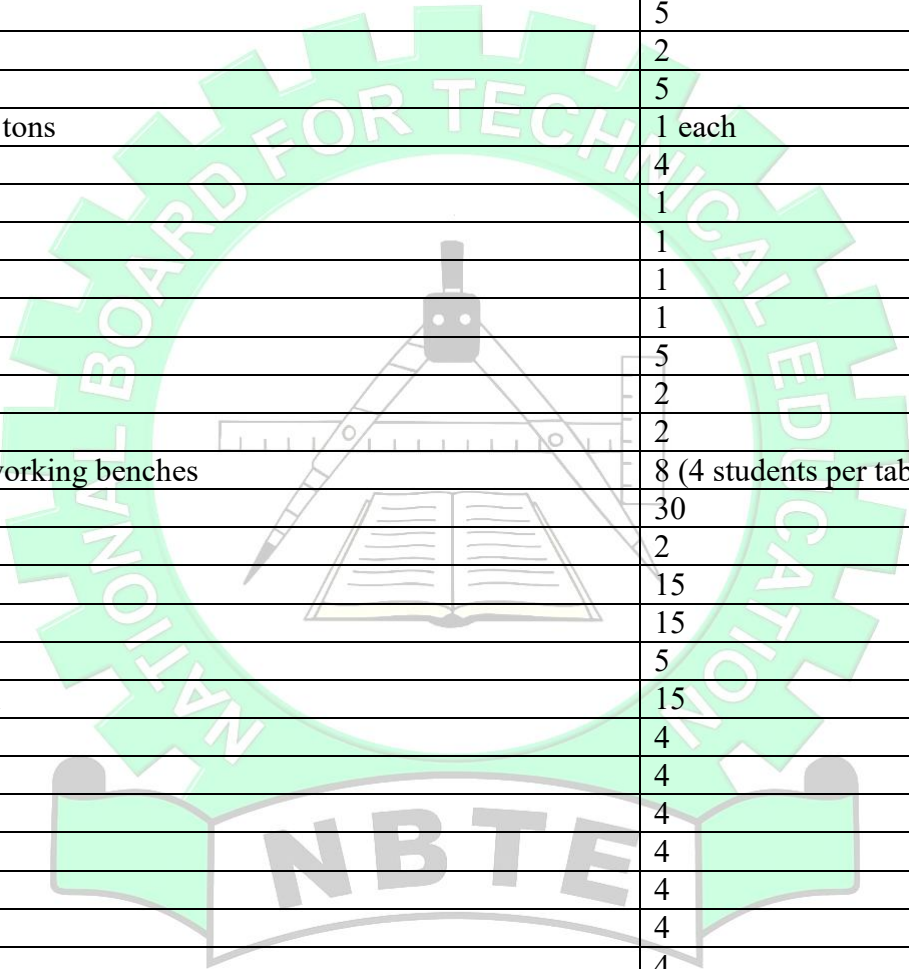
LIST OF MINIMUM RESOURCES/PHYSICAL FACILITIES

S/N	TOOLS, MATERIALS & EQUIPMENT	QUANTITY
A	Drawing room	
S/N	Description of Items	Quantity
1.	Drawing Boards / Stools	50
2.	Drafting set	10
3.	T- Square	20
4.	Set square	20
5.	Protractors	20
6.	Lettering set	20
	Survey equipment	
S/N	Description of Items	Quantity
1.	Stereoscope	8
2.	Prismatic compass	6
3.	Ranging Poles	20
4.	Chain	4
5.	Metric Tape	4
6.	Planimeters	2
7.	Theodolite and Staff	2
8.	Scale Rulers	30
9.	Set of Arrows	60
10.	Levels	20
11.	Pantograph	20
12.	GPS	8
B	Meteorological Station	
S/N	Description of Items	Quantity
1.	Stevenson's Screen	2
2.	Thermo hydrographs	2
3.	Maximum and Minimum Thermometers	4

4.	Rain gauge	4
5.	Measuring glasses	4
6.	Wind vane	4
7.	Anemometer	2
8.	Evaporimeter	2
9.	Hygrometer	4
10.	Barometer	4
C	Audio Visual Room	
S/N	Description of Items	Quantity
1.	Video Recorder	4
2.	Slide Projector	4
3.	Overhead Projector	4
4.	Film Projector	4
5.	Magnetic Board	4
6.	Public Address System	2
7.	Smart TV	2
8.	Cameras	5
9.	Enlarger	3
10.	Photo dryer	3
11.	Photo cutter	2
12.	Tables for Drawing	10
13.	Drawing pencils	Assorted
14.	Drawing pens	Assorted
15.	Water colour	Assorted
16.	Display Cabinets / Boards	Assorted
D	Pest Control Workshop	
S/N	Description of Items	Quantity
1.	Knapsack Pressure Sprayer	4

