

NATIONAL BOARD FOR TECHNICAL EDUCATION

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

NATIONAL DIPLOMA

IN

FORESTRY AND ENVIRONMENTAL TECHNOLOGY

JUNE, 2026

PREFACE

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

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

Professor Idris M. Bugaje, FNSE
Chairman, Implementation Committee

EXECUTIVE SECRETARY

National Board for Technical Education (NBTE), Kaduna

ACKNOWLEDGEMENT

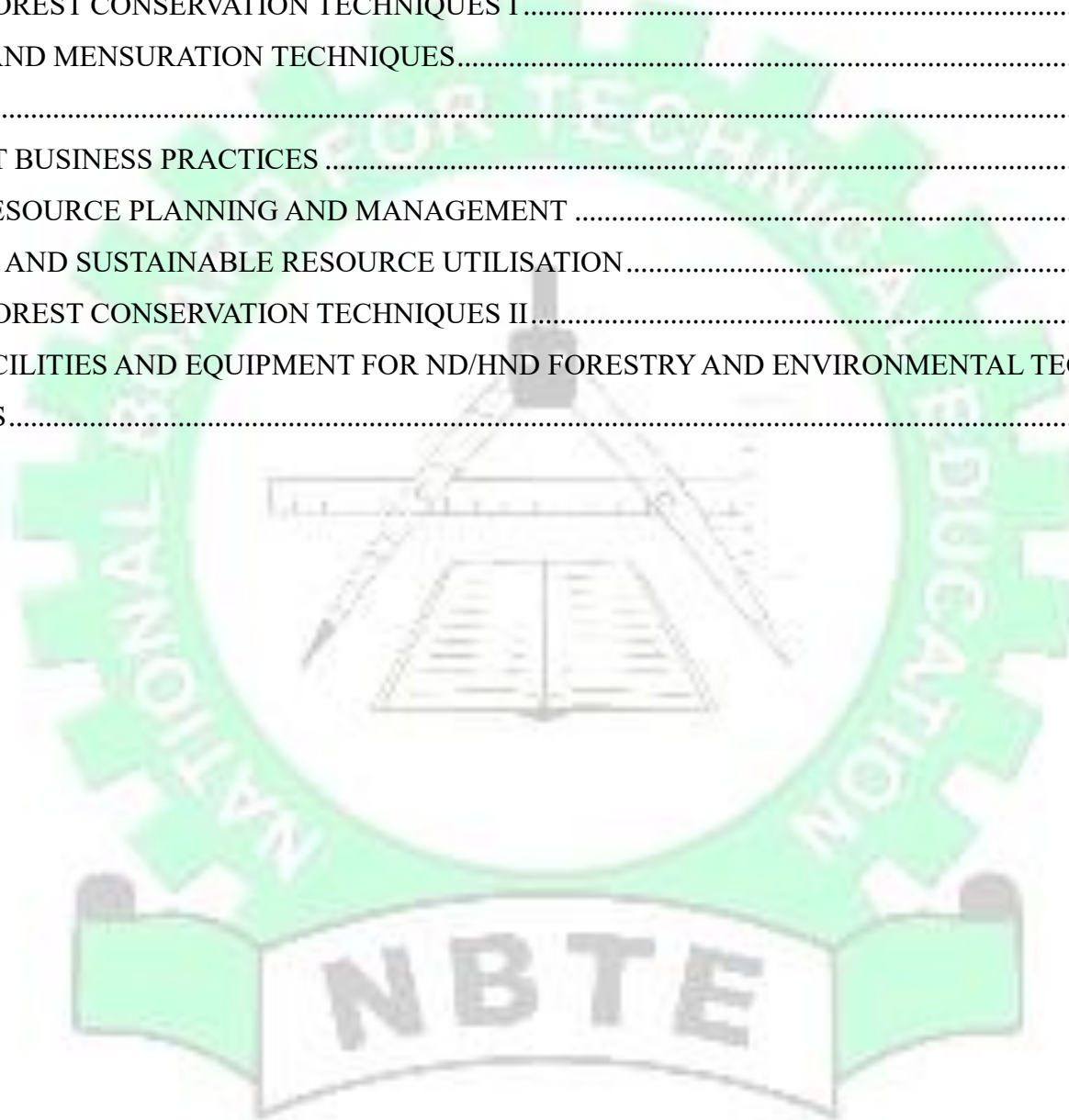
The National Board for Technical Education (NBTE) expresses its profound appreciation to all individuals and organizations whose invaluable support, expertise, and commitment made the successful review and modernization of the Agricultural Education curricula for Nigerian tertiary institutions possible.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

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

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GENERAL INFORMATION

1.0 PROGRAMME TITLE

The title of the Programme is National Diploma (ND) Forestry and Environmental Technology

2.0 PROGRAMME GOAL

The National Diploma Programme in Forestry and Environmental Technology is designed to produce technicians capable of assisting in the establishment and management of forest plantations and other forest resources.

3.0 OBJECTIVES OF THE PROGRAMME

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

- i. Survey, plot and demarcate an area for forestry and environmental projects.
- ii. Establish nursery for both forestry and horticultural seedlings production.
- iii. Identify trees, shrubs, climbers, herbs and other life forms.
- iv. Measure and calculate volume of wood in a given site.
- v. Assist in afforestation projects.
- vi. Assist in establishment of forest plantation
- vii. Carry out various forest operations such as planting, weeding, pruning, thinning, fire-tracing, etc. at the appropriate time.
- viii. Identify pest and disease symptoms in nurseries and plantations.
- ix. Operate and maintain various forestry tools and equipment.
- x. Harvest and add value to forest resources.
- xi. Prepare annual work calendar.
- xii. Participate in forestry business and extension programmes.

4.0 ENTRY REQUIREMENTS

The minimum entry requirements for admission into the Forestry and Environmental Technology Programme are:

- i. Four (4) O'Level credit passes in relevant subjects, including English Language, Mathematics, Biology/Agricultural Science, and any of Chemistry, Physics, Geography, Economics, Technical Drawing, Data Processing etc. in not more than two sittings
- ii. Evidence of registration with JAMB.

5.0 **STRUCTURE AND DURATION OF THE PROGRAMME**

The National Diploma in Forestry and Environmental Technology programme is structured to last for two (2) years (four semesters) of classroom work, laboratory practicals, field studies and workshop practices.

Each semester shall consist of 17 weeks made up as follows:

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

6.0 **CURRICULUM**

The curriculum of the ND Forestry and Environmental Technology Programme consists of four main components:

- a. General Studies/General Education Courses
- b. Foundation Courses
- c. Professional Courses
- d. Students' Industrial Work Experience Scheme (SIWES)

7.0 **STAFFING REQUIREMENTS**

7.1 **Core Teaching Staff**

A minimum of four (4) core teaching staff who should possess at least HND, B.Sc. or equivalent qualification in Forestry and Environmental Technology, Wood Science and Forestry or related disciplines.

7.2 **TECHNICAL STAFF**

i. Technologist

Technologist is a senior technical staff responsible for supervising practical and laboratory activities in the department. The technologist operates, manages, and maintains laboratory and field equipment, assists lecturers during practical sessions, and supports research and field studies in wildlife and ecotourism. There has to be a relevant Technologist attached to each training facility.

ii. Technician

Technician assists in carrying out technical and practical operations within the department. The technician helps in preparing equipment and materials for practical classes, maintaining tools and facilities, and supporting students and lecturers during laboratory and field activities. There has to be a relevant Technician attached to each training facility.

iii. Field Assistant

Field Assistant supports outdoor and field operations such as conservation activities, habitat monitoring, camping exercises, and data collection. The field assistant also helps in handling field equipment and ensuring smooth coordination of field trips and excursions.

7.3 Headship of the Department

The Head of Department shall possess at least a First and Master's Degree in Forestry and Environmental Technology, Wood Science and Forestry or a related discipline. He or she shall not be less than the rank of a Senior Lecturer, shall be registered with a relevant Professional Body and shall have a minimum of Ten (10) years' experience in either in academia, or both academia and industry.

8.0 CERTIFICATION

A diplomate of this Programme shall be awarded National Diploma (ND) in Forestry and Environmental Technology.

9.0 CONDITIONS FOR THE AWARD OF ND

Institutions offering accredited programmes will award the National Diploma to candidates who successfully completed the programme after passing prescribed coursework, examinations, diploma project and the Students Industrial Work Experience Scheme (SIWES). Such candidates should have completed a minimum of between 129 and 139 semester credit units depending on the programme.

9.1 Grading of Courses: Courses shall be graded as follows:

MARKED 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	0.0

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

The National Diploma (ND) in Forestry and Environmental Technology programme shall be accredited by NBTE before the diplomates can be awarded the diploma certificate. Details about the process of accrediting a programme for the award of the ND are available from the Executive Secretary, National Board for Technical Education (NBTE), Plot 'B', Bida Road, P.M.B. 2239, Kaduna, Nigeria.

11.0 LOGBOOK

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

12.0 FINAL YEAR PROJECTS

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

13.0 GUIDANCE NOTES FOR TEACHERS OF THE PROGRAMME

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

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

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

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

14.0 GUIDELINES ON SIWES PROGRAMME

For the smooth operation of the SIWES, the following guidelines shall apply:

14.1 Responsibility for placement of Students.

- a. Institution offering the ND programme shall arrange to place the students in relevant industries. By the end of second semester of the first academic session, six copies of the master list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE, who shall, in turn authenticate the list and forward it to the Industrial Training Fund, Jos.
- b. The Placement Officer should discuss and agree with the various industries on the following:
 - i. A task inventory of what the student is expected to experience during the period of attachment. It may be wise to adopt the one already approved for each field by the industry-based supervisor.
 - ii. The evaluation of the student by the industry-based supervisor and the institution-based supervisor.
 - iii. The final grading of the student during the period of attachment should be weighted more on the evaluation by industry-based supervisor.

14.2 Evaluation of Student during the SIWES

In the evaluation of the student, cognisance should be taken of the following items:

- i. Punctuality
- ii. Attendance
- iii. General attitude to work

- iv. Routine report of weekly activities in the logbook
- v. Respect for authority
- vi. Interest in the field/technical area
- vii. Technical competence as a potential technician in his field.

14.3 Grading of SIWES

To ensure uniformity of grading scales, the institution should ensure that the uniform grading of students work agreed to by all TVET Institutions is adopted.

14.4 The Institution based Supervisor

The institution-based supervisor should initial the log book during each visit. This will enable him to check and determine to what extent the objectives of the scheme are being met and to assist students having any problems regarding the specific tasks given to them by their industry-based supervisor.

14.5 Frequency of visit

Institutions should ensure that students placed on the attachment are visited within one month of their placement. Other visits shall be arranged so that:

- i. There is another visit six weeks after the first visit; and
- ii. A final visit in the last month of the attachment.

14.6 Stipend for Students in SIWES

The rate of stipend payable shall be determined from time to time by the Federal Government after due consultation with the Federal Ministry of Education, the Industrial Training fund and the NBTE.

14.7 SIWES as a component of the Curriculum

The completion of SIWES is important in the final determination of whether the student is successful in the programme or not. Failure in the SIWES is an indication that the student has not shown sufficient interest in the field or has no potential to become a skilled technician in his field. The SIWES should be graded on a **fail** or **pass** basis. Where a student has satisfied all other requirements but failed SIWES, she/he may only be allowed to repeat another four months SIWES at his own expense.

15.0 GUIDELINES ON MANDATORY SKILLS QUALIFICATIONS (MSQ)

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

CURRICULUM TABLE**Year I- Semester I**

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 101	Use of English I	2	0	0	2	2
2.	GNS 111	Citizenship Education I	2	0	0	2	2
3.	COM 111	Introduction to Computing	2	0	2	4	4
4.	MSQ 111	Mandatory Skills Qualification	1	0	1	2	2
5.	STC 111	General Principles of Chemistry	2	0	0	2	2
6.	AGR 101	Introduction to Agriculture	1	0	2	3	3
7.	MEC 111	Technical Drawing	1	0	3	4	4
8.	MEC 113	Basic Workshop Technology and Practice	1	0	3	4	4
9.	FET 111	Plant Morphology and Physiology in Forestry	1	0	3	4	4
10.	FET 112	Cell Biology in Forest Ecosystem	1	0	3	4	4
11.	FET 113	Forest Geography and Environmental Mapping	1	0	1	2	2
12.	FET 114	Introduction to Forestry	1	0	1	2	2
13.	FET 115	Introduction to Sustainable Environmental Management	2	0	0	2	2
TOTAL			18	0	19	37	37

Year I Semester II

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 102	Communication in English I	2	0	0	2	2
2.	GNS 121	Citizenship Education II	2	0	0	2	2
3.	ENT 126	Introduction to Entrepreneurship I	2	0	1	3	3
4.	AGT 125	Agro-Climatology	1	0	2	3	3
5.	WPT 123	Wood Preservation and Deterioration	1	0	2	3	3
6.	WPT 124	Introduction to Wood Processing Technology	1	0	2	3	3
7.	FET 121	Surveying and Geo-Informatics in Forestry I	1	0	2	3	3
8.	FET 122	Forest Botany and Conservation	1	0	2	3	3
9.	FET 123	Precision Forest Working Techniques	1	0	2	3	3
10.	FET 124	Non Timber Forest Products	1	0	2	3	3
11.	FET 125	Introduction to Forest Policy, Laws and Administration	2	0	0	2	2
12.	FET 126	Forest Protection and Integrated Pest Management Strategies	1	0	3	4	4
13.	FET 127	Wildlife Conservation	2	0	0	2	2
TOTAL			18	0	18	36	36

Year II- Semester I

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 201	Use of English II	2	0	0	2	2
2.	ENT 216	Introduction to Entrepreneurship II	2	0	1	3	3
3.	AGR 211	Research Methods and Experimental Design	1	0	2	3	3
4.	AGT 216	Basic Horticultural Crop Production	1	0	2	3	3
5.	WPT 213	Wood Seasoning, Drying and Quality Control	1	0	2	3	3
6.	WPT 216	Forest Engineering and Timber Harvesting	1	0	2	3	3
7.	FET 211	Surveying and Geo-Informatics in Forestry II	1	0	2	3	3
8.	FET 212	Silviculture and Forest Conservation Techniques I	1	0	3	4	4
9.	FET 213	Forest Inventory and Mensuration Techniques	1	0	3	4	4
10.	FET 214	Student Industrial Work Experience Scheme (SIWES)	0	0	4	4	4
TOTAL			11	0	21	32	32

Year II- Semester II

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 202	Communication in English II	2	0	0	2	2
2.	AGT 226	Agricultural Extension, Digital Advisory Systems and Rural Development	1	0	1	2	2
3.	WPT 224	Technology of Wood Products	1	0	2	3	3
4.	FET 221	Sustainable Forest Business Practices	1	0	2	3	3
5.	FET 222	Precision Forest Resource Planning and Management	1	0	1	2	2
6.	FET 223	Precision Forestry and Sustainable Resource Utilization	1	0	3	4	4
7.	FET 224	Silviculture and Forest Conservation Techniques II	1	0	3	4	4
8.	FET 225	Project	0	0	4	4	4
TOTAL			8	0	16	24	24

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



PLANT MORPHOLOGY AND PHYSIOLOGY IN FORESTRY

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: PLANT MORPHOLOGY AND PHYSIOLOGY IN FORESTRY	COURSE CODE: FET 111	CONTACT HOURS: 4HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: 1 SEMESTER: 1	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to provide students with knowledge and skills in the structures, features and functions of living organisms.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the morphology of Bryophyta, Pteridophyta, Spermatophyta; 2.0 Understand the life cycles of Bryophyta, Pteridophyta and Spermatophyta; 3.0 Recognize the economic importance of Bryophyta, Pteridophyta and Spermatophyta; 4.0 Know the life cycles of Protozoa, Coelenterate, Platy Helminthes, Nematoda, Annelids, Arthropod, Mollusca; 5.0 Appreciate the economic importance of Protozoa, Coelenterate, Platyhelmintha, Nematoda, Annelids, Anthropoda, Mollusca.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: PLANT MORPHOLOGY AND PHYSIOLOGY IN FORESTRY			COURSE CODE: FET 111		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide students with knowledge and skills in the structures, features and functions of living organisms						
GENERAL OBJECTIVE 1.0: Know the morphology of Bryophyta, Pteridophyta, Spermatophyta						
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 morphology of Bryophyta, Pteridophyta, and Spermatophyta, focusing on their structural differences 1.2 Explain the classification of Bryophyta, Pteridophyta, and Spermatophyte based on their morphological characteristics. 1.3 Explain the reproductive structures of Bryophyta, Pteridophyta, and Spermatophyte 1.4 Compare the life cycles of Bryophyta, Pteridophyta, and Spermatophyte, emphasizing the differences in	- Describe the morphology of Bryophyta, Pteridophyta, and Spermatophyte, focusing on their structural differences - Discuss the classification of Bryophyta, Pteridophyta, and Spermatophyte based on their morphological characteristics. - Identify the reproductive structures of Bryophyta, Pteridophyta, and	Microscopes, Slides, Video clips, Charts, Live specimen of a representative, etc.	- Identify examples of Bryophyta, Pteridophyta, and Spermatophyte in the field, observing their morphological features. - Collect examples of Bryophyta, Pteridophyta, and Spermatophyte in the field, observing their morphological features. - Observe and document the reproductive	Guide students to: - Identify examples of Bryophyta, Pteridophyta, and Spermatophyte in the field, observing their morphological features. - Collect examples of Bryophyta, Pteridophyta, and Spermatophyte in the field, observing	Microscopes, Slides, Video clips, Charts, Live specimen of a representative.

	reproduction. 1.5 Discuss the ecological significance of Bryophyta, Pteridophyta, and Spermatophyte in forest ecosystems. 1.6 Explain the impact of environmental factors (e.g., climate, soil) on the growth and distribution of Bryophyta, Pteridophyta, and Spermatophyte. 1.7 Explain the evolutionary relationship between Bryophyta, Pteridophyta, and Spermatophyte, focusing on adaptations and evolutionary trends	Spermatophyte • Compare the life cycles of Bryophyta, Pteridophyta, and Spermatophyte, emphasizing the differences in reproduction. • Discuss the ecological significance of Bryophyta, Pteridophyta, and Spermatophyte in forest ecosystems. • Describe the impact of environmental factors (e.g., climate, soil) on the growth and distribution of Bryophyta, Pteridophyta, and Spermatophyte. • Describe the evolutionary relationship between Bryophyta, Pteridophyta, and Spermatophyte, focusing on adaptations and evolutionary trends		structures of Bryophyta, Pteridophyta, and Spermatophyte under a microscope. • Conduct a field survey to assess the growth patterns and environmental conditions affecting the development of these plant groups. • Examine the morphology of Bryophyta, Pteridophyta, and Spermatophyte using dissection and microscopic techniques. • Record the habitat and distribution of Bryophyta, Pteridophyta, and Spermatophyte in different ecosystems,	their morphological features. • Observe and document the reproductive structures of Bryophyta, Pteridophyta, and Spermatophyte under a microscope. • Conduct a field survey to assess the growth patterns and environmental conditions affecting the development of these plant groups. • Examine the morphology of Bryophyta, Pteridophyta, and Spermatophyte using dissection and	
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				identifying environmental influences. • Perform experiments to observe how environmental factors like light, temperature, and soil moisture affect the germination and growth of these plant groups.	microscopic techniques. • Record the habitat and distribution of Bryophyta, Pteridophyta, and Spermatophytes in different ecosystems, identifying environmental influences. • Perform experiments to observe how environmental factors like light, temperature, and soil moisture affect the germination and growth of these plant groups.	
General Objective: 2.0 Understand the life cycles of Bryophyta, Pteridophyta and Spermatophyta						

4-6	2.1	Explain the life cycle of Bryophyta, highlighting the alternation of generations and the roles of gametophytes and sporophytes.	Describe the life cycle of Bryophyta, highlighting the alternation of generations and the roles of gametophytes and sporophytes.	Microscopes, Slides, Video clips, Charts, Live specimen of a representative, etc.	Observe the life cycle stages of Bryophyta in the field, identifying gametophyte and sporophyte stages using a microscope.	Guide students to:	Microscopes, Slides, Video clips, Charts, Live specimen of a representative.
	2.2	Explain the life cycle of Pteridophyta, emphasizing the development of spores and the alternation between sporophyte and gametophyte generations.	Describe the life cycle of Pteridophyta, emphasizing the development of spores and the alternation between sporophyte and gametophyte generations.		Document the life cycle stages of Bryophyta in the field, identifying gametophyte and sporophyte stages using a microscope.	Observe the life cycle stages of Bryophyta in the field, identifying gametophyte and sporophyte stages using a microscope.	
	2.3	Compare the life cycle of Spermatophyte (seed plants) with Bryophyta and Pteridophyta, focusing on fertilization, seed formation, and germination.	Compare the life cycle of Spermatophyte (seed plants) with Bryophyta and Pteridophyta, focusing on fertilization, seed formation, and germination.		Conduct an experiment to observe the germination process and development of Pteridophyta spores under controlled conditions.	Document the life cycle stages of Bryophyta in the field, identifying gametophyte and sporophyte stages using a microscope.	
	2.4	Explain the stages of gametophyte and sporophyte development in Bryophyta and Pteridophyta, noting key differences in reproductive strategies.	Describe the stages of gametophyte and sporophyte development in		Collect different seed types in Spermatophyte,	Conduct an experiment to observe the germination process and development	

	2.5 Explain the evolutionary significance of life cycle progression in Bryophyta, Pteridophyta, and Spermatophyte, focusing on adaptation to terrestrial environments. 2.6 Discuss the environmental factors that influence the life cycle transitions in Bryophyta, Pteridophyta, and Spermatophyte, such as moisture, temperature, and light. 2.7 Explain the mechanisms of seed dispersal and germination in Spermatophyte, comparing them to spore dispersal in Bryophyta and Pteridophyta.	Bryophyta and Pteridophyta, noting key differences in reproductive strategies. - Describe the evolutionary significance of life cycle progression in Bryophyta, Pteridophyta, and Spermatophyte, focusing on adaptation to terrestrial environments. - Discuss the environmental factors that influence the life cycle transitions in Bryophyta, Pteridophyta, and Spermatophyte, such as moisture, temperature, and light. - Describe the mechanisms of seed dispersal and germination in		observing the stages of seed germination and early seedling development - Examine the different seed types in Spermatophyte, observing the stages of seed germination and early seedling development. - Create a life cycle chart of Bryophyta, Pteridophyta, and Spermatophyte, comparing key transitions such as spore release and fertilization. - Track the development of sporophyte and gametophyte stages in Bryophyta and	of Pteridophyta spores under controlled conditions. - Collect different seed types in Spermatophyte, observing the stages of seed germination and early seedling development - Examine the different seed types in Spermatophyte, observing the stages of seed germination and early seedling development - Create a life cycle chart of Bryophyta,	
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		Spermatophyte, comparing them to spore dispersal in Bryophyta and Pteridophyta.	Pteridophyta through field observation and microscopic analysis. • Simulate the effect of environmental variables (e.g., moisture, temperature, light) on the germination rate and growth of Spermatophyte seeds in a controlled experiment.	Pteridophyta, and Spermatophyte, comparing key transitions such as spore release and fertilization. • Track the development of sporophyte and gametophyte stages in Bryophyta and Pteridophyta through field observation and microscopic analysis. • Simulate the effect of environmental variables (e.g., moisture, temperature, light) on the	
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					germination rate and growth of Spermatophyte seeds in a controlled experiment.	
General Objective 3.0: Recognize the economic importance of Bryophyta, Pteridophyta and Spermatophyta						
7-9	3.1 Explain the life cycle of Protozoa, focusing on key stages such as trophozoite, cyst formation, and reproduction in protozoans like Plasmodium and Entamoeba. 3.2 Explain the life cycle of Coelenterates, including stages such as the polyp and medusa, and the processes of asexual and sexual reproduction in organisms like hydra and jellyfish. 3.3 Explain the life cycle of Platyhelminthes, particularly focusing on flukes and tapeworms, their larval stages, and their parasite-host interactions.	- Describe the life cycle of Protozoa, focusing on key stages such as trophozoite, cyst formation, and reproduction in protozoans like Plasmodium and Entamoeba. - Describe the life cycle of Coelenterates, including stages such as the polyp and medusa, and the processes of asexual and sexual reproduction in organisms like hydra and jellyfish. - Identify the life cycle of Platyhelminthes, particularly focusing	Microscopes, Slides, Video clips, Charts, Live specimen of a representative, etc.	- Observe the life cycle of Protozoa using microscopic slides, focusing on trophozoite and cyst stages in protozoans like Plasmodium. - Document the life cycle of Protozoa using microscopic slides, focusing on trophozoite and cyst stages in protozoans like Plasmodium - Examine Coelenterates in a lab setting, observing the	Guide students to: - Observe and document the life cycle of Protozoa using microscopic slides, focusing on trophozoite and cyst stages in protozoans like Plasmodium. - Document the life cycle of Protozoa using microscopic slides, focusing on trophozoite	Microscopes, Slides, Prepared slides, Video clips, Charts, Live specimen of a representative.

	3.4 Explain the life cycle of Nematoda (roundworms), describing stages such as egg, larval stages, and adult worm in parasites like Ascaris and hookworms. 3.5 Describe the life cycle of Annelids, focusing on species like earthworms and leeches, and their reproductive processes and segmentation in their life cycle. 3.6 Explain the life cycle of Arthropods, particularly in insects like mosquitoes, flies, and beetles, focusing on egg, larvae, pupa, and adult stages. 3.7 Describe the life cycle of Mollusca, focusing on gastropods (e.g., snails) and bivalves (e.g., clams), explaining larval stages (like trochophore and veliger) and adult forms	on flukes and tapeworms, their larval stages, and their parasite-host interactions. - Describe the life cycle of Nematoda (roundworms), describing stages such as egg, larval stages, and adult worm in parasites like Ascaris and hookworms. - Describe the life cycle of Annelids, focusing on species like earthworms and leeches, and their reproductive processes and segmentation in their life cycle. - Describe the life cycle of Arthropods, particularly in insects like mosquitoes, flies, and beetles, focusing on egg, larvae, pupa, and adult stages. - Describe the life cycle of Mollusca,		polyp and medusa forms of hydra or jellyfish, and discuss the role of sexual and asexual reproduction in their life cycle. - Observe the life cycle stages of Platyhelminthes (e.g., tapeworms) in specimen or prepared slides, noting differences in larval and adult stages. - Perform an experiment to observe the Nematoda (e.g., roundworm larvae) under a microscope, recording developmental stages from egg to adult. - Study the life	and cyst stages in protozoans like Plasmodium - Examine Coelenterates in a lab setting, observing the polyp and medusa forms of hydra or jellyfish, and discuss the role of sexual and asexual reproduction in their life cycle. - Observe the life cycle stages of Platyhelminthes (e.g., tapeworms) in specimen or prepared slides, noting differences in larval and adult stages.	
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		focusing on gastropods (e.g., snails) and bivalves (e.g., clams), explaining larval stages (like trochophore and veliger) and adult forms		cycle of earthworms or leeches in the field or aquarium setup, observing their reproduction and segmentation during different stages. • Monitor the development of an arthropod, such as a mosquito or butterfly, documenting the transformation through larvae, pupa, and adult stages in an insectarium or controlled environment. • Examine molluscan larvae, such as trochophore and veliger stages, using	• Perform an experiment to observe the Nematoda (e.g., roundworm larvae) under a microscope, recording developmental stages from egg to adult. • Study the life cycle of earthworms or leeches in the field or aquarium setup, observing their reproduction and segmentation during different stages. • Monitor the development of an arthropod, such as a	
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				microscopic slides to observe and identify developmental stages in snails or clams	mosquito or butterfly, documenting the transformation through larvae, pupa, and adult stages in an insectarium or controlled environment Examine molluscan larvae, such as trochophore and veliger stages, using microscopic slides to observe and identify developmental stages in snails or clams	
General Objective 4.0: Know the life cycles of Protozoa, Coelenterate, Platy Helminthes, Nematoda, Annelids, Arthropod, Mollusca						
10-12	4.1 Explain the life cycle of Protozoa, highlighting stages like trophozoite, cyst formation, and	Explain the life cycle of Protozoa, highlighting stages like trophozoite, cyst	Textbooks, Journal Articles, Specimen, Case Studies,	Observe the life cycle of Protozoa under a microscope,	Guide students to: Observe the life cycle of	Microscopes, Slides, Prepared slides, Video clips,

	reproduction in organisms such as Plasmodium (malaria parasite). 4.2 Describe the life cycle of Coelenterates (e.g., Hydra, jellyfish), focusing on polyp and medusa stages, and how they reproduce through both asexual and sexual methods. 4.3 Explain the life cycle of Platyhelminthes, particularly tapeworms and flukes, explaining their larval stages and parasitic life cycle involving multiple hosts. 4.4 Explain the life cycle of Nematoda (e.g., Ascaris, hookworms), describing egg, larval, and adult stages, and their role in parasitism. 4.5 Describe the life cycle of Annelids (e.g., earthworms, leeches), covering their sexual reproduction, segmentation, and	formation, and reproduction in organisms such as Plasmodium (malaria parasite). - Describe the life cycle of Coelenterates (e.g., Hydra, jellyfish), focusing on polyp and medusa stages, and how they reproduce through both asexual and sexual methods. - Explain the life cycle of Platyhelminthes, particularly tapeworms and flukes, explaining their larval stages and parasitic life cycle involving multiple hosts. - Explain the life cycle of Nematoda (e.g., Ascaris, hookworms), describing egg, larval, and adult stages, and their role in parasitism. - Describe the life	Field Guides, Online databases, etc.	identifying stages such as trophozoites and cysts in a Plasmodium or Entamoeba sample. - Collect Coelenterates (e.g., Hydra) and document their polyp and medusa forms under laboratory conditions. - Observe Coelenterates (e.g., Hydra) and document their polyp and medusa forms under laboratory conditions. - Examine Platyhelminthes (e.g., tapeworms, liver flukes) under a microscope and observe their larval and adult stages in	Protozoa under a microscope, identifying stages such as trophozoites and cysts in a Plasmodium or Entamoeba sample. - Collect Coelenterates (e.g., Hydra) and document their polyp and medusa forms under laboratory conditions. - Examine Platyhelminthes (e.g., tapeworms, liver flukes) under a microscope and observe their larval and adult stages in prepared slides.	Charts, Live specimen of a representative.
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	regeneration capabilities. 4.6 Explain the life cycle of Arthropods, particularly insects like mosquitoes, flies, and beetles, describing their egg, larvae, pupa, and adult stages. 4.7 Explain the life cycle of Mollusca, including gastropods (e.g., snails) and bivalves (e.g., oysters), explaining larval stages like trochophore and veliger, and adult forms.	cycle of Annelids (e.g., earthworms, leeches), covering their sexual reproduction, segmentation, and regeneration capabilities. • Explain the life cycle of Arthropods, particularly insects like mosquitoes, flies, and beetles, describing their egg, larvae, pupa, and adult stages. • Explain the life cycle of Mollusca, including gastropods (e.g., snails) and bivalves (e.g., oysters), explaining larval stages like trochophore and veliger, and adult forms.		prepared slides. • Collect Nematoda (e.g., Ascaris, hookworms) in soil samples, identifying egg and larval stages, and analyzing their life cycle. • Examine Annelid specimens (e.g., earthworms) and identify segments, reproductive organs, and regenerative capabilities through dissection and observation. • Observe the development stages of Arthropods (e.g., mosquito larvae, caterpillars) in a controlled environment,	• Collect Nematoda (e.g., Ascaris, hookworms) in soil samples, identifying egg and larval stages, and analyzing their life cycle. • Examine Annelid specimens (e.g., earthworms) and identify segments, reproductive organs, and regenerative capabilities through dissection and observation. • Observe the development stages of Arthropods (e.g., mosquito	
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				tracking their egg, larval, pupal, and adult stages. • Collect Mollusca specimens (e.g., snails, clams) and observe their larval stages (e.g., trochophore and veliger) and adult forms using a microscope.	larvae, caterpillars) in a controlled environment, tracking their egg, larval, pupal, and adult stages. • Collect Mollusca specimens (e.g., snails, clams) and observe their larval stages (e.g., trochophore and veliger) and adult forms using a microscope.	
General Objective 5.0: Appreciate the economic importance of Protozoa, Coelenterate, Platyhelmintha, Nematoda, Annelids, Anthropoda, Mollusca						
13-15	5.1 Explain the economic importance of Protozoa in fields such as medicine (e.g., Plasmodium in malaria), agriculture (e.g., soil health), and their use as bioindicators in environmental studies.	• Discuss the economic importance of Protozoa in fields such as medicine (e.g., Plasmodium in malaria), agriculture (e.g., soil health), and their use as bioindicators in	Textbooks Journal Articles Specimen Case Studies Field Guides Online Databases	• Identify economically important Protozoa in the field or lab, • Document economically important Protozoa in the	Guide students to: • Identify economically important Protozoa in the field or lab • Document economically important	Microscopes, Slides, Prepared slides, Video clips, Charts, Live specimen of a representative.

	5.2 Explain the economic roles of Coelenterates (e.g., jellyfish, corals) in marine ecosystems, their use in aquaculture, and their significance in tourism and pharmaceuticals. 5.3 Explain the economic value of Platyhelminthes, particularly tapeworms and flukes, in terms of parasitic diseases in livestock and humans, as well as their use in biological control. 5.4 Explain the economic importance of Nematoda (e.g., root-knot nematodes, hookworms) in agriculture as pests, and their role in biological control of pests and soil aeration. 5.5 Explain the economic significance of Annelids, such as earthworms, in agriculture for soil fertility and their use in composting and organic farming.	environmental studies. • Discuss the economic roles of Coelenterates (e.g., jellyfish, corals) in marine ecosystems, their use in aquaculture, and their significance in tourism and pharmaceuticals. • Discuss the economic value of Platyhelminthes, particularly tapeworms and flukes, in terms of parasitic diseases in livestock and humans, as well as their use in biological control. • Describe the economic importance of Nematoda (e.g., root-knot nematodes, hookworms) in agriculture as pests, and their role in biological control of pests and soil aeration. • Explain the economic		field or lab, observing their role in disease transmission and ecological monitoring. • Examine the role of Coelenterates in the marine ecosystem and aquaculture, focusing on their contributions to marine biodiversity and tourism. • Conduct a field survey to assess the economic impact of Platyhelminthes on livestock health and public health through the transmission of diseases. • Identify nematodes in soil or plant samples, explaining their economic importance as	Protozoa in the field or lab, observing their role in disease transmission and ecological monitoring. • Examine the role of Coelenterates in the marine ecosystem and aquaculture, focusing on their contributions to marine biodiversity and tourism. • Conduct a field survey to assess the economic impact of Platyhelminthes on livestock health and public health through the transmission	
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	5.6 Explain the economic value of Arthropoda, including insects (e.g., bees, silkworms), crustaceans (e.g., shrimp, crabs), and arachnids (e.g., spiders), for pollination, food production, biological control, and industry (e.g., silk, honey). 5.7 Explain the economic importance of Mollusca, including gastropods (e.g., snails for food), bivalves (e.g., oysters, mussels for food and pearls), and their role in pharmaceuticals and biomonitoring	significance of Annelids, such as earthworms, in agriculture for soil fertility and their use in composting and organic farming. • Discuss the economic value of Arthropoda, including insects (e.g., bees, silkworms), crustaceans (e.g., shrimp, crabs), and arachnids (e.g., spiders), for pollination, food production, biological control, and industry (e.g., silk, honey). • Discuss the economic importance of Mollusca, including gastropods (e.g., snails for food), bivalves (e.g., oysters, mussels for food and pearls), and their role in pharmaceuticals and biomonitoring		pests in agriculture and biological control agents. • Assess the role of earthworms in enhancing soil health, observing their effect on soil structure, fertility, and organic matter decomposition. • Study the economic value of Arthropods (e.g., bees for pollination or silkworms for silk), and assess their role in ecosystem services and food production. • Observe the economic importance of Mollusca through hands-on activities such as harvesting pearls, studying	of diseases. • Identify nematodes in soil or plant samples, explaining their economic importance as pests in agriculture and biological control agents. • Assess the role of earthworms in enhancing soil health, observing their effect on soil structure, fertility, and organic matter decomposition. • Study the economic value of Arthropods (e.g., bees for pollination or silkworms for	
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				shellfish farming, or observing the use of mollusks in pharmaceutical applications.	silk), and assess their role in ecosystem services and food production. • Observe the economic importance of Mollusca through hands-on activities such as harvesting pearls, studying shellfish farming, or observing the use of mollusks in pharmaceutical applications.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

CELL BIOLOGY IN FOREST ECOSYSTEM

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: CELL BIOLOGY IN FOREST ECOSYSTEM	COURSE CODE: FET 111	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: 1 SEMESTER: 1	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to provide students with the knowledge and skills to understand the role of cell biology in plant growth, nutrient absorption, and ecosystem processes		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the role of the cell as the basic unit of life in forest ecosystems; 2.0 Know the processes of photosynthesis, respiration, transpiration, and translocation in forest plants, emphasizing their roles in energy production, water regulation, and nutrient transport; 3.0 Understand the different types of cell division (mitosis and meiosis) and their significance in forest plant growth, regeneration, and genetic diversity within forest ecosystems; 4.0 Know the specialized cells in plants, including their structure and function in processes like ion and water absorption, chemical reactions, and overall plant health in forest ecosystems; 5.0 Appreciate the integrated processes of plant growth, ion and water absorption, and how these processes contribute to forest health, productivity, and sustainability in dynamic environments.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: CELL BIOLOGY IN FOREST ECOSYSTEM			COURSE CODE: FET 112		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide students with the knowledge and skills to understand the role of cell biology in plant growth, nutrient absorption, and ecosystem processes						
GENERAL OBJECTIVE 1.0: Understand the role of the cell as the basic unit of life in forest 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 structure and function of the cell as the basic unit of life in forest ecosystems, including the components of the nucleus, cytoplasm, and their roles in maintaining cellular processes in plants. 1.2 Explain the different types of cell division (mitosis and meiosis) in plants, and their significance in growth, reproduction, and genetic diversity within forest	- Describe the structure and function of the cell as the basic unit of life in forest ecosystems, including the components of the nucleus, cytoplasm, and their roles in maintaining cellular processes in plants. - Discuss the different types of cell division (mitosis and meiosis) in plants, and their significance in	Textbooks, Weblinks, Whiteboard, Marker, Khan Academy, Coursera, Diagrams, Light microscopes, etc.	Identify and observe plant cells under a microscope, focusing on the nucleus, cytoplasm, and cell wall, and demonstrate an understanding of their functions in plant	Guide students to: Identify and observe plant cells under a microscope, focusing on the nucleus, cytoplasm, and cell wall, and demonstrate an understanding of their functions in plant physiology.	Local plant identification guides, Soil and forest condition guides, Potometers, Soil moisture meters and tensiometers, Dye or radioactive tracers, Thermometers, Living plant specimens, Soil samples, Field journal for

	ecosystems. 1.3 Explain the processes of photosynthesis, respiration, transpiration, and translocation in forest plants, emphasizing their roles in energy production, water regulation, and nutrient transport. 1.4 Explain the process of ion and water absorption in plants, focusing on how cells regulate water and nutrient uptake from the soil and how this affects forest growth and productivity. 1.5 Explain the role of specialized cells in forest plants, including their structure and function, and how they contribute to processes like growth, defense, and adaptation in forest ecosystems.	growth, reproduction, and genetic diversity within forest ecosystems. • Discuss the processes of photosynthesis, respiration, and translocation in forest plants, emphasizing their roles in energy production, water regulation, and nutrient transport. • Describe the process of ion and water absorption in plants, focusing on how cells regulate water and nutrient uptake from the soil and how this affects forest growth and productivity. • Discuss the role of specialized cells in forest plants, including their structure and function, and how they contribute to processes like growth, defense, and		physiology. • Demonstrate the processes of cell division by observing mitosis and meiosis in prepared slides of plant tissue and explaining their significance in plant growth and reproduction. • Conduct experiments to observe the processes of photosynthesis and respiration in plants, such as measuring oxygen production and carbon dioxide uptake, and explaining how these processes	• Demonstrate the processes of cell division by observing mitosis and meiosis in prepared slides of plant tissue and explaining their significance in plant growth and reproduction. • Conduct experiments to observe the processes of photosynthesis and respiration in plants, such as measuring oxygen production and carbon dioxide uptake, and explaining how these processes sustain forest growth. • Measure the rates of	documenting observations, Shovels or trowels.
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		adaptation in forest ecosystems.		sustain forest growth. • Measure the rates of transpiration and water absorption in plants using practical techniques like potometers and soil moisture sensors, and analyze how these processes affect forest water balance. • Perform a practical investigation on translocation in plants by using methods such as radioactive tracers or dye injection to trace the	transpiration and water absorption in plants using practical techniques like potometers and soil moisture sensors, and analyze how these processes affect forest water balance. • Perform a practical investigation on translocation in plants by using methods such as radioactive tracers or dye injection to trace the movement of nutrients through the plant vascular system.	
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				movement of nutrients through the plant vascular system.		
General Objective 2.0: Know the processes of photosynthesis, respiration, transpiration, and translocation in forest plants, emphasizing their roles in energy production, water regulation, and nutrient transport.						
4-6	2.1 Explain the process of photosynthesis in forest plants, focusing on the role of chlorophyll, light energy, carbon dioxide, and water in the production of glucose and oxygen. 2.2 Explain the process of respiration in forest plants, explaining how glucose is broken down in the presence of oxygen to produce ATP (energy), carbon dioxide, and water. 2.3 Define transpiration in forest plants, focusing on how water moves through the plant and evaporates through the stomata, and how this process helps in	- Describe the process of photosynthesis in forest plants, focusing on the role of chlorophyll, light energy, carbon dioxide, and water in the production of glucose and oxygen. - Describe the process of respiration in forest plants, explaining how glucose is broken down in the presence of oxygen to produce ATP (energy), carbon dioxide, and water. - Explain transpiration in forest plants, focusing on how water moves through the plant and evaporates through the stomata, and how	Textbooks, Weblinks, Whiteboard, Marker, Khan Academy, Coursera, Diagrams, Light microscopes, etc.	- Measure the rate of photosynthesis in forest plants by using a potometer or oxygen production method and analyze how light intensity or temperature influences photosynthetic rate. - Demonstrate plant respiration by using a respirometer to measure the consumption of oxygen or the release of	Guide students to: - Measure the rate of photosynthesis in forest plants by using a potometer or oxygen production method and analyze how light intensity or temperature influences photosynthetic rate. - Demonstrate plant respiration by using a respirometer to measure the consumption of oxygen or	Local plant identification guides, Soil and forest condition guides, Potometers, Soil moisture meters and tensiometers, Dye or radioactive tracers, Thermometers, Living plant specimens, Soil samples Field journal for documenting observations, Shovels or trowels.