2.	Motorized mist sprayer	4
3.	Handy sprayer	10
4.	Hand sprayer with container	10
5.	Flood jet nozzles	10
6.	Boom sprayer	2
E	Farm Machinery Shed	
S/N	Description of Items	Quantity
1.	Tractors	4
2.	Disc plough	4
3.	Disc harrows	5
4.	Disc ridgers	5
5.	4 wheel trailer	4
6.	Stump jumper	2
7.	Earth scoop	2
8.	Rotavators	2
9.	Versatile cultivators	2
10.	Mould board ridgers	2
11.	Tractor pulley	2
12.	Versatile seed loader	2
13.	Seed drill	2
14.	Seed cleaner	2
15.	Seed grader	2
16.	Cutter bay mower	2
17.	Rotary slasher	2
18.	Fertilizer spreader	2
19.	Sub soiler	2
20.	Spike tooth harrow	2
F	Nursery tools	
S/N	Description of Items	Quantity

1.	Watering system (spraying)	3
2.	Seed sowers	3
3.	Root prunners	3
4.	Plant lifters	3
5.	Flame weeders and hedgers	3
6.	G H P Pump	3
7.	Secateurs	3
8.	Planting hoes	30
9.	Spade	10
10.	Pick axe	10
11.	Hand trowel	10
12.	Wheelbarrows	10
13.	Watering cans	20
14.	Head pans	10
15.	Machetes	20
16.	Cutting knives	10
G	Wood Workshop	
S/N	Description of Items	Quantity
1.	Working benches with vice	10
2.	Band saw	2
3.	Surface planner	2
4.	Thicknessing planer	2
5.	Drilling machine	2
H	Hand Tools	Assorted
	Metal Workshop	
S/N	Description of Items	Quantity
1.	Lathe	1
2.	Pipe benders	3



3.	Anvils	1
4.	Micrometers (inside, outside)	5
5.	Stock and dice set	5
6.	Drill sets	5
7.	Electrical hand drills	2
8.	Tool boxes	5
9.	Hydraulic jack 12 and 15 tons	1 each
10.	Box of drill	4
11.	Battery charger	1
12.	Grease guns	1
13.	Pipe cutter	1
14.	Scribers	1
15.	Steel ruler	5
16.	Mallets sets	2
17.	Pipe screwing threading	2
18.	Arc welding equipment working benches	8 (4 students per table)
19.	Arc welder	30
20.	Electric grinder	2
21.	Welding gloves	15
22.	Welding helmet	15
23.	Wire brush	5
24.	Welding boots and screen	15
25.	Soldering equipment	4
26.	Blowtorch	4
27.	Tin snips	4
28.	Soldering flux	4
29.	Sheet metal sheer	4
30.	Mallet hammer	4
31.	Hack saw	4
32.	Oxygen and acetylene bottles	3
33.	Oxygen and acetylene regulators	2

34.	Cylinders wrenches	3
35.	Spark lighter	5
I	Maintenance Workshop (ND, HND)	
S/N	Description of Items	Quantity
1.	Tool boxes	5
2.	Hydraulic jack	2
3.	Service pit	1
4.	Teaching models for scraps of: Tractor engines, Tailers, ploughs, other farm implements	Assorted
J	Irrigation Workshop (ND, HND)	
S/N	Description of Items	Quantity
1.	Rotating sprinkler for 5 acres	100
2.	Hoses (Various sizes)	2 various sizes
3.	Irrigation water tester	2
4.	Current meter	2
5.	Electric motor pump	1
K	Logging Workshop (ND, HND)	
S/N	Description of Items	Quantity
1.	Power saw	2
2.	Bow saw	4
3.	Axe	10
4.	Machete	10
5.	Sledgehammer	1
6.	Wedge	2
7.	File (flat type)	3
8.	Round file	3
9.	Safety helmet	15 pairs

10.	Gloves	15 pairs
11.	First aid kit	1
12.	Rain boots	30 pairs
13.	Rain coats	30 pairs
14.	Circular saw blades	5
15.	Grinding stone	4
16.	Bench vice	4
L	Mensuration Workshop (ND, HND)	
S/N	Description of Items	Quantity
1.	Girthing tapes	5
2.	Abney level	1
3.	Improvised measuring poles	10
4.	Haga altimeter	5
5.	Improvised christens Hypsometer	5
6.	Back gauge	5
7.	Calipers	5
8.	Increment borers	5
9.	Relascope	4
M	Field and other Facilities (ND, HND)	
S/N	Description of Items	Quantity
1.	Greenhouse	1
2.	Wood graveyard (Adequately stocked)	1
3.	Herbarium (Adequately stocked)	1
4.	Orchard (Teaching/commercial)	10 ha
5.	Nursery (Teaching/commercial)	5 ha
6.	Arboretum	10 ha
7.	Forest plantation	10 ha
8.	Camping equipment	Assorted
9.	Firefighting equipment	Assorted

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