	nutrient uptake, cooling, and water regulation. 2.4 Explain the process of translocation in plants, describing how water, minerals, and sugars are transported through the phloem and xylem from roots to leaves and vice versa, ensuring balanced nutrient distribution. 2.5 Explain the interrelationship between photosynthesis, respiration, transpiration, and translocation in supporting the overall functioning of forest ecosystems, emphasizing how these processes work together to sustain plant health and growth	this process helps in nutrient uptake, cooling, and water regulation. - Describe the process of translocation in plants, describing how water, minerals, and sugars are transported through the phloem and xylem from roots to leaves and vice versa, ensuring balanced nutrient distribution. - Discuss the interrelationship between photosynthesis, respiration, transpiration, and translocation in supporting the overall functioning of forest ecosystems, emphasizing how these processes work together to sustain plant health and growth		carbon dioxide in a plant over time. - Measure the rate of transpiration using a potometer to observe how environmental factors (e.g., humidity, temperature) affect water movement through the plant. - Observe the process of translocation in plants by using a dye injection technique or radioactive tracers to trace the movement of nutrients from roots to leaves through xylem and phloem.	the release of carbon dioxide in a plant over time. - Measure the rate of transpiration using a potometer to observe how environmental factors (e.g., humidity, temperature) affect water movement through the plant. - Observe the process of translocation in plants by using a dye injection technique or radioactive tracers to trace the movement of nutrients from roots to leaves through xylem and	
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				• Perform experiments to analyze the interaction between transpiration and photosynthesis , observing how water loss influences photosynthetic efficiency and plant hydration. • Monitor and record the effects of different environmental factors (e.g., soil moisture, light intensity, temperature) on the processes of photosynthesis , respiration, transpiration, and translocation in forest	phloem. • Perform experiments to analyze the interaction between transpiration and photosynthesis , observing how water loss influences photosynthetic efficiency and plant hydration. • Monitor and record the effects of different environmental factors (e.g., soil moisture, light intensity, temperature) on the processes of photosynthesis , respiration, transpiration, and translocation	
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				plants.	in forest plants.	
General Objective 3.0: Understand the different types of cell division (mitosis and meiosis) and their significance in forest plant growth, regeneration, and genetic diversity within forest ecosystems.						
7-9	3.1 Define Mitosis and Meiosis, explaining the stages involved in each type of cell division and their key differences in terms of chromosome number and genetic variation. 3.2 Explain the significance of Mitosis in forest plants, focusing on its role in growth, tissue regeneration, and asexual reproduction in forest ecosystems. 3.3 Explain the role of Meiosis in forest plant reproduction, particularly its contribution to genetic diversity and the production of haploid cells (e.g., spores in ferns, pollen and ovules in seed plants). 3.4 Compare Mitosis and	- Discuss Mitosis and Meiosis, explaining the stages involved in each type of cell division and their key differences in terms of chromosome number and genetic variation. - Discuss the significance of Mitosis in forest plants, focusing on its role in growth, tissue regeneration, and asexual reproduction in forest ecosystems. - Describe the role of Meiosis in forest plant reproduction, particularly its contribution to genetic diversity and the production of haploid cells (e.g., spores in ferns, pollen and ovules in seed plants). - Compare Mitosis and	Textbooks Weblinks Whiteboard Marker Khan Academy Coursera Diagrams Light microscopes	- Observe the stages of Mitosis and Meiosis in plant cells using microscopic slides of plant root tips (for Mitosis) and pollen grains or flower anthers (for Meiosis). - Conduct an experiment to study mitotic cell division in actively growing tissues (e.g., root tips) and calculate the mitotic index as a measure of cell division rate. - Examine plant cell divisions	Guide students to: - Observe the stages of Mitosis and Meiosis in plant cells using microscopic slides of plant root tips (for Mitosis) and pollen grains or flower anthers (for Meiosis). - Conduct an experiment to study mitotic cell division in actively growing tissues (e.g., root tips) and calculate the mitotic index as a measure of cell division rate. - Examine plant	Local plant identification guides, Soil and forest condition guides, Potometers, Soil moisture meters and tensiometers, Dye or radioactive tracers, Thermometers, Living plant specimens, Soil samples, Field journal for documenting observations, Shovels or trowels.

	Meiosis in terms of their functions, processes, and outcomes, and discuss how they contribute to forest plant development and adaptation in changing environments. 3.5 Explain the role of both Mitosis and Meiosis in forest regeneration, focusing on how mitotic division leads to clonal growth and how meiotic division ensures genetic variation and evolutionary potential within forest plant populations	Meiosis in terms of their functions, processes, and outcomes, and discuss how they contribute to forest plant development and adaptation in changing environments. • Discuss the role of both Mitosis and Meiosis in forest regeneration, focusing on how mitotic division leads to clonal growth and how meiotic division ensures genetic variation and evolutionary potential within forest plant populations		under different environmental conditions, such as light, temperature, and water availability, and observe how these factors affect growth and regeneration. • Perform an activity to demonstrate genetic variation in forest plants through meiosis, such as crossbreeding experiments or observing genetic markers in different plant populations. • Track and compare the rates of asexual reproduction	cell divisions under different environmental conditions, such as light, temperature, and water availability, and observe how these factors affect growth and regeneration. • Perform an activity to demonstrate genetic variation in forest plants through meiosis, such as crossbreeding experiments or observing genetic markers in different plant populations. • Track and compare the rates of asexual	
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				(via mitosis) and sexual reproduction (via meiosis) in a forest ecosystem, observing how these processes contribute to forest regeneration and biodiversity. • Create a report summarizing observations of mitotic and meiotic divisions in various forest plant species, analyzing their roles in forest growth and genetic diversity	reproduction (via mitosis) and sexual reproduction (via meiosis) in a forest ecosystem, observing how these processes contribute to forest regeneration and biodiversity. • Create a report summarizing observations of mitotic and meiotic divisions in various forest plant species, analyzing their roles in forest growth and genetic diversity	
General Objective 4.0: Know the specialized cells in plants, including their structure and function in processes like ion and water absorption, chemical reactions, and overall plant health in forest ecosystems.						
10-12	4.1 Explain the structure and function of specialized cells in	• Describe the structure and function of specialized cells in	Textbooks, Weblinks, Whiteboard,	• Observe specialized plant cells such	Guide students to: • Observe specialized	Local plant identification guides,

	plants, focusing on root hair cells, xylem, phloem, guard cells, and trichomes, and their roles in ion and water absorption, nutrient transport, and gas exchange.	plants, focusing on root hair cells, xylem, phloem, guard cells, and trichomes, and their roles in ion and water absorption, nutrient transport, and gas exchange.	Marker, Khan Academy, Coursera, Diagrams, Light microscopes, etc.	as root hair cells, xylem, phloem, and guard cells under a microscope, and describe their structure and function in plant processes.	plant cells such as root hair cells, xylem, phloem, and guard cells under a microscope, and describe their structure and function in plant processes.	Soil and forest condition guides, Potometers, Soil moisture meters and tensiometers, Dye or radioactive tracers, Thermometers, Living plant specimens, Soil samples, Field journal for documenting observations, Shovels or trowels.
4.2	Explain the role of root hair cells in water and nutrient uptake, detailing how osmosis and active transport function in the absorption of water and essential ions in forest plants.	Describe the role of root hair cells in water and nutrient uptake, detailing how osmosis and active transport function in the absorption of water and essential ions in forest plants.		Measure the effect of environmental factors such as light, temperature, and humidity on guard cells and stomatal opening in plant leaves, demonstrating their role in gas exchange and transpiration.	Measure the effect of environmental factors such as light, temperature, and humidity on guard cells and stomatal opening in plant leaves, demonstrating their role in gas exchange and transpiration.	
4.3	Explain the function of xylem and phloem in the transportation of water, minerals, and food throughout the plant, highlighting their significance in forest growth and productivity.	Discuss the function of xylem and phloem in the transportation of water, minerals, and food throughout the plant, highlighting their significance in forest growth and productivity.		Conduct an experiment to demonstrate water absorption in root hair cells, using dye	Conduct an experiment to demonstrate water absorption in root hair cells,	
4.4	Explain the role of guard cells in stomatal regulation, controlling gas exchange and water loss through	Discuss the role of guard cells in stomatal regulation, controlling gas exchange and water loss through transpiration, and				

	transpiration, and their adaptation to environmental conditions in forest ecosystems. 4.5 Explain the involvement of specialized cells in chemical reactions within plant systems, including their participation in photosynthesis, respiration, and nitrogen fixation within forest ecosystems	their adaptation to environmental conditions in forest ecosystems. • Discuss the involvement of specialized cells in chemical reactions within plant systems, including their participation in photosynthesis, respiration, and nitrogen fixation within forest ecosystems		tracing or potometer techniques to visually track water movement through plant cells. • Examine the role of xylem and phloem by conducting a dye injection experiment to trace the movement of nutrients and water through the plant, highlighting their function in nutrient transport. • Perform a chemical reaction experiment in which students observe photosynthesis or respiration in plants,	using dye tracing or potometer techniques to visually track water movement through plant cells. • Examine the role of xylem and phloem by conducting a dye injection experiment to trace the movement of nutrients and water through the plant, highlighting their function in nutrient transport. • Perform a chemical reaction experiment in which students observe photosynthesis or respiration	
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				demonstrating how specialized cells are involved in these essential biological processes. - Record the absorption of ions by plant roots, - Analyze the absorption of ions by plant roots using laboratory equipment such as ion-selective electrodes or spectrophotometry to measure ion concentration in plant tissues.	in plants, demonstrating how specialized cells are involved in these essential biological processes. - Record the absorption of ions by plant roots, - Analyze the absorption of ions by plant roots using laboratory equipment such as ion-selective electrodes or spectrophotometry to measure ion concentration in plant tissues.	
General Objective 5.0: Appreciate the integrated processes of plant growth, ion and water absorption, and how these processes contribute to forest health, productivity, and sustainability in dynamic environments						
13-15	5.1 Explain the relationship between plant growth and water	Describe the relationship between plant growth and	Textbooks, Weblinks, Whiteboard,	Demonstrate water absorption in	Guide students to: Demonstrate water	Local plant identification guides,

	absorption, focusing on how water is essential for cellular functions, nutrient transport, and photosynthesis in plants.	water absorption, focusing on how water is essential for cellular functions, nutrient transport, and photosynthesis in plants.	Marker, Khan Academy, Coursera, Diagrams, Light microscopes, etc.	plants using a potometer to measure the rate of water uptake and explain its relationship with transpiration and plant growth.	absorption in plants using a potometer to measure the rate of water uptake and explain its relationship with transpiration and plant growth.	Soil and forest condition guides, Potometers, Soil moisture meters and tensiometers, Dye or radioactive tracers, Thermometers, Living plant specimens, Soil samples, Field journal for documenting observations, Shovels or trowels.
5.2	Explain the process of ion absorption in plants, explaining how root cells actively absorb essential ions such as nitrogen, phosphorus, and potassium, and their role in plant metabolism and growth.	Discuss the process of ion absorption in plants, explaining how root cells actively absorb essential ions such as nitrogen, phosphorus, and potassium, and their role in plant metabolism and growth.		Observe ion absorption in plant roots by conducting an experiment with ion-selective electrodes or spectrophotometry to track the movement and concentration of ions in the plant tissues.	Observe ion absorption in plant roots by conducting an experiment with ion-selective electrodes or spectrophotometry to track the movement and concentration of ions in the plant tissues.	
5.3	Explain the role of water in plant growth, including its function in maintaining turgor pressure, nutrient uptake, and as a medium for biochemical reactions in plant cells.	Describe the role of water in plant growth, including its function in maintaining turgor pressure, nutrient uptake, and as a medium for biochemical reactions in plant cells.		Investigate the impact of environmental factors (e.g., light, humidity,	Investigate the impact of environmental factors (e.g., light,	
5.4	Explain the integrated role of transpiration in the movement of water and nutrients within the plant, and how	Discuss the integrated role of transpiration in the movement of water and nutrients within the plant, and				

	stomatal regulation affects water loss and gas exchange. 5.5 Explain how ion absorption and water uptake are interconnected, and how the root system, vascular tissues (xylem and phloem), and environmental factors contribute to overall plant health and forest productivity	how stomatal regulation affects water loss and gas exchange. Describe how ion absorption and water uptake are interconnected, and how the root system, vascular tissues (xylem and phloem), and environmental factors contribute to overall plant health and forest productivity		temperature) on water and ion absorption in plants by setting up controlled experiments and monitoring stomatal opening and transpiration rate. - Measure plant growth in response to varying water availability and nutrient levels, documenting how water and ion absorption affect leaf expansion, root development, and overall biomass production. - Examine the interaction	humidity, temperature) on water and ion absorption in plants by setting up controlled experiments and monitoring stomatal opening and transpiration rate. - Measure plant growth in response to varying water availability and nutrient levels, documenting how water and ion absorption affect leaf expansion, root development, and overall biomass production. - Examine the	
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				between water and nutrient movement in plants by injecting a dye or radioactive tracers into the soil to visualize and measure translocation of both water and nutrients.	interaction between water and nutrient movement in plants by injecting a dye or radioactive tracers into the soil to visualize and measure translocation of both water and nutrients.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

FOREST GEOGRAPHY AND ENVIRONMENTAL MAPPING

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST GEOGRAPHY AND ENVIRONMENTAL MAPPING	COURSE CODE: FET 113	CONTACT HOURS: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 1 HOUR/WEEK
YEAR: 1 SEMESTER: 1	PRE-REQUISITE:	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is designed to provide the students with the knowledge and skills of the geography and environmental mapping.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the physical features, vegetation and climatic zones of Nigeria; 2.0 Understand the outline and the demography of Nigeria; 3.0 Know the measurement of climatic factors; 4.0 Know the geographic information systems (GIS) and remote sensing technologies to forest mapping and resource management.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: FOREST GEOGRAPHY AND ENVIRONMENTAL MAPPING			COURSE CODE: FET 113		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 1 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide the students with the knowledge and skills of the geography and environmental mapping.						
GENERAL OBJECTIVE 1.0: Know the physical features, vegetation and climatic zones of Nigeria						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain map of Nigeria showing important physical features e.g. hills, highland, rivers, lakes. 1.2 Explain map of Nigeria clearly indicating all the vegetation zones (e.g. Mangrove forest, Freshwater swamps, Montane forest, Forest Derived Savannah etc.) 1.3 Explain the influence of vegetation zones on vegetative distribution in Nigeria	- Describe map of Nigeria showing important physical features e.g. hills, highland, rivers, lakes. - Describe map of Nigeria clearly indicating all the vegetation zones (e.g. Mangrove forest, Freshwater swamps, Montane forest, Forest Derived Savannah etc.) - Discuss the influence of vegetation zones	Textbooks, Journals, Maps, PowerPoint presentations, GIS Software, Reports, Charts, Documentaries, Climate data, Topographic Maps, etc.	- Draw a map of Nigeria showing important features e.g. physical hills, highland, rivers, lakes etc - Label a map of Nigeria clearly indicating all the vegetation zones e.g: ✓ Mangrove forest ✓ Freshwater swamps ✓ Montane forest ✓ Forest	Guide students to: - Draw a map of Nigeria showing important features e.g. physical hills, highland, rivers, lakes etc. - Label a map of Nigeria clearly indicating all the vegetation zones e.g: ✓ Mangrove forest ✓ Freshwater swamps ✓ Montane forest ✓ Forest	Topographic, Maps, Vegetation, Sampling kits, Climatic data, Loggers, Soil testing kits, Field notebooks and clipboards, GPS devices, Soil augers, Aerial photography or Satellite imagery, Ranging Poles, Field Guides.

		on vegetative distribution in Nigeria				
General Objective 2.0: Know the outline and the demography of Nigeria						
4-7	2.1 List the major tribal groupings in Nigeria 2.2 Describe map of Nigeria showing areas occupied by the groupings mentioned in 2.1above 2.3 Explain the farming habits and traditions of the major tribal groups in Nigeria and the influence of the farming traditions on Forestry	- Outline the major tribal groupings in Nigeria - Describe map of Nigeria showing areas occupied by the groupings mentioned in 2.1above - Outline the farming habits and traditions of the major tribal groups in Nigeria and the influence of the farming traditions on Forestry	Textbooks, Journals, Maps, PowerPoint presentations, GIS Software, Reports, Charts, Documentaries, Climate data, Topographic maps, etc.	Draw a map of Nigeria indicating areas occupied by the major tribal grouping in Nigeria	Guide students to draw a map of Nigeria indicating areas occupied by the major tribal grouping in Nigeria	Topographic maps, Vegetation Sampling Kits, Climatic data, Loggers, Soil testing kits, Field notebooks, Clipboards, GPS devices, Soil augers, Aerial photography or Satellite imagery, Ranging poles, Field guides.
General Objective 3.0: Know the measurement of climatic factors						
8-11	3.1 List instruments in measurement of climatic factors 3.2 Explain how to measure climatic factors using the instruments 3.3 Explain how to	- Identify instruments in measurement of climatic factors - Describe how to measure climatic factors using the instruments	Textbooks, Journals, Maps, PowerPoint presentations, GIS Software, Reports, Charts,	- Measure climatic factors using the appropriate instruments - Demonstrate how to maintain weather measuring	Guide students to: - Measure climatic factors using the appropriate instruments - Demonstrate how to maintain	Topographic maps, Vegetation, Sampling kits, Climatic data, Loggers, Soil testing kits, Field notebooks,

	improvise when necessary some of the measuring instruments listed in 3.1 above. 3.4 Explain how to maintain the instruments listed in 3.1	- Describe how to improvise when necessary some of the measuring instruments listed in 3.1 above. - Describe how to maintain the instruments listed in 3.1	Documentaries, Climate data, Topographic maps, etc.	instruments Demonstrate how to improvise weather measuring instruments	weather measuring instruments Demonstrate how to improvise weather measuring instruments	and clipboards, GPS devices, Soil augers, Aerial photography or Satellite imagery, Ranging poles, Field guides.
General Objective 4.0: Know the geographic information systems (GIS) and remote sensing technologies to forest mapping and resource management						
12-15	4.1 Explain the principles and applications of Geographic Information Systems (GIS) in forest mapping 4.2 Explain the role of remote sensing technologies in monitoring and managing forest resources. 4.3 Identify the different types of GIS and remote sensing data used in forest management. 4.4 Explain how GIS and remote sensing contribute to	- Discuss the principles and applications of Geographic Information Systems (GIS) in forest mapping - Describe the role of remote sensing technologies in monitoring and managing forest resources. - Describe the different types of GIS and remote sensing data used in forest management. - Discuss how GIS	Textbooks, Journals, Maps, PowerPoint presentations, GIS software, Reports, Charts, Documentaries, Climate data, Topographic maps.	- Demonstrate the use of GIS software for forest mapping and resource analysis. - Perform remote sensing data interpretation to assess forest health and land cover changes. - Apply GIS tools to create and manage forest resource maps and databases. - Conduct a field-based exercise using remote sensing	Guide students to: - Demonstrate the use of GIS software for forest mapping and resource analysis. - Perform remote sensing data interpretation to assess forest health and land cover changes. - Apply GIS tools to create and manage forest resource maps and databases. - Conduct a field-based exercise using remote	Topographic maps, Vegetation, Sampling kits, Climatic data, Loggers, Soil testing kits, Field notebooks and Clipboards, GPS devices, Soil augers, Aerial photography or Satellite imagery, Ranging poles, Field guides.

	sustainable forest management and conservation efforts.	and remote sensing contribute to sustainable forest management and conservation efforts.		technologies to monitor forest conditions.	sensing technologies to monitor forest conditions.	
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COURSE ASSESSMENT**Course Work: 10%****Tests: 10%****Practical 40****Examination: 40%****Total: 100%**

INTRODUCTION TO FORESTRY

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: INTRODUCTION TO FORESTRY	COURSE CODE: FET 114	CONTACT HOURS: 2HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 1 HOUR/WEEK
YEAR: 1 SEMESTER: 1	PRE-REQUISITE:	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is aimed at introducing the student to the scope of forestry and environmental technology as a profession		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the benefits of forestry and environmental technology and their contributions to the national economy; 2.0 Know the Structure, organization and administration of forestry and environmental technology in Nigeria; 3.0 Understand forestry as a major land user: 4.0 Know the characteristics and classification of common forest tree species in Nigeria; 5.0 Understand the principles of forest conservation and sustainable management.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: INTRODUCTION TO FORESTRY			COURSE CODE: FET 114		CONTACT HOURS: 2HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 2 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is aimed at introducing the student to the scope of forestry and environmental technology as a profession						
GENERAL OBJECTIVE 1.0: Know the benefits of forestry and environmental technology and their contributions to the national economy						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Learning Resources	Specific Learning Outcome	Teacher’s Activities	Learning Resources
1-3	1.1 Define forest and forestry 1.2 List the direct and indirect benefits of forestry 1.3 Classify the benefits enumerated in 1.2 above into minor and major 1.4 Explain the following common forestry and environmental terms: i. Advance growth ii. Beating up iii. Compartment iv. Coppice v. Coppice with standard vi. Silviculture	• Explain forest and forestry • Outline the direct and indirect benefits of forestry • Classify the benefits enumerated in 1.2 above into minor and major • Discuss the following common forestry and environmental terms: — Advance growth — Beating up — Compartment — Coppice — Coppice with standard	Marker, Marker board, Video clips, Journal, Textbooks , First aid kit, Projector, Internet, etc.	•Visit a nearby forest reserve •Record five (5) direct and five (5) indirect benefits observed •Map and label five (5) major forest reserves on a vegetation map of Nigeria •Collect ten (10) forestry terms from the field visit and •Prepare a brief glossary •Collect and label three (3) local forest	Guide students to: •Visit a nearby forest reserve •Record five (5) direct and five (5) indirect benefits observed •Map and label five (5) major forest reserves on a vegetation map of Nigeria •Collect ten (10) forestry terms from the field visit and •Prepare a brief glossary	Marker, Marker board, Journals, Textbooks, Projector, Internet, First aid kit, Field notebooks, Map of Nigeria (vegetation zones), Collection bags, specimen containers Camera, Smartphone.

	vii. Mensuration viii. Grave Yard ix. Field laboratory x. Eco system xi. Ecology xii. Nature, Climate, etc. 1.6 Describe the location of major forest reserves/estates by vegetation types and their distribution according to states using appropriate map. 1.7 Describe the following terms: i. Erosion sites ii. Mine spoils to seepit-pros iii. Forest reserves iv. Wood based industries v. Shelterbelt vi. Game Reserves vii. Plantation viii. National Parks ix. Mangrove forest	— Silviculture — Mensuration — Grave Yard — Field laboratory — Eco system — Ecology — Nature, Climate, etc. • Describe the location of major forest reserves/estates by vegetation types and their distribution according to states using appropriate map. • Describe the following terms: — Erosion sites — Mine spoils to seepit-pros — Forest reserves — Wood based industries — Shelterbelt — Game Reserves — Plantation — National Parks — Mangrove forest	products •Record the source tree and community benefit	•Collect and label three (3) local forest products •Record the source tree and community benefit	
General Objective 2.0: Know the structure, organization and administration of forestry in Nigeria					

4-6	2.1 Describe the relationship among the various forestry services in Nigeria 2.2 Describe the hierarchical organization of the Federal, State, Local Government Forestry Services and Forestry Research institutes as well as the functions of each 2.3 List forestry education and training institutions in Nigeria	• Explain the relationship among the various forestry services in Nigeria • Discuss the hierarchical organization of the Federal, State, Local Government Forestry Services and Forest Research institutes as well as the functions of each • Highlight forestry education and training institutions in Nigeria	Marker, Marker board, Computer system, Journal, Textbooks, First aid kit, Projector, Internet, Organogram, etc.	• Draw and label the organogram of the Federal and one (1) State Forestry Service • Identify forestry education and training institutions in Nigeria with their locations and qualifications • Prepare a table comparing functions of Federal, State and Local Government Forestry Services	Guide students to: • Draw and label the organogram of the Federal and one (1) State Forestry Service • Identify forestry education and training institutions in Nigeria with their locations and qualifications • Prepare a table comparing functions of Federal, State and Local Government Forestry Services	Marker, Marker board, Journal, Textbook, First aid kit, Projector, Internet, Computer system, Organogram, Charts, Computer etc.
General Objective 3.0: Understand forestry as a major land user						
7-9	5.1 Explain various land uses in Nigeria: - Agriculture - Forestry - Infrastructural development e.g urbanizations, industries, dams, roads etc.	• Discuss various land uses in Nigeria: — Agriculture — Forestry — Infrastructural development e.g	Marker, Marker board, Computer, systems, Journal, Textbooks, First aid kit, Projector, Internet, etc.	• Map and shade four (4) land use types on a Nigeria land use map • Record area and competing uses • Draw and label a simple agroforestry	Guide students to: • Map and shade four (4) land use types on a Nigeria land use map • Record area and competing uses	Marker, Marker board, Journals, Textbooks, Projector, Internet, First aid kit, Field notebooks, Land use maps of

5.2 Compare the land demands of the users in 3.1 above 5.3 Explain the concept of multiple land use with relevant example e.g; Types of Agro-forestry systems 5.4 Explain the concept of carbon and climate change 5.5 Explain the following terms as they relate to 3.4: - Ozone layer depletion - Green House Gases (GHG) Emission - Ocean rise - Irregular rainfall pattern - Drought - Extreme temperature - Reduction of Emission and Destruction of forest Resources (REDD +) etc	urbanizations, industries, dams, roads etc. - Compare the land demands of the users in 3.1 above - Discuss the concept of multiple land use with relevant - Explain the concept of carbon and climate change - Explain the following terms as they relate to 3.4: - Ozone layer depletion - Green House Gases (GHG) Emission - Ocean rise - Irregular rainfall pattern - Drought - Extreme temperature - Reduction of Emission and Destruction of forest Resources (REDD +) etc		system diagram for a 1-hectare plot - Collect deforestation data for one (1) Nigerian state - Prepare a one-page summary - Survey two (2) REDD+ projects in Nigeria - Record name, location and stated benefits	- Draw and label a simple agroforestry system diagram for a 1-hectare plot - Collect deforestation data for one (1) Nigerian state - Prepare a one-page summary - Survey two (2) REDD+ projects in Nigeria - Record name, location and stated benefits	Nigeria, Computer system, Coloured pencils/markers
General Objective 4.0: Know the characteristics and classification of common forest tree species in Nigeria					

10–12	4.1 Describe the major ecological zones of Nigeria and the forest tree species associated with each zone 4.2 Describe the morphological characteristics used for tree identification: leaf shape, bark texture, growth form, fruit and flower type 4.3 Explain the classification of Nigerian forest tree species into timber trees, non-timber forest product (NTFP) species and multipurpose trees 4.4 List at least ten (10) commercially important Nigerian timber tree species with their local and botanical names 4.5 Explain common non-timber forest products (NTFPs) and their source species (e.g. shea butter — <i>Vitellaria paradoxa</i>; locust bean — <i>Parkia biglobosa</i>) 4.6 Describe the ecological	• Discuss the major ecological zones of Nigeria and the forest tree species associated with each zone • Describe the morphological characteristics used for tree identification: leaf shape, bark texture, growth form, fruit and flower type • Discuss the classification of Nigerian forest tree species into timber trees, non-timber forest product (NTFP) species and multipurpose trees • Discuss commercially important Nigerian timber tree species with their local and botanical names • Describe common non-timber forest products (NTFPs) and their source species (e.g. shea butter — <i>Vitellaria paradoxa</i>; locust bean — <i>Parkia</i>	Marker / Marker board Video clips Journals / Textbooks Projector Internet First aid kit Tree identification guide / field key Herbarium specimens or photographs Map of Nigerian ecological zones	• Collect samples from five (5) tree species • Record local name, botanical name, family and ecological zone • Prepare a labelled herbarium specimen of three (3) tree species • Construct a table of ten (10) Nigerian timber species with names, uses and conservation status • Conduct a market survey of locally sold NTFPs • Record product, species, price and use	Guide students to: • Collect samples from five (5) tree species • Record local name, botanical name, family and ecological zone • Prepare a labelled herbarium specimen of three (3) tree species • Construct a table of ten (10) Nigerian timber species with names, uses and conservation status • Conduct a market survey of locally sold NTFPs • Record product, species, price and use	Marker, Marker board, Journals, Textbooks, Projector, Internet, First aid kit, Field notebooks, Tree identification field guide / dichotomous key, Herbarium mounting materials (mounting paper, press, tape), Collection bags, Gloves Camera, Smartphone
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	and economic importance of selected indigenous tree species	biglobosa) • Explain the ecological and economic importance of selected indigenous tree species				
General Objective 5.0: Understand the principles of forest conservation and sustainable management						
13–15	5.1 Define conservation 5.2 Explain conservation importance in forest management 5.3 Distinguish between preservation, conservation and sustainable utilisation of forest resources 5.4 Explain the causes and consequences of deforestation and forest degradation in Nigeria 5.5 Describe strategies for forest conservation: i. Establishment and management of forest reserves and protected areas ii. Afforestation and reforestation programmes iii. Community-based forest management (CBFM)	• Explain conservation and its importance in forest management • Distinguish between preservation, conservation and sustainable utilisation of forest resources • Discuss the causes and consequences of deforestation and forest degradation in Nigeria • Describe strategies for forest conservation: i. Establishment and management of forest reserves and protected areas ii. Afforestation and reforestation programmes iii. Community-based forest management	Marker / Marker board Video clips Journals / Textbooks Projector Internet First aid kit Deforestation data / maps Nigerian National Forest Policy document FSC/PEFC certification guides	• Visit a degraded site • Record evidence of degradation, causes and one recommended intervention • Prepare a reforestation plan for a 0.5-hectare plot with species, spacing and maintenance schedule • Write a one-page policy brief on one (1) Nigerian forest conservation challenge • Participate in a CBFM stakeholder role-play • Present a	• Visit a degraded site • Record evidence of degradation, causes and one recommended intervention • Prepare a reforestation plan for a 0.5-hectare plot with species, spacing and maintenance schedule • Write a one-page policy brief on one (1) Nigerian forest conservation challenge • Participate in a	Marker, Marker board, Journals, Textbooks, Projector, Internet, First aid kit, Field notebooks, Deforestation maps and satellite images, Nigerian National Forest Policy document, Reforestation planning template, Role-play scenario cards

	iv. Forest certification schemes (e.g. FSC, PEFC) 5.6 Explain the concept of sustainable forest management (SFM) and its key principles 5.7 Describe relevant national and international policy frameworks for forest conservation: i. Nigerian National Forest Policy ii. Convention on Biological Diversity (CBD) iii. United Nations Forum on Forests (UNFF) iv. REDD+	(CBFM) iv. Forest certification schemes (e.g. FSC, PEFC) • Discuss the concept of sustainable forest management (SFM) and its key principles • Discuss relevant national and international policy frameworks for forest conservation: i. Nigerian National Forest Policy ii. Convention on Biological Diversity (CBD) iii. United Nations Forum on Forests (UNFF) iv. REDD+		conservation position for an assigned group	CBFM stakeholder role-play • Present a conservation position for an assigned group	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

INTRODUCTION TO SUSTAINABLE ENVIRONMENTAL MANAGEMENT

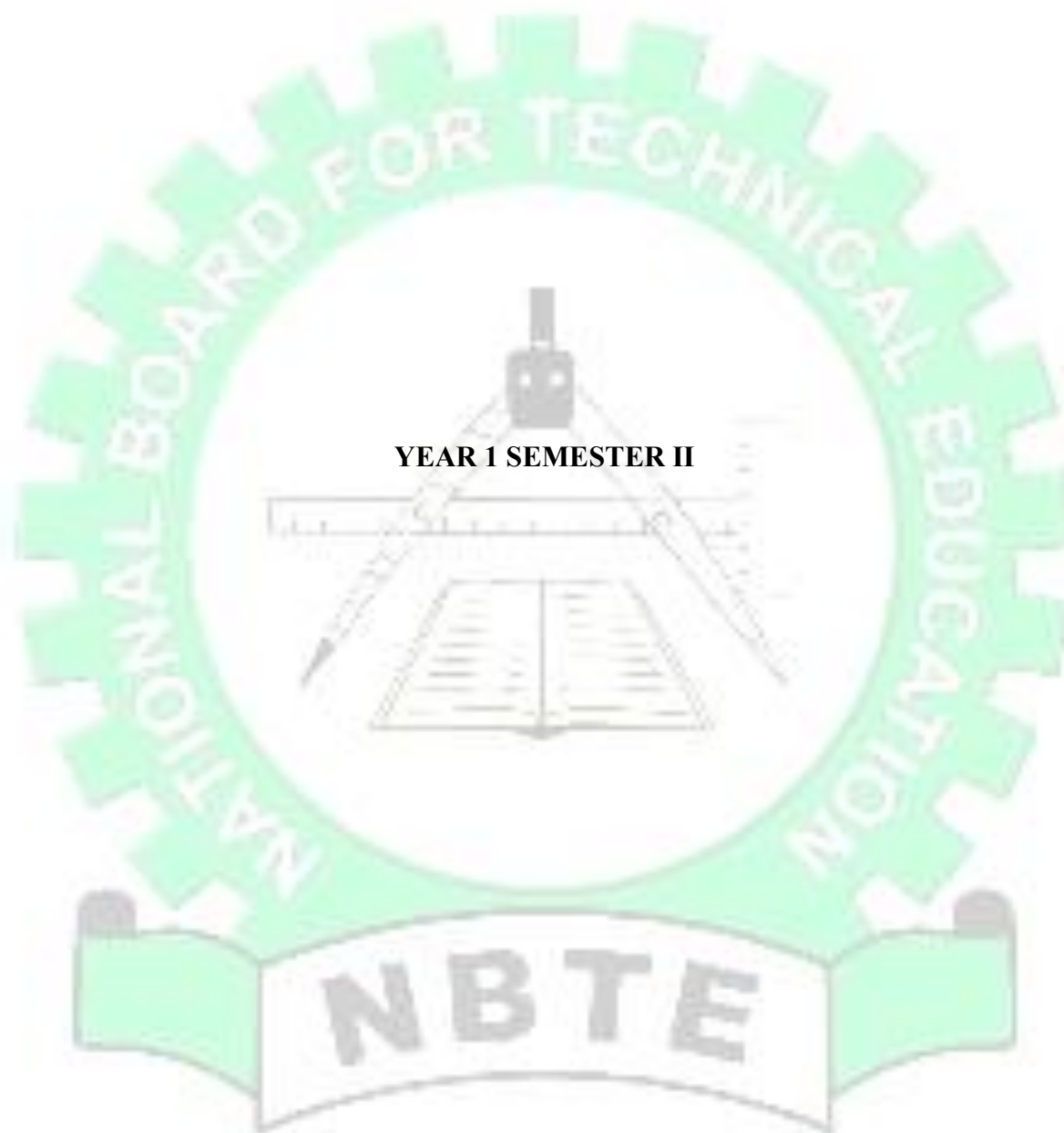
PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: INTRODUCTION TO SUSTAINABLE ENVIRONMENTAL MANAGEMENT	COURSE CODE: FET 115	CONTACT HOURS: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 2 HOURS/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 0 HOUR/WEEK
GOAL: This course is designed to equip students with knowledge of the scope, importance and multi -disciplinary nature of environmental management technology		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles and concepts of sustainable environmental management in forestry; 2.0 Understand the major environmental challenges affecting forest ecosystems, including deforestation, climate change, pollution, and biodiversity loss; 3.0 Understand the methods and practices used in the sustainable utilization, conservation, and management of environmental and forest resources; 4.0 Understand the role of individuals, communities, and institutions in promoting environmental sustainability.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: INTRODUCTION TO SUSTAINABLE ENVIRONMENTAL MANAGEMENT			COURSE CODE: FET 115		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORETICAL: 2 HOURS/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 0 HOURS	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge of the scope, importance and multi -disciplinary nature of environmental management technology						
GENERAL OBJECTIVE 1.0: Understand the principles and concepts of sustainable environmental management in 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 concept of sustainable environmental management. 1.2 Describe the principles of sustainability in forestry management. 1.3 Identify the components of forest ecosystems and their functions. 1.4 Explain the relationship between forestry and environmental conservation. State the importance of sustainable management of forest resources	• Discuss the concept of sustainable environmental management. • Describe the principles of sustainability in forestry management. • Discuss the components of forest ecosystems and their functions. • Discuss the relationship between forestry and environmental conservation. State the importance of	Textbooks, Lecture notes, Whiteboard markers, Projector, Videos, Charts, Case studies, Government policy documents, Newspapers, Journals, Posters and infographics, etc.			

		sustainable management of forest resources				
General Objective 2.0: Understand the major environmental challenges affecting forest ecosystems						
4-7	2.1 Define sustainable environmental management in forestry and explain its key principles. 2.2 List the major components of forest ecosystems and their roles in sustainability. 2.3 Explain the relationship between forestry practices and environmental conservation. 2.4 Explain the importance of sustainable management of forest resources for present and future needs	• Explain sustainable environmental management in forestry and explain its key principles. • Outline the major components of forest ecosystems and their roles in sustainability. • Describe the relationship between forestry practices and environmental conservation. • Discuss the importance of sustainable management of forest resources for present and future needs	Textbooks, Lecture notes, Whiteboard markers, Projector, Videos, Charts, Case studies, Government policy documents, Newspapers, Journals, Posters and infographics, etc.			
General Objective 3.0: Understand the methods and practices used in the sustainable utilization, conservation, and management of environmental and forest resources.						
8-11	2.1 Explain the major methods used in sustainable utilization of forest and environmental resources. 2.2 Explain the techniques applied in the conservation	• Discuss the major methods used in sustainable utilization of forest and environmental resources.	Textbooks, Lecture notes, Whiteboard markers, Projector, Videos, Charts,			

	of forest ecosystems and environmental resources. 2.3 Explain conservation practices applied in protecting forest ecosystems and biodiversity	- Describe the techniques applied in the conservation of forest ecosystems and environmental resources. - Discuss conservation practices applied in protecting forest ecosystems and biodiversity	Case studies, Government policy documents, Newspapers, Journals, Posters and infographics, etc.			
General Objective 4.0: Understand the role of individuals, communities, and institutions in promoting environmental sustainability						
12-15	4.1 Define environmental sustainability and explain its importance. 4.2 Identify the roles of individuals in promoting environmental sustainability. 4.3 Describe the contributions of communities to sustainable environmental practices. 4.4 Explain the functions of institutions in supporting environmental sustainability. 4.5 Explain the interaction between individuals, communities, and institutions in environmental	- Explain environmental sustainability and explain its importance. - Describe the roles of individuals in promoting environmental sustainability. - Describe the contributions of communities to sustainable environmental practices. - Discuss the functions of institutions in supporting environmental sustainability.	Textbooks, Lecture notes, Whiteboard markers, Projector, Videos, Charts, Case studies, Government policy documents, Newspapers, Journals, Posters and infographics, etc.			

	management. 4.6 Explain the challenges affecting effective participation in environmental sustainability efforts.	• Explain the interaction between individuals, communities, and institutions in environmental management. • Discuss the challenges affecting effective participation in environmental sustainability efforts.				
COURSE ASSESSMENT Course Work: 20% Tests: 20% Examination: 60% Total: 100%						



SURVEYING AND GEO-INFORMATICS IN FORESTRY I

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: SURVEYING AND GEO-INFORMATICS IN FORESTRY I	COURSE CODE: FET 121	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR
YEAR: 1 SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills to effectively use surveying and geo-informatics tools and techniques for forest management, mapping, and resource monitoring		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles and scope of Surveying and Geo-informatics; 2.0 Understand the use and methods of using linen and steel tapes in making linear measurements; 3.0 Understand the principles of measurement of angles with theodolites and perform such measurement; 4.0 Understand the principles of survey computations and plotting; 5.0 Know how to make measurements from maps, lay-out and engineering plans.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: SURVEYING AND GEO-INFORMATICS IN FORESTRY I			COURSE CODE: FET 121		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and skills to effectively use surveying and geo-informatics tools and techniques for forest management, mapping, and resource monitoring						
GENERAL OBJECTIVE 1.0: Understand the principles and scope of Surveying and Geo-informatics;						
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 key principles of surveying and geo-informatics, focusing on their roles in forest management and resource mapping. 1.2 Explain the scope of surveying in forestry, highlighting its applications in land boundary delineation, forest inventory, and environmental monitoring. 1.3 Describe the tools and technologies used in geo-informatics for forest data collection and analysis, including	- Discuss the key principles of surveying and geo-informatics, focusing on their roles in forest management and resource mapping. - Discuss the scope of surveying in forestry, highlighting its applications in land boundary delineation, forest inventory, and environmental monitoring. - Describe the tools	Textbooks, Scientific, Papers, Online resources, Visual Aids, GIS Software, ArcGIS, QGIS Surveying, Software, AutoCAD, Survey Pro, PowerPoint slides, etc.	- Demonstrate the use of surveying equipment such as compasses, theodolites, and GPS in forest mapping and boundary setting. - Apply geo-informatics tools like GIS software and remote sensing data to create maps and analyze spatial data related to forest resources. - Conduct a small-scale forest	Guide students to: - Demonstrate the use of surveying equipment such as compasses, theodolites, and GPS in forest mapping and boundary setting. - Apply geo-informatics tools like GIS software and remote sensing data to create maps and analyze spatial data related to forest resources. - Conduct a small-scale forest survey,	Total Station, Theodolite, GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring tapes, Chains, Ranging poles, Compass, Leveling rod, Plumb line, Topographic maps, Surveying field Guides, Portable

	GIS, remote sensing, and GPS. 1.4 Describe the relationship between surveying and geo-informatics in forest ecosystem management, emphasizing data integration for accurate decision-making. 1.5 Explain the legal and environmental implications of surveying and geo-informatics in forestry, including the impact of mismeasurement on forest land ownership and conservation efforts.	and technologies used in geo-informatics for forest data collection and analysis, including GIS, remote sensing, and GPS. • Examine the relationship between surveying and geo-informatics in forest ecosystem management, emphasizing data integration for accurate decision-making. • Discuss the legal and environmental implications of surveying and geo-informatics in forestry, including the impact of mismeasurement on forest land ownership and conservation		survey, using surveying techniques to determine land boundaries and map the terrain. • Use GPS devices for precise location tracking and mapping of key forest areas. • Generate basic spatial maps from survey data and interpret the results for practical forestry applications	using surveying techniques to determine land boundaries and map the terrain. • Use GPS devices for precise location tracking and mapping of key forest areas. • Generate basic spatial maps from survey data and interpret the results for practical forestry applications	weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.
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		efforts.				
General Objective 2.0: Understand the use and methods of using linen and steel tapes in making linear measurements;						
4-6	2.1 Explain the principles of using linen and steel tapes for linear measurements in forestry. 2.2 Explain the advantages and limitations of linen and steel tapes in different terrain types and measurement scenarios. 2.3 Explain the methods for ensuring accurate measurements with linen and steel tapes, including tensioning, stretching, and alignment. 2.4 Explain the role of accurate linear measurements in forest boundary setting, plantation mapping, and road construction. 2.5 Explain the proper care and maintenance of linen and steel tapes to ensure longevity and accuracy.	• Discuss the principles of using linen and steel tapes for linear measurements in forestry. • Discuss the advantages and limitations of linen and steel tapes in different terrain types and measurement scenarios. • Describe the methods for ensuring accurate measurements with linen and steel tapes, including tensioning, stretching, and alignment. • Discuss the role of accurate linear measurements in forest boundary	Textbooks, Scientific, Papers, Online resources, Visual Aids, GIS Software, ArcGIS, QGIS Surveying, Software, AutoCAD, Survey Pro, PowerPoint slides, etc.	• Demonstrate the correct procedure for using linen and steel tapes to measure distances in a forest environment. • Conduct measurements using linen and steel tapes across varying terrain types (flat, hilly, uneven) and compare accuracy. • Perform accuracy tests on linear measurements by using standard reference distances and calculating error margins. • Measure forest plots using steel and linen tapes, recording boundary lines and areas for land	Guide students to: • demonstrate the correct procedure for using linen and steel tapes to measure distances in a forest environment. • conduct measurements using linen and steel tapes across varying terrain types (flat, hilly, uneven) and compare accuracy. • perform accuracy tests on linear measurements by using standard reference distances and calculating error margins. • measure forest plots using steel and linen tapes, recording boundary lines and areas for land surveying. • apply tension control techniques to ensure	Total Station, Theodolite, GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring tapes, Chains, Ranging poles, Compass, Leveling rod, Plumb line, Topographic maps, Surveying field Guides, Portable weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.

		setting, plantation mapping, and road construction. • Discuss the proper care and maintenance of linen and steel tapes to ensure longevity and accuracy.		surveying. • Apply tension control techniques to ensure correct measurement accuracy when using linen and steel tapes.	correct measurement accuracy when using linen and steel tapes.	
General Objective 3.0: Understand the principles of measurement of angles with theodolites and perform such measurement						
7-9	3.1 Explain the working principle of the theodolite, focusing on its ability to measure horizontal and vertical angles. 3.2 Explain the importance of accurate angle measurement in land surveying, especially in forest resource management and boundary definition. 3.3 Explain the components of theodolites, such as horizontal/vertical circles, leveling devices, and optical plumb bobs. 3.4 Explain how angle measurements contribute to accurate mapping and	• Describe the working principle of the theodolite, focusing on its ability to measure horizontal and vertical angles. • Discuss the importance of accurate angle measurement in land surveying, especially in forest resource management and boundary definition. • Describe the components of theodolites, such as horizontal/vertical	Textbooks, Scientific, Papers, Online resources, Visual Aids, GIS Software, ArcGIS, QGIS Surveying, Software, AutoCAD, Survey Pro, PowerPoint slides, etc.	• Demonstrate the use of a theodolite to measure horizontal and vertical angles in a forest plot. • Set up and level a theodolite correctly in the field and measure angles to reference points. • Measure angles between multiple points to determine the location of a survey station or boundary line. • Use angle	Guide students to: • Demonstrate the use of a theodolite to measure horizontal and vertical angles in a forest plot. • Set up and level a theodolite correctly in the field and measure angles to reference points. • Measure angles between multiple points to determine the location of a survey station or boundary line. • Use angle measurements in combination with	Total Station, Theodolite, GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring tapes, Chains, Ranging poles, Compass, Leveling rod, Plumb line, Topographic maps, Surveying field Guides, Portable weather stations,

	land assessment in forestry. 3.5 State the common errors in angle measurement and how to minimize them during surveying operations	circles, leveling devices, and optical plumb bobs. • Discuss how angle measurements contribute to accurate mapping and land assessment in forestry. • Outline the common errors in angle measurement and how to minimize them during surveying operations		measurements in combination with linear distances to determine areas and land contours. • Analyze angle measurements for creating a forest survey map based on angular data.	linear distances to determine areas and land contours. • Analyze angle measurements for creating a forest survey map based on angular data.	Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.
General Objective 4.0: Understand the principles of survey computations and plotting						
10-12	4.1 Explain the basic principles of survey computations, including trigonometry, geometry, and coordinate systems. 4.2 Explain the process of plotting survey data, from field measurements to final map creation, including the importance of accuracy and scale. 4.3 Explain the application of survey computations in forest management, including topographic	• Describe the basic principles of survey computations, including trigonometry, geometry, and coordinate systems. • Discuss the process of plotting survey data, from field measurements to final map	Textbooks, Scientific, Papers, Online resources, Visual Aids, GIS Software, ArcGIS, QGIS Surveying, Software, AutoCAD, Survey Pro, PowerPoint slides, etc.	• Perform survey computations based on field data and calculate distances, angles, and elevations. • Plot survey data from the field onto a graph or map to visualize terrain features and boundaries. • Use software tools like	Guide students to: • Perform survey computations based on field data and calculate distances, angles, and elevations. • Plot survey data from the field onto a graph or map to visualize terrain features and boundaries • Use software tools like AutoCAD or	Total Station, Theodolite, GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring tapes, Chains, Ranging poles, Compass, Leveling rod, Plumb line, Topographic

	mapping, forest inventory, and boundary setting. 4.4 Explain the role of modern technologies like GPS and GIS in enhancing survey computations and plotting. 4.5 Explain the significance of survey adjustments to account for errors in measurements, ensuring the accuracy of final plots.	creation, including the importance of accuracy and scale. • Discuss the application of survey computations in forest management, including topographic mapping, forest inventory, and boundary setting. • Discuss the role of modern technologies like GPS and GIS in enhancing survey computations and plotting. • Discuss the significance of survey adjustments to account for errors in measurements, ensuring the accuracy of final plots.		AutoCAD or GIS to digitally plot survey data for forest mapping and land-use planning. • Analyze errors in survey computations, and use adjustment techniques to improve data accuracy. • Create a basic survey map of a forest area by translating field data (angles, distances) into visual representations	GIS to digitally plot survey data for forest mapping and land-use planning. • Analyze errors in survey computations, and use adjustment techniques to improve data accuracy. • Create a basic survey map of a forest area by translating field data (angles, distances) into visual representations	maps, Surveying field Guides, Portable weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.
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General Objective 5.0: Know how to make measurements from maps, lay-out and engineering plans						
13-15	5.1 Explain the basic components of a topographic map, layout plan, and engineering plans, and their role in forest planning. 5.2 Explain how to interpret map symbols, scales, contour lines, and elevations in forestry surveys. 5.3 Discuss the role of maps in forest inventory, land use planning, and forest management. 5.4 Explain the process of converting survey data into maps and plans for practical forestry applications. 5.5 Explain how different types of maps and plans (e.g., topographic, thematic, forest management) contribute to forest ecosystem management.	- Describe the basic components of a topographic map, layout plan, and engineering plans, and their role in forest planning. - Describe how to interpret map symbols, scales, contour lines, and elevations in forestry surveys. - Discuss the role of maps in forest inventory, land use planning, and forest management. - Describe the process of converting survey data into maps and plans for practical forestry applications. - Analyze how different types of maps and plans (e.g., topographic, thematic, forest	Textbooks, Scientific, Papers, Online resources, Visual Aids, GIS Software, ArcGIS, QGIS Surveying, Software, AutoCAD, Survey Pro, PowerPoint slides, etc.	- Interpret topographic maps to identify elevations, contours, and forest boundaries. - Read and measure distances from maps and engineering plans using the appropriate scales and tools (e.g., planimeter). - Use maps and plans to identify and measure areas and features within forest landscapes (e.g., roads, waterways, and zones). - Convert field measurements to map data and plot points onto a map, applying appropriate scales and coordinates. - Review and analyze map data,	Guide students to: - Interpret topographic maps to identify elevations, contours, and forest boundaries. - read and measure distances from maps and engineering plans using the appropriate scales and tools (e.g., planimeter). - use maps and plans to identify and measure areas and features within forest landscapes (e.g., roads, waterways, and zones). - convert field measurements to map data and plot points onto a map, applying appropriate scales and coordinates. - review and analyze map data,	Total Station, Theodolite, GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring tapes, Chains, Ranging poles, Compass, Leveling rod, Plumb line, Topographic maps, Surveying field Guides, Portable weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.

		management) contribute to forest ecosystem management.		comparing survey results with engineered layouts and identifying discrepancies	comparing survey results with engineered layouts and identifying discrepancies	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

FOREST BOTANY AND CONSERVATION

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST BOTANY AND CONSERVATION	COURSE CODE: FET 122	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 2 HOURS/WEEK
YEAR: 2 SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is designed to acquaint the student with knowledge and skills in the biology of forest plants.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the external features of plants and relate them to their functions 2.0 Understand the principles of plants classification and identification 3.0 Understand the relationship between plants and its environment		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: FOREST BOTANY AND CONSERVATION			COURSE CODE: FET 122		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to acquaint the student with knowledge and skills in the biology of forest plants.						
GENERAL OBJECTIVE 1.0: Know the external features of plants and relate them to their functions						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-5	1.1 Explain the various types and forms of leaves 1.2 Explain the significance of the structural variation in 1.1 above 1.3 Describe the role of leaves 1.4 Describe various leaf modifications 1.5 Explain the function of the stem 1.6 Explain different types of stem form 1.7 Describe a typical flower 1.8 Describe the longitudinal section of a typical flower e. g	- Describe the various types and forms of leaves - Discuss the significance of the structural variation in 1.1 above - Explain the role of leaves - Explain various leaf modifications - Describe the function of the stem - Explain different types of stem form - Describe a typical flower - Describe the longitudinal section	Marker board, Marker, Internet, Projector, Computer Systems, Textbook, Biology, etc.	- Collect various types and forms of leaves - Draw various types and forms of leaves to illustrate their: i. shapes ii. venation iii. glands iv. stipules v. bracts vi. bracteoles - Identify various leaf modification for: i. feeding ii. storage iii. protection iv. support etc - Collect different types of stem forms: i. Flowering plants	Guide students to: - Collect various types and forms of leaves - Draw various types and forms of leaves to illustrate their: vii. shapes iii. venation ix. glands x. stipules xi. bracts xii. bracteoles - Identify various leaf modification for: v. feeding vi. storage vii. protection iii. support etc - Collect different types of stem forms:	Hibiscus flower, Razor blade, Dissecting kits, Practical notebook, Writing materials, Hand lens.

	hibiscus. 1.9 Describe the cross section of a typical flower. 1.10 State floral formulae of the hibiscus and other common flowers	of a typical flower e. g: hibiscus - Describe the cross section of a typical flower. - State floral formulae of the hibiscus and other common flowers		ii. Monocots iii. Dicots iv. Gymnosperms v. Angiosperms - Identify different types of stem forms: - Flowering plants - Monocots - Dicots - Gymnosperms - Angiosperms - Draw and label a typical flower - Dissect a longitudinal section of a flower - Write the floral formula of the hibiscus and other common flowers	vi. Flowering plants vii. Monocots iii. Dicots ix. Gymnosperms x. Angiosperms - Identify different types of stem forms: - Flowering plants - Monocots - Dicots - Gymnosperms - Angiosperms - Draw and label a typical flower - Dissect a longitudinal section of a flower - Write the floral formula of the hibiscus and other common flowers	
General Objective 2.0: Understand the principles of plants classification and identification						
6-9	2.1 Explain the principles for the classification of plants 2.2 Classify plants into the phyla 2.3 Explain the classification of thallophyte into:	- Outline the principles for the classification of plants - Classify plants into the phyla - Discuss the classification of thallophyte into:	Marker board, Marker, Internet, Projector, Computer Systems, Textbook,	- Prepare field KEY for identification of plants. - Collect 30 plant species for the herbarium. - Collect: 30 high forest species	Guide students to: - Prepare field KEY for identification of plants - Collect 30 plant species for the herbarium. - Collect:	Hand lens, Razor blade, Leaves, Flowers, Textbooks, Biology practical

	i. Algae ii. Fungi 2.4 Explain the classification of spermatophyte into: i. Gymnosperms ii. Angiosperms 2.5 Explain the characteristics of spermatophyte 2.6 Explain the classification of angiosperms into: i. Dicotyledon ii. Monocotyledon 2.7 Explain the binomial system of plant nomenclature 2.8 Describe the use of field KEY for identification of plants 2.9 Describe various characteristics used in field identification of plants 2.10 Describe the characteristics of important high forest families 2.11 Describe the characteristics of the following important	— Algae — Fungi • Explain the classification of spermatophyte into: — Gymnosperms — Angiosperms • Explain the characteristics of spermatophyte • Explain the classification of angiosperms into: — dicotyledon — monocotyledon • Explain the binomial system of plant nomenclature • Describe the use of field KEY for identification of plants • Describe various characteristics used in field identification of plants • Describe the characteristics of important high forest families	Biology, etc.	30 savanna plant species • Preserve collected plant species in catalogues • Label plants according to their families • Preserve collected plant species in lockers	30 high forest species 30 savanna plant species • Preserve collected plant species in catalogues • Label plants according to their families • Preserve collected plant species in lockers	notebook, Plant press.
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	savanna families: i. Sterculiaceae ii. Rubiaceae iii. Apocynaceae iv. Malvaceae v. Verbanaceae vi. Sapotaceae vii. Ebenaceae iii. Bombaceae ix. Euphorbiaceae x. Bignoniaceae xi. Anacardiaceae 2.12 Describe 30 plant species for the herbarium. 2.13 List: i. 30 high forest species ii. 30 savanna plant species					
General Objective 3.0: Understand the relationship between plants and its environment						
10-15	3.1 Define ecology 3.2 Outline the scope of ecology 3.3 Explain the following ecological terms: i. Biome ii. Biomass iii. Biosphere iv. Ecosystem v. Ecological niches	• Explain ecology • Outline the scope of ecology • Describe the following ecological terms: — Biome — Biomass — Biosphere — Ecosystem	Marker board, Marker, Internet, Projector, Computer Systems, Textbook, Biology, etc.	• Visit various forest reserves (high forest and savanna zones) to observe the following: i. Climate ii. Soil iii. Human interferences iv. Annual burning • Carry out ecological	Guide students to: • Visit various forest reserves (high forest and savanna zones) to observe the following: v. Climate vi. Soil vii. Human interferences	Dissecting kits, Hand lens, Razor blade, Leaves, Flowers.

vi. Habitat	— Ecological niches		study on a few plant species	viii. Annual burning	
vii. Ecotype	— Habitat			• Carry out ecological study on a few plant species	
viii. Succession	— Ecotype				
ix. Population	— Succession				
x. Competition	— Population				
xi. Plant community	— Competition				
xii. Endemic species	— Plant community				
xiii. Endangered species	— Endemic species				
xiv. Parasitism	— Endangered species				
xv. Commensalism	— Parasitism				
xvi. Symbiosis etc.	— Commensalism				
3.4 Describe factors that determine the distribution and abundance of plant species e.g climate, edaphic etc	— Symbiosis etc.				
	• Discuss factors that determine the distribution and abundance of plant species in 3.4				
3.5 Describe the components of the following ecosystems:	• Explain the components of ecosystem as highlighted in 3.5				
i. Forest	— Forest				
ii. Savanna	— Savanna				
iii. Derived savanna	— Derived savanna				
iv. Sahel	— Sahel				
v. Sudan Guinea	— Sudan Guinea				
vi. Moist rain forest	— Moist rain forest				
vii. Mangrove	— Mangrove				
viii. Dry high forest	— Dry high forest				
ix. Montane	— Montane				
3.6 Describe the characteristics of the	• Discuss the				

	vegetation types in Nigeria and their relationship 3.7 Explain the role of vegetation in carbon sequestration and climate change	characteristics of the vegetation types in Nigeria and their relationship • Discuss the role of vegetation in carbon sequestration and climate change				
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

PRECISION FOREST WORKING TECHNIQUES

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: PRECISION FOREST WORKING TECHNIQUES	COURSE CODE: FET 123	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: 1 SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills required to apply precision techniques in forest management		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the common tools and equipment used in forestry practice; 2.0 Know common injuries associated with use of forestry tools, equipment and precautionary measures against them; 3.0 Know the manpower requirements for accomplishing different operations in forestry.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: PRECISION FOREST WORKING TECHNIQUES				COURSE CODE: FET 123		CONTACT HOURS: 3 HOURS/WEEK
				CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II				PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and skills required to apply precision techniques in forest management						
GENERAL OBJECTIVE 1.0: Know the common tools and equipment used in forestry practice						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-5	1.1 Describe tools used in forestry operations (e.g matchet, pruning knife, axe, bow saw, chain saw etc) 1.2 Explain how to maintain the equipment listed in 1.1 above (e.g sharpening the chain saw,machetes, axe etc) 1.3 Explain forestry measuring instruments such as tapes, gunter chains, arrows and ranging poles etc. 1.4 Explain the use of different climbing equipment (e.g. ladder, spikes, safety belts, tree	- Describe tools used in forestry operations (e.g matchet, pruning knife, axe, bow saw, chain saw etc) - Describe how to maintain the equipment listed in above (e.g sharpening the chain saw,machetes, axe etc) - Describe forestry measuring instruments such as tapes, gunter chains, arrows and ranging poles etc. - Describe the use of	White board, Projector, Computer systems,, Note books Marker, etc.	- Identify tools used in forestry operations e.g; matchet, pruning knife, axe, bow saw, chain saw etc - Maintain the equipment listed in 1.1 above e.g sharpening the chain saw, machetes, axe etc - Identify forestry measuring instruments such as tapes, gunter chains, arrows and ranging poles etc - Identify different climbing equipment	Guide students to: - Identify tools used in forestry operation - Demonstrate the maintenance of forestry equipment - Identify forestry measuring instruments - Identify different climbing, protective and camping equipment used in forestry work	Machete, Pruning Knife, Axe, Bow Saw, Chainsaw, Bench Vice, Flat and round files, Safety Belt, Climbing ropes, Tapes, Chains, Arrows, Ranging poles, Ladder, Spikes, Tree Bicycles, Hand gloves, Safety helmets, Jungle boots,

	bicycles etc) 1.5 Explain how to improvise some of the equipment listed in 1.4 1.6 Explain the different protective equipment used in forestry work (e.g, hand gloves, safety helmets, rainboots, colour jackets, life jackets, rain coats, jungle boot, first aid boxes, goggles, masks, ear protectors etc). 1.7 Explain different camping equipment used in forestry work viz; tents, mosquito nets, camp beds, blankets, lanterns, cooking utensils, water containers, and matchet.	different climbing equipment (e.g. ladder, spikes, safety belts, tree bicycles etc) • Explain how to improvise some of the equipment listed in 1.4 • Describe the different protective equipment used in forestry work (e.g, hand gloves, safety helmets, rainboots, colour jackets, life jackets, rain coats, jungle boot, first aid boxes, goggles, masks, ear protectors etc). • Describe different camping equipment used in forestry work viz; tents, mosquito nets, camp beds, blankets, lanterns, cooking utensils, water containers, and matchet.		(e.g. ladder, spikes, safety belts, tree bicycles etc) • Improvise some of the equipment listed in 1.4 above (e.g ladder, spikes etc)		Rain boots, Colour jackets, Life jackets, Rain coats, First aid boxes, Goggles, Masks, Ear protectors, Tents, Mosquito nets, Camp beds, Blankets, Lanterns, Cooking, Utensils, Water, Containers, Machetes.
General Objective 2.0: Know common injuries associated with use of forestry tools, equipment and precautionary measures against						

them						
6-9	2.1 Describe the correct methods and working positions for the use of different tools and equipment to ensure safety and for maximum efficiency (e.g Lifting and camping sites, felling positions, sawing position etc). 2.2 Describe common accidents and injuries in forestry and their preventive measures (e.g. chain saws, kickbacks, knife and matchet sore cuts, falling trees etc). 2.3 Explain the need for first aid in forestry operations 2.4 Explain how to apply first aid treatment	- Describe the correct methods and working positions for the use of different tools and equipment to ensure safety and for maximum efficiency - Describe common accidents and injuries in forestry and their preventive measures - Explain the need for first aid in forestry operations - Explain how to apply first aid treatment	White board, Marker, Projector, Poster showing ergonomics position, Computer systems, etc.	- Demonstrate the correct methods and working positions for the use of different tools and equipment to ensure safety and for maximum efficiency e.g Lifting and camping sites, felling positions, sawing position etc - Demonstrate the use of first aid	Guide students to: - Demonstrate lifting and camping sites, felling positions, sawing position etc. - Demonstrate the use of first aid	Chain saw, Lifting equipment, First aid boxes.
General Objective 3.0: Know the manpower requirements for accomplishing different operations in forestry						
10-15	3.1 State the importance of manpower in forest operations 3.2 Explain the	Discuss the importance of manpower in forest operations	White board, Marker, Projector, Poster	Determine the manpower requirements for accomplishing	Guide students to determine the manpower requirements for	Computer systems, Writing materials.

	manpower requirements for accomplishing specific tasks in forest operations: - felling with an axe - felling with chain saw - logging - collecting seeds - stumping of seedlings - site preparation - planting operations etc 3.3 Explain the importance of a balanced diet and adequate rest in forest operations	- Describe the manpower requirements for accomplishing specific tasks in forest operations: - felling with an axe - felling with chain saw - logging - collecting seeds - stumping of seedlings - site preparation - planting operations etc - Discuss the importance of a balanced diet and adequate rest in forest operations	showing ergonomics position, Computer systems, etc.	specific tasks in forest work (e.g; logging with an axe, chain saw, collecting seeds, stumping of seedlings, site preparation etc)	accomplishing specific tasks in forest work (e.g, logging with an axe, chain saw, collecting seeds, stumping of seedlings, site preparation etc)	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

NON-TIMBER FOREST PRODUCTS

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: NON-TIMBER FOREST PRODUCTS	COURSE CODE: FET 124	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR
YEAR: 1 SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to provide students with the knowledge and skills in Non-Timber Forest Products (NTFPs), utilization and management		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the classification of NTFPs and their importance; 2.0 Know the major NTFPs in the ecological zones; 3.0 Know the sustainable harvesting techniques used in NTFPs; 4.0 Know the value addition, processing, and storage methods in NTFPs; 5.0 Know the socio-economic role of NTFPs in rural economies.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: NON-TIMBER FOREST PRODUCTS			COURSE CODE: FET 124		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide students with the knowledge and skills in Non-Timber Forest Products (NTFPs), utilization and management						
GENERAL OBJECTIVE 1.0: Know the classification of NTFPs and recognize their importance						
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 different types of Non-Timber Forest Products (NTFPs). 1.2 Explain the role of NTFPs in sustainable forest management. 1.3 Explain the impact of NTFPs on local communities and economies. 1.4 Explain the ecological importance of NTFPs in forest ecosystems. 1.5 Explain NTFPs with timber products in terms of economic value and sustainability.	- Describe the different types of Non-Timber Forest Products (NTFPs). - Discuss the role of NTFPs in sustainable forest management. - Describe the impact of NTFPs on local communities and economies. - Discuss the ecological importance of NTFPs in forest ecosystems.	Textbooks on NTFPs and forestry, Printed course materials, Research Papers/Reports on NTFPs, Posters or charts illustrating NTFP classification. Marker, Whiteboard, Multimedia projector, etc.	- Identify various NTFPs found in forests. - Classify various NTFPs found in forests. - Demonstrate the extraction process of a specific NTFP (e.g., resins, medicinal plants). - Prepare a presentation on the economic importance of a selected NTFP in local communities. - Conduct a survey on the marketability and demand for local NTFPs.	Guide students to: - Identify various NTFPs found in forests. - Classify various NTFPs found in forests. - Demonstrate the extraction process of a specific NTFP (e.g., resins, medicinal plants). - Prepare a presentation on the economic importance of a selected NTFP	Botanical identification kits, Sample collection bags, Maps of local and regional forests, Classification tables, Notebooks for recording data.

	1.6 Explain the global and local markets for NTFPs and their trade regulations	• Discuss NTFPs with timber products in terms of economic value and sustainability. • Discuss the global and local markets for NTFPs and their trade regulations		• Apply methods of sustainable harvesting for a selected NTFP species. • Assess the ecological impact of harvesting specific NTFPs on forest ecosystems	in local communities. • Conduct a survey on the marketability and demand for local NTFPs. • Apply methods of sustainable harvesting for a selected NTFP species. • Assess the ecological impact of harvesting specific NTFPs on forest ecosystems	
General Objective 2.0: understand the major NTFPs in Nigerian forests						
4-7	2.1 Explain the major NTFPs found in Nigerian forests such as: - Fruits - Wrapping leaves - Snails - Resins etc 2.2 Explain the ecological significance of NTFPs	• Describe the major NTFPs found in Nigerian forests such as: — Fruits — Wrapping leaves — Snails — Resins etc • Discuss the	Textbooks on NTFPs and forestry, Printed course materials, Research Papers/Reports on NTFPs, Posters or charts	• Conduct field identification of major NTFPs in 2.1 • Collect data on the seasonal growth patterns of some NTFPs • Map the distribution of NTFPs across different parts of the ecological	Guide students to: • Conduct field identification of major NTFPs in 2.1 • Collect data on the seasonal growth patterns of some NTFPs • Map the distribution of NTFPs across	Sample NTFPs collected from local forests, Local herbarium collection, Map of the Ecological Zone, Field journals, Botanical

	2.3 Explain the role of NTFPs in maintaining biodiversity in the ecological zone. 2.4 Discuss the seasonal availability and growth patterns of NTFPs in the zone.	ecological significance of NTFPs - Describe the role of NTFPs in maintaining biodiversity in the ecological zone. - Discuss the seasonal availability and growth patterns of NTFPs in the zone.	illustrating NTFP classification. Marker, Whiteboard, Multimedia projector, etc.	zone.	different parts of the ecological zone.	identification tools.
General Objective 3.0: Know the sustainable harvesting techniques used in NTFPs						
8-10	3.1 Explain the different methods of sustainable harvesting of NTFPs. 3.2 Explain the concept of harvesting intensity and its effect on NTFPs regeneration 3.3 Discuss the role of harvest rotation systems in ensuring the sustainability of NTFPs. 3.4 Explain the ecological principles that guide sustainable NTFPs	- Describe the different methods of sustainable harvesting of NTFPs. - Discuss the concept of harvesting intensity and its effect on NTFPs regeneration - Discuss the role of harvest rotation systems in ensuring the	Textbooks on NTFPs and forestry, Printed course materials, Research Papers/Reports on NTFPs, Posters or charts illustrating NTFP classification. Marker, Whiteboard, Multimedia	- Demonstrate the use of tools and techniques for sustainable harvesting of NTFPs. - Implement harvest rotation schedules for a specific NTFPs species. - Conduct a field exercise to assess the environmental impact of different harvesting techniques. - Measure the sustainability of harvested NTFPs. - Apply the principles of	Guide students to: - Demonstrate the use of tools and techniques for sustainable harvesting of NTFPs. - Implement harvest rotation schedules for a specific NTFPs species. - Conduct a field exercise to assess the environmental impact of different harvesting	Harvesting tools (shears, pruning knives, ropes), Sustainability Assessment checklists, Field guides on NTFP harvesting, Data collection sheets, Monitoring equipment (GPS devices, cameras).

	harvesting practices. 3.5 State the importance of using non-destructive harvesting techniques for NTFPs.	sustainability of NTFPs. - Describe the ecological principles that guide sustainable NTFPs harvesting practices. - Outline the importance of using non-destructive harvesting techniques for NTFPs.	projector, etc.	non-destructive harvesting in a forest environment	techniques. - Measure the sustainability of harvested NTFPs. - Apply the principles of non-destructive harvesting in a forest environment	
General Objective 4.0: know the value addition, processing, and storage methods of NTFPs						
11-13	4.1 Explain the concept of value addition in NTFPs and its economic importance. 4.2 Explain the different processing methods used for various NTFPs (e.g., drying, distillation, fermentation). 4.3 Explain the role of packaging and marketing in adding value to NTFPs.	- Discuss the concept of value addition in NTFPs and its economic importance. - Discuss the various processing methods for NTFPs (e.g., drying, distillation, fermentation). - Discuss the role of packaging and	Textbooks on NTFPs and forestry, Printed course materials, Research Papers/Reports on NTFPs, Posters or charts illustrating NTFP classification. Marker,	- Demonstrate the process of drying and preserving NTFPs for long-term storage. - Apply basic processing techniques (e.g., distillation for essential oils, fermentation for food products). - Package processed NTFPs for retail. - Perform a storage trial to assess the	Guide students to: - Demonstrate the process of drying and preserving NTFPs for long-term storage. - Apply basic processing techniques (e.g., distillation for essential oils, fermentation for food products). - Package processed	Drying racks, Ovens, Distillation kits, Packaging materials. (vacuum bags, bottles) Processing equipment (grinders mills), Storage containers

	4.4 Explain the key factors that affect the quality and shelf life of processed NTFPs. 4.5 Outline the economic benefits of value-added NTFPs in local and international markets.	marketing in enhancing the value of NTFPs. Describe key factors that affect the quality and shelf life of processed NTFPs, using examples.	Whiteboard, Multimedia projector, etc.	shelf life of different NTFP products. Develop a value-added product from an NTFP (e.g., herbal tea, essential oils).	NTFPs for retail. - Perform a storage trial to assess the shelf life of different NTFP products. - Develop a value-added product from an NTFP (e.g., herbal tea, essential oils).	(airtight containers).
General Objective 5.0: know the socio-economic role of NTFPs in rural economies						
14-15	5.1 Explain the role of NTFPs in the livelihood of rural communities. 5.2 Explain how NTFPs contribute to poverty alleviation in rural areas 5.3 State the economic importance of NTFPs in rural household incomes. 5.4 Discuss the social benefits of NTFPs collection and trade, such as employment and community development. 5.5 Explain the	- Describe the role of NTFPs in the livelihood of rural communities. - Discuss how NTFPs contribute to poverty alleviation in rural areas. - Outline the economic importance of NTFPs in rural household incomes. - Discuss the social benefits of NTFPs collection	Textbooks on NTFPs and forestry, Printed course materials, Research Papers/Reports on NTFPs, Posters or charts illustrating NTFP classification. Marker, Whiteboard, Multimedia projector, etc.	- Conduct a survey on the use and economic value of NTFPs in a rural community. - Participate in the local trade of NTFPs to understand their socio-economic impact.	Guide students to: - Conduct a survey on the use and economic value of NTFPs in a rural community. - Participate in the local trade of NTFPs to understand their socio-economic impact.	Survey Forms for market and community studies, Local NTFP, Samples data collection kits (questionnaires, recording sheets), Case study presentations.

	relationship between NTFPs markets and rural economic growth.	and trade, such as employment and community development. Discuss the relationship between NTFPs markets and rural economic growth.				
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

INTRODUCTION TO FOREST POLICY, LAW AND ADMINISTRATION

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: INTRODUCTION TO FOREST POLICY, LAW AND ADMINISTRATION	COURSE CODE: FET 125	CONTACT HOURS: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 2 HOURS/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 0 HOUR/WEEK
GOAL: This course is designed to provide the student with knowledge of the policy and laws that govern forestry practices in Nigeria		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the scope of forest policy in Nigeria 2.0 Understand land tenure, use and ownership pattern in Nigeria 3.0 Understand the procedures and legal implications of constituting forest reserves 4.0 Know the prohibited acts and offences in forest reserves 5.0 Know the existing international environmental laws on forest conservation and management		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: INTRODUCTION TO FOREST POLICY, LAW AND ADMINISTRATION			COURSE CODE: FET 125		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORETICAL: 2 HOURS/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 0 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide the student with knowledge of the policy and laws that govern forestry practices in Nigeria						
GENERAL OBJECTIVE 1.0: Know the scope of forestry policy in Nigeria						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Define forest policy 1.2 Explain the scope of forest policy in Nigeria. 1.3 Explain the purpose of forest policy 1.4 Explain the basis of forest policy and its objectives. 1.5 Explain forest policy as it relates to allocation of land for other uses, e.g Agriculture, mining, urban development etc. 1.6 Explain the problems of present forest policy in Nigeria 1.7 Explain the similarities and dissimilarities between National and State forest policies.	• Explain forest policy • Discuss the scope of forest policy in Nigeria. • Discuss the purpose of forest policy • Explain the basis of forest policy and its objectives. • Discuss forest policy as it relates to allocation of land for other uses, e.g Agriculture, mining, urban development etc. • Describe the problems of present forest policy in	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Current Land use Act, Land use Decree, National forestry policy document, etc.			

	1.8 Explain factors to be considered in formulating future forest policies in Nigeria, e.g, home markets, export demand, land tenure system, etc	Nigeria • Explain the similarities and dissimilarities between National and State forest policies. • Discuss factors to be considered in formulating future forest policies in Nigeria, e.g, home markets, export demand, land tenure system, etc				
General Objective 2.0: Understand land tenure, use and ownership pattern in Nigeria						
4-6	2.1 Explain land tenure systems in Nigeria, e.g individual ownership, communal, etc. 2.2 Explain land use problems in Nigeria, e.g boundary disputes, farmer-herder conflicts, compulsory acquisition of land, etc. 2.3 Describe multiple use of land. 2.4 Describe problems associated with multiple use of land in relation to execution of forest	• Describe land tenure systems in Nigeria (e.g., individual ownership, communal ownership), explaining their legal and cultural implications. • Describe the land use problems in Nigeria, including boundary disputes, farmer-herder conflicts, and the compulsory	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Current Land use Act, Land use Decree, National forestry policy document, etc.			

	policy. 2.5 Describe the advantages and disadvantages of multiple land use.	• acquisition of land by the government. • Discuss the concept of multiple land use, highlighting how land can serve various purposes such as agriculture, forestry, mining, and urban development. • Explain the problems associated with multiple land use in relation to the execution of forest policy, focusing on issues like land degradation and land-use conflicts. • Discuss advantages and disadvantages of multiple land use, helping students weigh the benefits and challenges from environmental, economic, and social perspectives.				
General Objective 3.0: Understand the procedures and legal implications of constituting forest reserves						
7-9	3.1 Explain the procedures for establishing a forest reserve, e.g:	• Describe the procedures for	Marker, Marker board, Projector,			

	i. Appointment of a reserve settlement officer. ii. Settlement of claims and rights iii. Quit notice iv. Actual constituting of the forest into a reserve. 3.2 Explain the legal implications of constituting a forest into a reserve. 3.3 Describe means of forestalling any subsequent litigation after a reserve is constituted. 3.4 Describe the problems associated with the acquisition of land for forestry use based on the different land tenure systems in different parts of Nigeria. 3.5 Explain solutions to the problems described in 3.4 3.6 Explain causes of variation in the forest policies among the geographical zones of Nigeria.	establishing a forest reserve. • Describe the legal implications of constituting a forest into a reserve, focusing on the rights of landowners and the legal process involved in declaring land a reserve. • Discuss strategies for forestalling subsequent litigation after a forest is constituted into a reserve • Discuss the problems associated with acquiring land for forestry use, emphasizing the challenges posed by different land tenure systems (individual ownership, communal land, etc.) in various parts of Nigeria. • Describe potential solutions to the problems of land	Computer systems, Textbooks, Internet, Current Land use Act, Land use Decree, National forestry policy document, etc.			
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		acquisition, including community consultation, fair compensation etc.				
General Objective 4.0: Know prohibited acts and offences in forest reserves						
10-12	4.1 Explain forest offences such as: - malicious damage to government property - illegal felling and related thefts - damage from trespass - poaching - arson - torts - Unethical practices etc. 4.3 Describe the differences between civil and criminal offences 4.4 Describe the procedures for prosecuting forest reserve offenders	- Describe forest offences as highlighted in 4.1 - Discuss the legal implications of these offences and provide real-world examples of their impact on forestry and conservation. - Explain the differences between civil and criminal offences, highlighting how these categories apply to forest-related legal issues and their consequences. - Explain procedures for prosecuting forest reserve offenders, detailing the steps from investigation to trial and punishments for offenders.	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Current Land use Act, Land use Decree, National forestry policy document, etc.			
General Objective 5.0: Know the existing international environmental laws on forest conservation and management						

13-15	5.1 Explain the key existing international environmental laws on forest conservation and management: - United Nations Framework Convention on Climate Change (UNFCCC) - Convention on Biological Diversity (CBD) - United Nations Convention to Combat Desertification (UNCCD) - Forest Principles (Rio Earth Summit 1992) - International Tropical Timber Agreement (ITTA) - Paris Agreement (under the UNFCCC) - Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) - UN Declaration on the Rights of Indigenous Peoples (UNDRIP) - Kyoto Protocol (under	- Outline the key international environmental laws on forest conservation and management as highlighted in 5.1 - Discuss how these international agreements influence forest management and conservation policies globally - Discuss the key Pan African environmental laws related to forest conservation and management as highlighted in 5.2 - Discuss the effectiveness of these international and regional laws in achieving forest conservation goals, highlighting any challenges faced in implementation.	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Current Land use Act, Land use Decree, National forestry policy document, etc.			
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	the UNFCCC) 5.2 Outline the key existing Pan African environmental laws on forest conservation and management: - African Convention on the Conservation of Nature and Natural Resources (1968) - African Union's Agenda 2063 - Protocol on the African Charter on Human and Peoples' Rights on the Environment - The Great Green Wall Initiative - African Forest Landscape Restoration Initiative (AFR100) - Convention on the Conservation of Migratory Species of Wild Animals (CMS) - African Ministerial Conference on the Environment (AMCEN) - Sustainable Development Goals (SDGs) 15 - Life on Land (Pan-African Context)					
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	ix. The 2003 African Forest Law Enforcement and Governance (AFLEG) Ministerial Conference x. The Nairobi Convention for the Protection, Management, and Development of the Marine and Coastal Environment of the Eastern African Region 5.3 Explain the effectiveness of these international and regional laws in achieving forest conservation goals, highlighting any challenges faced in implementation.					
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

FOREST PROTECTION AND INTEGRATED PEST MANAGEMENT STRATEGIES

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST PROTECTION AND INTEGRATED PEST MANAGEMENT STRATEGIES	COURSE CODE: FET 126	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 3 HOURS
GOAL: This course is designed to equip students with knowledge and skills of prevention and control of all biotic and abiotic factors which cause damage or loss in production of forest and forest product		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the scope of forest protection; 2.0 Know classification of agencies which cause damage to forest estates and forest produce; 3.0 Know methods of prevention of damages caused by physical agents; 4.0 Know simple methods of prevention and control of soil erosion; 5.0 Know causes of forest fire, their prevention and control; 6.0 Know common insects, pests and diseases of forest crops and their management in Nigeria; 7.0 Know the invasive species of pests prevailing forest crops in Nigeria.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: FOREST PROTECTION AND INTEGRATED PEST MANAGEMENT STRATEGIES			COURSE CODE: FET 126		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of prevention and control of all biotic and abiotic factors which cause damage or loss in production of forest and forest product						
GENERAL OBJECTIVE 1.0: Understand the scope of forest 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 aims and objectives of forest protection 1.2 Describe all aspects of protection given to forest and forest produce. 1.3 Explain the four major groups of forest pests and diseases. 1.4 Describe different methods of managing forest crop pests and diseases including invasive species 1.5 Describe damages caused to forest by wild animals. 1.6 Describe methods of	- Discuss the aims and objectives of forest protection, highlighting its importance in biodiversity conservation, sustainable resource management, and ecosystem health. - Describe all aspects of protection given to forests and forest products, such as legal protection, forest monitoring, anti-poaching measures, and sustainability initiatives. - Discuss ways in which forests are protected and	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	Identify the four major groups of forest pests and diseases	Guide students to identify the four major groups of forest pests and diseases	Machete, Debarking knife, Drawing books, Pencils, Insect nets, Insect trap, Insect box, Display cabinet/board, Charts.

	preventing forest destruction by animals	how these methods contribute to forest health.				
General Objective 2.0: Know classification of agencies which cause damage to forest estates and forest produce.						
3-5	2.1 Explain all agents of damage to forest and forest produce: - Fire problems in forest and plantations - Erosion agencies in forest estates - Mycological - problems in - plantations, - natural forests and nurseries. - Adverse environmental effects on forest plants 2.2 Describe agencies responsible for causing damage to forest estates and forest produce, including natural agents (e.g., weather conditions, wildlife) and human activities (e.g., illegal logging, pollution). 2.3 Discuss the role of natural agencies (e.g.,	- Describe all agents of damage to forest and forest produce: - Fire problems in forest and plantations - Erosion agencies in forest estates - Mycological problems in - plantations, natural forests and nurseries. - Adverse environmental effects on forest plants - Explain agencies responsible for causing damage to forest estates and forest produce, including natural agents (e.g., weather conditions, wildlife) and human activities (e.g., illegal logging, pollution). - Explain the role of natural agencies (e.g., drought, fire, floods, pests) in damaging forest resources and their long-term impacts on forest	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	- Visit erosion sites - Identify and classify agents of damage during a field visit to a forest estate, categorizing them into natural or human-induced factors. - Classify agents of damage during a field visit to a forest estate, categorizing them into natural or human-induced factors. - Monitor the effects of natural damage (e.g., fire, pests, drought) on forest health by measuring tree growth, leaf condition, and bark damage over time. - Assess human-induced damage in a field exercise, evaluating the	- Guide students to: - Visit erosion sites - Identify and classify agents of damage during a field visit to a forest estate, categorizing them into natural or human-induced factors. - Classify agents of damage during a field visit to a forest estate, categorizing them into natural or human-induced factors. - Monitor the effects of natural damage	Machete, Debarking knife, Drawing books, Pencils, Insect nets, Insect trap, Insect box, Display cabinet/board, Charts.

	drought, fire, floods, pests) in damaging forest resources and their long-term impacts on forest health. 2.4 Explain the impact of human agencies (e.g., deforestation, forest degradation, poaching, invasive species) on forest ecosystems and economic sustainability.	health. Discuss the impact of human agencies (e.g., deforestation, forest degradation, poaching, invasive species) on forest ecosystems and economic sustainability.		effects of illegal logging, land-use change, or pollution on forest structure and diversity. Conduct a case study analysis of a forest area affected by invasive species, documenting the impact on native plants, soil health, and ecosystem services	(e.g., fire, pests, drought) on forest health by measuring tree growth, leaf condition, and bark damage over time. Observe damage caused by weather conditions (e.g., drought) and human activities (e.g., logging, pollution).	
General Objective 3.0: Know methods of prevention of damages caused by physical agents						
6-7	3.1 Explain physical agent that cause damages to forest and its products: - Drought - Lightening - Flood - Heat - Domestic and wild animal - Fire 3.2 Explain the causes of drought. 3.3 Describe the effect of drought on forest	- Describe physical agents that cause damage to forests and their products, focusing on the impact of: drought, lightning, flood, heat, domestic and wild animals, and fire. - Explain the causes of drought, discussing factors such as climate change, deforestation, and seasonal variations. - Describe the effects of drought on forest	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	- Identify the physical agents causing damage to forest plantations in a local field setting, recording visible effects of drought, fire, and animal damage. - Assess the impact of drought on forest plantations, using methods such as measuring tree health, soil	Guide students to: - Identify the physical agents causing damage to forest plantations in a local field setting, recording visible effects of drought, fire, and animal damage. - Assess the impact of	Machete, Debarking knife, Drawing books, Pencils, Insect nets, Insect trap, Insect box, Display cabinet/board, Charts.

	plantations	plantations, explaining how drought leads to water stress, reduced growth, increased vulnerability to pests, and soil degradation		moisture levels, and growth rate before and after drought conditions. • Monitor the effects of physical agents on forest health by conducting a field survey of a forest area affected by fire or flood, and produce a report on the damage observed. • Simulate a drought scenario in a controlled forest plot by reducing water supply, and observe the physiological response of the trees, documenting changes in leaf color, growth, and vigor.	drought on forest plantations, using methods such as measuring tree health, soil moisture levels, and growth rate before and after drought conditions. • Monitor the effects of physical agents on forest health by conducting a field survey of a forest area affected by fire or flood, and produce a report on the damage observed. • Simulate a drought scenario in a controlled forest plot by reducing water supply • Observe the physiological	
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					response of the trees, documenting changes in leaf color, growth, and vigor.	
General Objective 4.0: Know simple methods of prevention and control of soil erosion						
8-10	4.1 Describe the following types of erosions: - Splash - Sheet - Rill - Gully 4.2 Explain the factors that influence wind Erosion. 4.3 Describe simple erosion control methods 4.4 Describe methods of reclaiming eroded forest areas 4.5 Define shelterbelt 4.6 Explain the methods of establishing Shelterbelt	- Explain the following types of erosions as highlighted in 4.1 - Describe the factors that influence wind erosion - Explain simple erosion control methods - Describe methods of reclaiming eroded forest areas - Explain shelterbelt and the methods of establishing Shelterbelt	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	- Apply soil erosion control techniques in a forest setting, such as planting cover crops, building terraces, and using mulch to reduce soil loss and protect forested areas. - Assess soil erosion in forested areas by measuring changes in soil depth, texture, and compaction before and after implementing erosion control practices. - Implement reforestation or agroforestry practices to prevent soil erosion in	Guide students to: - Apply soil erosion control techniques in a forest setting, such as planting cover crops, building terraces, and using mulch to reduce soil loss and protect forested areas. - Assess soil erosion in forested areas by measuring changes in soil depth, texture, and compaction before and after implementing erosion control practices. - Implement reforestation or	Machete, Debarking knife, Drawing books, Pencils, Insect nets, Insect trap, Insect box, Display cabinet/board, Charts.

				deforested or degraded forest land, and monitor the effectiveness over time. • Measure the success of erosion control methods using tools such as erosion pins, soil loss measurements, and visual monitoring of vegetation growth. • Prepare a report on soil erosion control efforts in a forested area, summarizing the methods used, results observed, and recommendations for further improvement based on the outcomes.	agroforestry practices to prevent soil erosion in deforested or degraded forest land, and monitor the effectiveness over time. • Measure the success of erosion control methods using tools such as erosion pins, soil loss measurements, and visual monitoring of vegetation growth. • Prepare a report on soil erosion control efforts in a forested area, summarizing the methods used, results observed, and recommendations for further improvement	
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					based on the outcomes.	
General Objective 5.0: Know causes of forest fire, their prevention and control						
8-10	5.1 Define fire 5.2 Explain causes of forest fire (natural and artificial) 5.3 Describe the methods of preventing forest fire 5.4 Explain the concept of fire triangle: i. Heat ii. Fuel iii. Oxygen (air) 5.5 Describe classes of fire	• Explain fire • Discuss causes of forest fire (natural and artificial) • Explain the methods of preventing forest fire • Explain the concept of fire triangle • Describe classes of fire	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	• Demonstrate the following fire preventing methods: i. fire tracing ii. fire separation • Demonstrate the methods of fighting various classes of fire. • Operate fire extinguisher	Guide student to: • Demonstrate the following fire preventing methods: iii. fire tracing iv. fire separation • Demonstrate the methods of fighting various classes of fire. • Operate fire extinguisher	Sand bucket, Fire extinguisher, Beater.
General Objective 6.0: Know common insects, pests and diseases of forest crops and their management in Nigeria						
11-13	6.1 Describe the prevalent pests and diseases of forest crops in Nigeria 6.2 Describe different physical methods of insect control (barriers, nettings, trapping etc) 6.3 Explain different chemical methods of insect pest control (e.g.	• Discuss the prevalent pests and diseases of forest crops in Nigeria • Explain different physical methods of insect control (barriers, nettings, trapping etc) • Describe different chemical methods of insect pest control (e.g. insecticides) • Explain the different biological methods of	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	• Apply different physical methods of insect control (e.g. barriers, nettings, trapping etc) • Apply common insecticides to control insect pests • Apply different biological methods of insect pest control (e.g. use of	Guide students to: • Apply different Physical methods of insect control (e.g. barriers, nettings, trapping etc) • Apply different chemical methods of insect control (e.g. insecticides) • Apply different	Sweep nets, Beat sheets, Pheromone traps, Sticky traps, Hand lens (10× or 20×), Insect aspirators, pooter, Plastic specimen containers,

	insecticides) 6.4 Describe different biological methods of insect control (e.g use of predators and natural enemies) 6.5 Explain major diseases of forest estates in Nigeria 6.6 Describe the methods of disease control in the forests diseases in Nigeria 6.7 Explain the concept of integrated pest management (IPM) in forest pests and diseases control	insect control (e.g use of predators and natural enemies) - Describe major diseases of forest estates in Nigeria - Explain the methods of disease control in the forests diseases in Nigeria		predators and natural enemies)	biological methods of insect pest control (e.g use of predators and natural enemies)	Cooler or portable storage box, Protective gloves.
General Objective 7.0: Know the invasive species of pests prevailing forest crops in Nigeria						
13-15	7.1 State the most common invasive species of pests affecting forest crops in Nigeria 7.2 Explain the environmental and economic consequences of invasive pests on Nigeria's forest health, timber production, and	- Explain the most common invasive species of pests affecting forest crops in Nigeria, highlighting key pests such as armyworms, bark beetles, and termite species. - Discuss methods used for monitoring and detecting invasive pest species in forest crops, focusing on field	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	- Identify the most common invasive species of pests affecting forest crops in Nigeria - Apply pest management strategies in the control of invasive pest species - Identify major diseases of forest estates in Nigeria	Guide students to: - Identify the most common invasive species of pests affecting forest crops in Nigeria - Apply pest management strategies in the control of invasive pest species - Identify major	Sweep nets, Beat sheets, Pheromone traps, Sticky traps, Hand lens (10× or 20×), Insect aspirators pooter, Plastic specimen containers,

	biodiversity. 7.3 Discuss the methods used for monitoring and detecting invasive pest species in forest crops in Nigeria, including field surveys and remote sensing techniques. 7.4 Explain the effectiveness of various pest management strategies (e.g., chemical, biological, and cultural controls 7.5 Explain the preventive and control measures to manage invasive pest species, including quarantine protocols, early detection systems, and integrated pest management (IPM) approaches.	surveys, remote sensing techniques, and the importance of early detection for effective pest management. Explain the preventive and control measures to manage invasive pest species, including quarantine protocols, early detection systems, and integrated pest management (IPM) approaches.		Apply methods of controlling forest diseases in Nigeria	diseases of forest estates in Nigeria Apply methods of controlling forest diseases in Nigeria	Cooler or portable storage box, Protective gloves.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

WILDLIFE CONSERVATION

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: WILDLIFE CONSERVATION	COURSE CODE: FET 127	CONTACT HOURS: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 2 HOURS/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 0 HOUR/WEEK
GOAL: This course is aimed at introducing the student to animal territory, population and migration		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know importance of wildlife management and conservation strategies; 2.0 Understand the relationship between game animals and their habitat; 3.0 Understand the concept of food chain, food web and trophic levels; 4.0 Understand factors influencing population dynamics; 5.0 Understand the criteria for game recognition; 6.0 Understand the importance of zoos and zoo management.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE:WILDLIFE CONSERVATION			COURSE CODE: FET 127		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORETICAL: 2 HOURS/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 0 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is aimed at introducing the student to animal territory, population and migration						
GENERAL OBJECTIVE 1.0: Know importance of wildlife management and conservation strategies						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Define wildlife 1.2 Explain the scope of wildlife management 1.3 Define wildlife conservation 1.4 Explain wildlife conservation methods (in-situ and ex-situ) 1.5 Explain the importance of wildlife conservation such as: i. Foreign exchange earnings ii. Export of live animals and protein iii. Sport hunting and fishing iv. Protein supply v. Education and research purpose	• Explain wildlife • Discuss the scope of wildlife management • Explain wildlife conservation • Discuss wildlife conservation methods (in-situ and ex-situ) • Outline the importance of wildlife conservation such as: — Foreign exchange earnings — Export of live animals and protein — Sport hunting and	Marker, Marker board, Projector, Computer, Textbooks, Internet, Animal chart, Mini zoo, etc.			

	vi. Conservation for posterity vii. Employment opportunities, etc.	fishing — Protein supply — Education and research purpose — Conservation for posterity — Employment opportunities, etc				
General Objective 2.0: Understand the relationship between game animals and their habitats						
3-5	2.1 Describe the various Relationships between game animals and their habitats viz; Symbiotic association Mutualism Commensalism Antagonistic association Competition Parasitism Antibiotics Predator-Prey 2.2 Describe the type of relationship that may occur between different population species. 2.3 Describe the type of relationship that occurs between members of the same animal	- Describe the various Relationships between game animals and their habitats viz; Symbiotic association Mutualism Commensalism Antagonistic association Competition Parasitism Antibiotics Predator-Prey Describe the type of relationship that may occur between different population species. - Describe the type of relationship that	Marker, Marker board, Projector, Computer, Textbooks, Internet, Animal chart, etc.			

	species.	occurs between members of the same animal species.				
General Objective 3.0: Understand the concept of food chain, food web and trophic level						
6-8	3.1 Explain food Chain 3.2 Explain the activities of organism in the food chain process 3.3 Explain food web 3.4 Explain the activities of organism in the food web process 3.5 Explain trophic level 3.6 Describe organisms that belong to the same trophic level such as: i. The green plants occupy the same trophic level (the producer level) ii. The plant eaters, i.e. the herbivores belong to the same trophic level, i.e. the primary consumers. 3.7 Explain primary and secondary consumers	• Describe food Chain • Describe the activities of organism in the food chain process • Describe food web • Describe the activities of organism in the food web process • Explain trophic level • Describe organisms that belong to the same trophic level such as: — The green plants occupy the same trophic level (the producer level) — The plant eaters, i.e. the herbivores belong to the same trophic level, i.e. the primary consumers. • Describe primary and secondary	Marker, Marker board, Projector, Computer, Textbooks, Internet, Animal chart, etc.			

		consumers				
General Objective 4.0: Understand factors influencing population dynamics						
9-11	4.1 Explain the following ecological terms: - Habitat - Animal territory - Animal home range - Niche 4.2 List the different types of territory maintained by the animals for: - Mating - Nesting - Feeding 4.3 Explain the importance of each of 4.2 above 4.4 Explain the peculiarities of each of the territories in 4.2 above. 4.5 Define: - population - population density - Population dynamics 4.5 Explain the following: - Single species population - Multi species population - Potential natality or	- Discuss the following ecological terms: - Habitat - Animal territory - Animal home range - Niche - Outline the different types of territory maintained by the animals for: - Mating - Nesting - Feeding - Discuss the importance of each of 4.2 above - Describe the peculiarities of each of the territories in 4.2 above. - Explain: - population - population density - Population dynamics - Discuss the following: - Single species	Marker, Marker board, Projector, Computer, Textbooks, Internet, Animal chart, etc.			

	birthrate iv. Realised natality v. Potential mortality vi. Realised mortality 4.6 Explain the concept of migration (immigration and emigration) 4.7 Explain the importance of migration	population — Multi species population — Potential natality or birthrate — Realised natality — Potential mortality — Realised mortality • Discuss the concept of migration (immigration and emigration) • Discuss the importance of migration				
General Objective 5.0: Understand the criteria for game recognition						
12-13	5.1 Explain some important games that are of economic importance, e.g kob, bush-buck, roan antelope etc. 5.2 List the features of the animals listed in 5.1 with regards to: i. Size ii. Shape iii. Colour iv. Gestation period v. Weight 5.3 Outline the characteristics of the animals	• Enumerate some important games that are of economic importance, e.g kob, bush-buck, roan antelope etc. • Outline the features of the animals listed in 5.1 with regards to: — Size — Shape — Colour	Marker, Marker board, Projector, Computer, Textbooks, Internet, Animal chart, etc.			

	listed in 5.1 above: - Whether they move in groups - Whether it moves alone - Life span of the animals, etc. 5.4 Explain the activities of the animals listed in 5.1 above: - Herbivores - Carnivores - Omnivores 5.5 State the economic importance of the animals listed in 5.1 above.	— Gestation period — Weight • Outline the characteristics of the animals listed in 5.1 above: — Whether they move in groups — Whether it moves alone — Life span of the animals, etc. • Describe the activities of the animals listed in 5.1 above: — Herbivores — Carnivores — Omnivores • Outline the economic importance of the animals listed in 5.1 above.				
General Objective 6.0: Understand the importance of zoo and zoo management						
14-15	6.1 Define zoo 6.2 List types of zoo 6.3 Explain the purpose of establishing and maintaining zoos, e.g; - Conservation - Tourism	• Explain zoo • Outline types of zoo • Discuss the purpose of establishing and maintaining zoos, e.g; — Conservation	Marker, Marker board, Projector, Computer, Textbooks, Internet, Animal chart,			

	iii. Education iv. Research 6.4 Explain the procedures for establishing a zoo. 6.5 Describe the organizational structure of typical zoo with regards to personnel.	— Tourism — Education — Research • Outline the procedures for establishing a zoo. • Describe the organizational structure of typical zoo with regards to personnel.	etc.			
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

YEAR II, SEMESTER I

SURVEYING AND GEO-INFORMATICS IN FORESTRY II

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: SURVEYING AND GEO-INFORMATICS IN FORESTRY II	COURSE CODE: FET 211	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK

YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is to provide students with an in-depth understanding; knowledge and skills of surveying techniques and geo-informatics systems used in forest ecosystem management		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the use of equipment and methods for electro-magnetic distance measurement 2.0 Understand the procedure and methods of optical theodolite and total station traversing 3.0 Understand the principles, field methods and calculation procedures for minor triangulation 4.0 Understand the methods of heighting and tertiary leveling 5.0 Understand problems involved in producing contoured plans 6.0 Understand setting out procedure		



PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: SURVEYING AND GEO-INFORMATICS IN FORESTRY II			COURSE CODE: FET 211		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is to provide students with an in-depth understanding; knowledge and skills of surveying techniques and geo-informatics systems used in forest ecosystem management						
GENERAL OBJECTIVE 1.0: Understand the use of equipment and methods for electro-magnetic distance measurement						
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 electromagnetic distance measurement, including the concept of signal propagation and its application in distance measurement. 1.2 Explain the types of equipment used in electromagnetic distance measurement, such as electronic distance measurement (EDM) instruments and total stations. 1.3 Discuss the advantages of electromagnetic distance measurement over traditional	- Discuss the principles of electromagnetic distance measurement, including the concept of signal propagation and its application in distance measurement. - Describe the types of equipment used in electromagnetic distance measurement, such as electronic distance measurement (EDM) instruments and total stations. - Discuss the	Textbooks, Scientific papers, Online resources, Visual aids, GIS Software, ArcGIS, QGIS Surveying, Software AutoCAD, Survey Pro, Powerpoint slides, etc.	- Demonstrate the use of electronic distance measuring (EDM) equipment, including setting up and performing distance measurements in a field environment. - Measure distances using total stations and electromagnetic measuring devices, ensuring proper calibration and data accuracy. - Conduct field tests to evaluate the impact of environmental conditions (e.g.,	Guide students to: - Demonstrate the use of electronic distance measuring (EDM) equipment, including setting up and performing distance measurements in a field environment. - Measure distances using total stations and electromagnetic measuring	Total Station, Theodolite and GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring Tapes, Chains and ranging poles, Compass, Leveling rod, Plumb line, Topographic maps, Local forestry and surveying

	methods like tape and chain measurement, focusing on accuracy and efficiency. 1.4 Explain the factors that affect the accuracy of electromagnetic distance measurement, such as temperature, humidity, and terrain type. 1.5 Explain the procedure for performing electromagnetic distance measurement, including setup, calibration, and data collection.	advantages of electromagnetic distance measurement over traditional methods like tape and chain measurement, focusing on accuracy and efficiency. • Describe the factors that affect the accuracy of electromagnetic distance measurement, such as temperature, humidity, and terrain type. • Describe the procedure for performing electromagnetic distance measurement, including setup, calibration, and data collection.		temperature, humidity) on electromagnetic distance measurements. • Calculate measured distances and adjust for environmental factors to ensure accurate survey data. • Analyze and compare the results of electromagnetic measurements with traditional methods to assess efficiency and accuracy.	devices, ensuring proper calibration and data accuracy. • Conduct field tests to evaluate the impact of environmental conditions (e.g., temperature, humidity) on electromagnetic distance measurements. • Calculate measured distances and adjust for environmental factors to ensure accurate survey data. • Analyze and compare the results of electromagnetic measurements with traditional methods to assess efficiency and accuracy.	field guides, Portable weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.
General Objective 2.0: Understand the procedure and methods of optical theodolite and total station traversing						

3-5	2.1 Explain the principles of optical theodolites and their role in measuring angles for surveying in forestry and other applications. 2.2 Explain the procedure of total station traversing, including how angles and distances are measured to create accurate surveying networks. 2.3 State the advantages of using optical theodolites and total stations for precise angle measurement and distance calculation in forestry surveys. 2.4 Explain the components and setup requirements for optical theodolites and total stations in the field. 2.5 Explain the principles of traversing in the context of surveying, including how	• Discuss the principles of optical theodolites and their role in measuring angles for surveying in forestry and other applications. • Describe the procedure of total station traversing, including how angles and distances are measured to create accurate surveying networks. • Discuss the advantages of using optical theodolites and total stations for precise angle measurement and distance calculation in forestry surveys. • Describe the components and setup requirements for optical theodolites and total stations in the field. • Discuss the principles of traversing in the	Textbooks, Scientific papers, Online resources, Visual aids, GIS Software, ArcGIS, QGIS Surveying, Software AutoCAD, Survey Pro, Powerpoint slides, etc.	• Set up and calibrate optical theodolites for angle measurement, ensuring the equipment is properly aligned and leveled for accurate readings. • Conduct a survey using total stations to measure angles and distances, applying traversing techniques in the field. • Perform a total station traverse and calculate the coordinates of survey points based on measured angles and distances. • Use theodolites and total stations for angle and distance measurement, and apply the data to produce a basic survey plot. • Evaluate the accuracy of survey	Guide students to: • Set up and calibrate optical theodolites for angle measurement, ensuring the equipment is properly aligned and leveled for accurate readings. • Conduct a survey using total stations to measure angles and distances, applying traversing techniques in the field. • Perform a total station traverse and calculate the coordinates of survey points based on measured angles and distances. • Use theodolites and total stations for angle and	Total Station, Theodolite and GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring Tapes, Chains and ranging poles, Compass, Leveling rod, Plumb line, Topographic maps, Local forestry and surveying field guides, Portable weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.
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	measured angles and distances are used to compute locations and boundaries	context of surveying, including how measured angles and distances are used to compute locations and boundaries		data obtained from optical theodolites and total stations by comparing the results with known reference points.	distance measurement, and apply the data to produce a basic survey plot. Evaluate the accuracy of survey data obtained from optical theodolites and total stations by comparing the results with known reference points.	
General Objective 3.0: Understand the principles, field methods and calculation procedures for minor triangulation						
6-8	3.1 Define minor triangulation and explain its use in mapping small-scale survey areas and forest boundaries 3.2 Explain the principles of triangulation, focusing on how angles between survey stations are used to compute the position of points in the field. 3.3 Describe the field	- Explain minor triangulation and explain its use in mapping small-scale survey areas and forest boundaries. - Discuss the principles of triangulation, focusing on how angles between survey stations are used to compute the position of points in	Textbooks, Scientific papers, Online resources, Visual aids, GIS Software, ArcGIS, QGIS Surveying, Software AutoCAD, Survey Pro,	- Perform minor triangulation in a field setting, using tripods, sextants, or theodolites to measure angles between multiple survey stations. - Apply trigonometric formulas to calculate distances and coordinates for triangulation points based on field	Guide students to: - Perform minor triangulation in a field setting, using tripods, sextants, or theodolites to measure angles between multiple survey stations. - Apply trigonometric formulas to	Total Station, Theodolite and GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring Tapes, Chains and ranging poles, Compass, Leveling rod,

	methods involved in minor triangulation, including setting up triangulation stations and measuring angles between known reference points. 3.4 Explain the calculation procedures for minor triangulation, including the use of trigonometry to solve for unknown distances and locations. 3.5 Explain the challenges of minor triangulation, including issues with accuracy, line of sight, and survey station setup.	the field. - Describe the field methods involved in minor triangulation, including setting up triangulation stations and measuring angles between known reference points. - Describe the calculation procedures for minor triangulation, including the use of trigonometry to solve for unknown distances and locations. - Discuss the challenges of minor triangulation, including issues with accuracy, line of sight, and survey station setup.	Powerpoint slides, etc.	measurements. - Set up and measure angles between triangulation stations, ensuring accuracy and proper alignment. - Compute the location of unknown points based on triangulation data, comparing calculated coordinates with field observations. - Analyze field data for triangulation, checking for measurement errors and applying correction techniques as necessary.	calculate distances and coordinates for triangulation points based on field measurements. - Set up and measure angles between triangulation stations, ensuring accuracy and proper alignment. - Compute the location of unknown points based on triangulation data, comparing calculated coordinates with field observations. - Analyze field data for triangulation, checking for measurement	Plumb line, Topographic maps, Local forestry and surveying field guides, Portable weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.
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					errors and applying correction techniques as necessary.	
General Objective 4.0: Understand the methods of heighting and tertiary leveling						
9-11	4.1 Explain the concept of heighting and its importance in surveying and forest management, particularly in establishing elevations and topographic features. 4.2 Explain the methods of tertiary leveling, including the use of spirit levels and auto levels for precise elevation measurements over short distances. 4.3 Explain the role of heighting in forestry surveys, such as in tree height measurement, landscape mapping, and forest regeneration studies. 4.4 State the importance of accurate leveling for construction and land management in forested	- Discuss the concept of heighting and its importance in surveying and forest management, particularly in establishing elevations and topographic features. - Describe the methods of tertiary leveling, including the use of spirit levels and auto levels for precise elevation measurements over short distances. - Discuss the role of heighting in forestry surveys, such as in tree height measurement, landscape mapping, and forest regeneration studies. - Outline the	Textbooks, Scientific papers, Online resources, Visual aids, GIS Software, ArcGIS, QGIS Surveying, Software AutoCAD, Survey Pro, Powerpoint slides, etc.	- Perform heighting measurements using spirit levels or auto levels to determine elevations at different survey points. - Use tertiary leveling techniques to measure small height differences between known reference points in the field. - Set up leveling equipment in a forested environment and measure differences in elevation over varying terrains. - Identify and correct errors in heighting measurements, including instrument calibration and line	Guide students to: - Perform heighten measurements using spirit levels or auto levels to determine elevations at different survey points. - Use tertiary leveling techniques to measure small height differences between known reference points in the field. - Set up leveling equipment in a forested environment and measure differences in	Total Station, Theodolite and GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring Tapes, Chains and ranging poles, Compass, Leveling rod, Plumb line, Topographic maps, Local forestry and surveying field guides, Portable weather stations, Field journals, Dye or radioactive

	areas, especially when planning for roads or plantations. 4.5 Explain common sources of error in heighting and leveling, and how to mitigate them during field surveys.	importance of accurate leveling for construction and land management in forested areas, especially when planning for roads or plantations. Describe common sources of error in heighting and leveling, and how to mitigate them during field surveys.		of sight adjustments. Apply heighting and leveling data to produce a simple contour map or topographic profile for a forest area.	elevation over varying terrains. - Identify and correct errors in heighting measurements, including instrument calibration and line of sight adjustments. - Apply heighting and leveling data to produce a simple contour map or topographic profile for a forest area.	tracers, Soil moisture meters, Tensiometers.
General Objective 5.0: Understand problems involved in producing contoured plans						
12-13	5.1 Explain the process of producing contoured plans, focusing on the steps involved in measuring elevations and drawing contour lines to represent terrain features. 5.2 Explain the challenges in producing accurate contoured plans, such as terrain complexity,	- Describe the process of producing contoured plans, focusing on the steps involved in measuring elevations and drawing contour lines to represent terrain features. - Discuss the challenges in producing accurate contoured plans, such	Textbooks, Scientific papers, Online resources, Visual aids, GIS Software, ArcGIS, QGIS Surveying, Software	- Measure elevations at multiple points in the field to generate data for contour lines. - Draw contour lines based on elevation data collected in the field, ensuring accuracy and clarity in the representation of terrain.	Guide students to: - Measure elevations at multiple points in the field to generate data for contour lines. - Draw contour lines based on elevation data collected in the field, ensuring	Total Station, Theodolite and GPS devices, Electromagnetic Distance Measuring (EDM) equipment, Measuring Tapes, Chains and ranging poles,

	data gaps, and measurement errors. 5.3 Explain the importance of contour mapping in forest management for tasks such as water flow analysis, erosion control, and site suitability studies. 5.4 Explain the key tools and equipment required for producing contoured plans, including theodolites, GPS systems, and software for contour plotting. 5.5 Explain the relationship between contour lines and land surface features, such as slopes, valleys, and ridges.	• Describe the importance of contour mapping in forest management for tasks such as water flow analysis, erosion control, and site suitability studies. • Describe the key tools and equipment required for producing contoured plans, including theodolites, GPS systems, and software for contour plotting. • Explain the relationship between contour lines and land surface features, such as slopes, valleys, and ridges.	AutoCAD, Survey Pro, Powerpoint slides, etc.	• Use digital tools such as GIS or AutoCAD to generate contoured maps from survey data. • Perform error checks on contour maps to identify discrepancies between field data and mapped representations. • Analyze a contour map and use it to assess slope, water drainage, and land-use suitability for forest projects	accuracy and clarity in the representation of terrain. • Use digital tools such as GIS or AutoCAD to generate contoured maps from survey data. • Perform error checks on contour maps to identify discrepancies between field data and mapped representations. • Analyze a contour map and use it to assess slope, water drainage, and land-use suitability for forest projects	Compass, Leveling rod, Plumb line, Topographic maps, Local forestry and surveying field guides, Portable weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.
General Objective 6.0: Understand the setting-out procedure						
14-15	6.1 Define the concept of setting out in surveying, including its importance for defining	• Explain the concept of setting out in surveying, including its importance for	Textbooks, Scientific papers, Online	• Set out a survey plot using measuring tapes, compasses, and angles to mark	Guide students to: • Set out a survey plot using measuring tapes,	Total Station, Theodolite and GPS devices, Electromagneti

	boundaries, marking roads, and establishing construction sites in forestry. 6.2 Explain the setting-out process, including the use of measuring tools, angles, and coordinates to create accurate layout plans. 6.3 Explain the use of modern technologies in setting-out procedures, such as total stations, GPS, and laser levels. 6.4 Explain the challenges in setting out forested areas, such as terrain variations, obstructions, and environmental conditions. 6.5 Explain the role of setting-out in forestry management, including its application in forest planning, road construction, and site preparation	defining boundaries, marking roads, and establishing construction sites in forestry. • Discuss the setting-out process, including the use of measuring tools, angles, and coordinates to create accurate layout plans. • Describe the use of modern technologies in setting-out procedures, such as total stations, GPS, and laser levels. • Describe the challenges in setting out forested areas, such as terrain variations, obstructions, and environmental conditions. • Discuss the role of setting-out in forestry management, including its application in forest planning, road construction, and site	resources, Visual aids, GIS Software, ArcGIS, QGIS Surveying, Software AutoCAD, Survey Pro, Powerpoint slides, etc.	boundaries in the field. • Use total stations and GPS equipment to set out points for forest roads, boundary lines, or forest management zones. • Create a layout plan for a forest plantation or conservation area based on the setting-out procedure. • Perform a practical setting-out task in a forest environment, adjusting for terrain changes and obstructions. • Verify the accuracy of the setting-out process by checking positions with a second measurement method and adjusting any discrepancies	compasses, and angles to mark boundaries in the field. • Use total stations and GPS equipment to set out points for forest roads, boundary lines, or forest management zones. • Create a layout plan for a forest plantation or conservation area based on the setting-out procedure. • Perform a practical setting-out task in a forest environment, adjusting for terrain changes and obstructions. • Verify the accuracy of the setting-out	c Distance Measuring (EDM) equipment, Measuring Tapes, Chains and ranging poles, Compass, Leveling rod, Plumb line, Topographic maps, Local forestry and surveying field guides, Portable weather stations, Field journals, Dye or radioactive tracers, Soil moisture meters, Tensiometers.
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		preparation			process by checking positions with a second measurement method and adjusting any discrepancies	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

SILVICULTURE AND FOREST CONSERVATION TECHNIQUES I

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: SILVICULTURE AND FOREST CONSERVATION TECHNIQUES I	COURSE CODE: FET 212	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to provide the student with the knowledge of silviculture		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the aim of silviculture; 2.0 Know the various types of forests in Nigeria; 3.0 Know the methods of forest seed collection, processing, procurement, and storage; 4.0 Know the techniques employed in forest nursery; 5.0 Know the establishment of forest plantation.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: SILVICULTURE AND FOREST CONSERVATION TECHNIQUES I			COURSE CODE: FET 212		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide the student with the knowledge of silviculture						
GENERAL OBJECTIVE 1.0: Understand the aim of silviculture						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Define Silviculture 1.2 State the aim of Silviculture 1.3 Explain the importance of Silviculture in forestry practice	- Define Silviculture and its role in forest management. - Discuss the aim of Silviculture, focusing on tree growth, forest regeneration, and ecosystem maintenance. - Discuss the importance of Silviculture in forestry practice, emphasizing its contribution to forest sustainability, biodiversity conservation, and timber production.	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Physical map of Nigeria, etc.			
General Objective 2.0: Know the various types of forests in Nigeria						

4-7	2.1 Explain the map of Nigeria indicating all the vegetation zones - Mangrove - Freshwater swamp - Plateau/Montane - Humid rain forest - Derived savannah - Southern guinea savannah - Northern guinea savannah - Sudan savannah - Sahel savannah 2.2 Explain the influence of vegetation zones on plant species distribution 2.3 Explain the Nigerian climatic pattern as it affects the various silvicultural operations e.g: Seed collection, planting, nursery etc. 2.4 Explain the various effect of environmental factors on tree	- Explain the map of Nigeria indicating all the vegetation zones — Mangrove — Freshwater swamp — Plateau/Montane — Humid rain forest — Derived savannah — Southern guinea savannah — Northern guinea savannah — Sudan savannah — Sahel savannah - Explain the map of Nigeria indicating all the vegetation zones - Explain the Nigerian climatic pattern as it affects the various silvicultural operations e.g: Seed collection, planting, nursery etc. - Describe the various effect of environmental factors on tree growth and distribution e.g:	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Physical map of Nigeria, etc.			
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	growth and distribution e.g: Light, Moisture, Temperature, etc.	Light, Moisture, Temperature, etc.				
General Objective 3.0: Know the methods of forest seed collection, processing, procurement, and storage						
8-10	3.1 Describe seed collection and processing of the following major indigenous and exotic tree species: <i>Triplochiton scleroxylon</i> (Obeche) <i>Milicia excelsa</i> (Iroko) <i>Azalia africana</i> (Afzelia) <i>Terminalia ivorensis</i> (Idigbo) <i>Khaya ivorensis</i> (Lagos Mahogany) <i>Khaya senegalensis</i> (Khaya) <i>Terminalia superba</i> (Afara) <i>Entandrophragma cylindricum</i> (Sapele Wood) <i>Nauclea diderrichi</i> (Opepe)	- Describe seed collection and processing of the following major indigenous and exotic tree species: <i>Triplochiton scleroxylon</i> (Obeche) <i>Milicia excelsa</i> (Iroko) <i>Azalia africana</i> (Afzelia) <i>Terminalia ivorensis</i> (Idigbo) <i>Khaya ivorensis</i> (Lagos Mahogany) <i>Khaya senegalensis</i> (Khaya) <i>Terminalia superba</i> (Afara) <i>Entandrophragma cylindricum</i> (Sapele Wood) <i>Nauclea diderrichi</i>	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Physical map of Nigeria, etc.	- Collect seeds of the following major indigenous and exotic tree species: <i>Triplochiton scleroxylon</i> (Obeche) <i>Milicia excelsa</i> (Iroko) <i>Azalia africana</i> (Afzelia) <i>Terminalia ivorensis</i> (Idigbo) <i>Khaya ivorensis</i> (Lagos Mahogany) <i>Khaya senegalensis</i> <i>Terminalia superba</i> (Afara) - Process the above seeds	Guide students to: - Collect seeds of the following major indigenous and exotic tree species: <i>Triplochiton scleroxylon</i> (Obeche) <i>Milicia excelsa</i> (Iroko) <i>Azalia africana</i> (Afzelia) <i>Terminalia ivorensis</i> (Idigbo) <i>Khaya ivorensis</i> (Lagos Mahogany) <i>Khaya senegalensis</i> <i>Terminalia superba</i> (Afara) - Process the above seeds.	Jute bags, Ladder, Vibrator, Axe, Dehumidifier, Sieves, Trays, Tarpaulin, Matchete, Kiln jar.

xii. <i>Acacia</i>	(Opepe)				
xiii. <i>Nilotica</i> (Bagaruwa)	— <i>Acacia</i>				
xiv. <i>Vitellaria paradoxa</i> (shea butter)	— <i>Nilotica</i> (Bagaruwa)				
xv. <i>Tectona grandis</i> (Teak)	— <i>Vitellaria paradoxa</i> (shea butter)				
xvi. <i>Gmelina aborea</i> (Gmelina)	— <i>Tectona grandis</i> (Teak)				
xvii. <i>Eucalyptus spp</i>	— <i>Gmelina aborea</i> (Gmelina)				
xviii. <i>Pinus carabaea</i> (Pine)	— <i>Eucalyptus spp</i>				
xix. <i>Azadirachta indica</i>	— <i>Pinus carabaea</i> (Pine)				
xx. <i>Acacia spp</i>	— <i>Azadirachta indica</i>				
3.2 Describe the following:	— <i>Acacia spp</i>				
i. Seed extraction	• Describe the following:				
ii. Seed purity	— Seed extraction				
iii. Seed viability	— Seed purity				
iv. Germination capacity	— Seed viability				
v. Seed treatment	— Germination capacity				
vi. Planting	— Seed treatment				
3.3 Describe the various methods of seed storage e.g:	— Planting				
i. Cold storage	• Describe the various methods of seed storage e.g:				
ii. Puddling	— Cold storage				
iii. Open air storage, etc.	— Puddling				

	3.4 Describe the procedure for seed procurement from outside Nigeria.	— Open air storage, etc. • Describe the procedure for seed procurement from outside Nigeria.				
General Objective 4.0: Know the techniques employed in forest nursery						
11-12	4.1 Explain various factors that determine the location of forestry nurseries. 4.2 Explain types of forestry nurseries: - Temporary - Permanent - Central - Extension/Satellite 4.3 State the advantages and disadvantages of the nurseries above in 4.2 4.4 Explain the following modern irrigation systems used in nursery technology: - Drip - Sprinkler - Centre pivot - Sub surface - Micro-sprinkler/fog etc	• Discuss various factors that determine the location of forestry nurseries. • Describe types of forestry nurseries: — Temporary — Permanent — Central — Extension/Satellite • Outline the advantages and disadvantages of the nurseries above in 4.2 • Describe the following modern irrigation systems used in nursery technology: — Drip — Sprinkler — Centre pivot — Sub surface — Micro-sprinkler/fog etc	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Physical map of Nigeria, etc.	• Identify the various types of planting stocks • Establish temporary nursery (10m x 10m) • Identify temporary, permanent, central and extension/satellite nurseries	Guide students to: • Identify the various types of planting stocks • Establish temporary nursery (10m x 10m) • Identify temporary, permanent, central and extension/satellite nurseries	Jute bags, Ladder, Vibrator, Axe, Dehumidifier, Sieves, Trays, Tarpaulin, Matchete, Kiln jar.

	4.5 Explain the various types of planting stock: - Seeds - Stumps - Root stock etc 4.6 Explain the factors that determine the use various types of planting stock e.g: Cost of production, Climatic condition of the area, Geographical location 4.7 Describe the various operations carried out in the germination beds and transplant beds. 4.8 Explain the importance of good planting stock on the subsequent success of plantation.	- Describe the various types of planting stock: - Seeds - Stumps - Root stock etc - Explain the factors that determine the use various types of planting stock e.g: Cost of production, Climatic condition of the area, Geographical location - Describe the various operations carried out in the germination beds and transplant beds. - Discuss the importance of good planting stock on the subsequent success of plantation.				
General Objective 5.0: Know the establishment of forest plantation						
13-15	5.1 Explain the following forestry operations: - Site selection - Demarcation	- Explain the following forestry operations: - Site selection - Demarcation	Marker, Marker board, Projector, Computer	- Carry out the plantation establishment operations: - Site selection - Demarcation	Guide students to: Carry out the plantation establishment operations:	Physical Map of Nigeria, Machete, Tarpaulin, Tree

iii. Felling/logging iv. Clearing v. Pegging vi. Planting vii. Weeding viii. Beating-up ix. Pruning x. Thinning etc. 5.2 Explain the various types of herbicides used in forestry 5.3 Explain methods of application of the herbicides listed in 5.2 above 5.4 Explain the precautionary measures involved in the use of the herbicides listed in 5.2 above. 5.5 Describe the following forest plantation: i. Even aged forest ii. Uneven aged forest iii. Irregular/uneven aged forest	— Felling/logging — Clearing — Pegging — Planting — Weeding — Beating-up — Pruning — Thinning etc. • Describe the various types of herbicides used in forestry • Describe methods of application of the herbicides listed in 5.2 above • Explain the precautionary measures involved in the use of the herbicides listed in 5.2 above. • Describe the following forest plantation: — Even aged forest — Uneven aged forest — Irregular/uneven aged forest	systems, Textbooks, Internet, Physical map of Nigeria, etc.	iii. Felling/logging iv. Clearing v. Pegging vi. Planting vii. Weeding viii. Beating-up ix. Pruning x. Thinning etc. • Identify various types of herbicides used in forestry. • Identify: i. Even aged forest ii. Uneven aged forest iii. Irregular/uneven aged forest.	xi. Site selection xii. Demarcation xiii. Felling/logging xiv. Clearing xv. Pegging xvi. Planting xvii. Weeding xviii. Beating-up xix. Pruning xx. Thinning etc. • Identify various types of herbicides used in forestry. • Identify: — Even aged forest — Uneven aged forest — Irregular/uneven aged forest.	seedlings or saplings, Soil preparation tools (shovels, hoes, soil testing kits), Measuring instruments, Field notebooks for documentation, Thinning and pruning tools (saws, shears, axes)
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COURSE ASSESSMENT

Course Work: 10%

Tests: 10%

Practical 40%

Examination: 40%

Total: 100%



FOREST INVENTORY AND MENSURATION TECHNIQUES

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: FOREST INVENTORY AND MENSURATION TECHNIQUES	COURSE CODE: FET 213	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills in forest inventory, identification and use of instruments for measurement of tree dimensions		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand mensuration terms; 2.0 Know instruments for tree measurement; 3.0 Know the measurement of tree and stand; 4.0 Understand the preparation of volume table; 5.0 Know sampling techniques in forestry.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE:			COURSE CODE: FET 213		CONTACT HOURS: 4 HOURS/WEEK	
FOREST INVENTORY AND MENSURATION TECHNIQUES			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills in forest inventory, identification and use of instruments for measurement of tree dimensions						
GENERAL OBJECTIVE 1.0: Understand mensuration terms						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Define mensuration 1.2 Explain the following mensuration terms: i. Total Height ii. Timber Height iii. Girth at Breast Height (GBH) iv. Diameter at Breast Height (DBH) v. Form Factor vi. Basal Area vii. Volume, etc 1.3 Describe how to	• Explain mensuration • Discuss the following mensuration terms: — Total Height — Timber Height — Girth at Breast Height (GBH) — Diameter at Breast Height (DBH) — Form Factor — Basal Area — Volume, etc	Marker, Marker board, Projector, Computer, Textbooks, Internet, etc.			

	convert imperial to metric units and vice versa.	Describe how to convert imperial to metric units and vice versa.				
General Objective 2.0: Know instruments for tree measurement						
4-6	2.1 Explain height measuring instruments e.g; - Christen's - Hypsometer - Abney level - Haga altimeter - Blumeleis altimeter - Measuring rods - Clinometer etc 2.2 Explain Diameter measuring instrument such as Girthing tapes and Calipers etc. 2.3 Explain the working principles of the height and diameter measuring instruments in 2.2. 2.4 Describe measurement of height GBH/DBH of trees with instruments listed in 2.1 and 2.2 above. 2.5 Explain how to	- Describe height measuring instruments e.g; - Christen's - Hypsometer - Abney level - Haga altimeter - Blumeleis altimeter - Measuring rods - Clinometer etc - Describe Diameter measuring instrument such as Girthing tapes and Calipers etc. - Describe the working principles of the height and diameter measuring instruments in 2.2. - Describe measurement of height GBH/DBH of trees with instruments listed in 2.1 and 2.2 above. - Describe how to	Marker, Marker board, Projector, Computer, Textbooks, Internet, etc.	- Identify height measuring instruments - Identify diameter measuring instrument, e.g; Girthing tapes, Calipers etc. - Measure height GBH/DBH of trees with instruments - Improvise instruments for measuring height and diameter of trees	Guide students to: - Identify height measuring instruments e.g; Christen's Hypsometer, altimeter, measuring rods, etc. - Identify diameter measuring instrument - Demonstrate the measurement of height, GBH/DBH of trees with instruments - Demonstrate the use of improvised instruments for measuring height and diameter of trees	Matchete, Girth tapes, Abney level, Improvise measuring poles, Haga altimeter, Improvised Christen's Hypsometer, Bark guage, Calipers, Increment borers, Relascope.

	improvise instruments for measuring height and diameter of trees where applicable. 2.6 Explain the following modern forestry inventory technologies: - Light Detection Ranging (LiDAR) - Remote Sensing/satellite imagery - Digital data collection/Forestry software	improvise instruments for measuring height and diameter of trees where applicable. - Describe the following modern forestry inventory technologies: - Light Detection Ranging (LiDAR) - Remote Sensing/satellite imagery - Digital data collection/Forestry software				
General Objective 3.0: General Objective: 3.0 Know the measurement of a tree and stand						
7-9	3.1 Define a tree 3.2 Define a stand 3.3 Explain the purpose of measuring a tree and stand. 3.4 Describe how to measure standing and felled trees in plantations. 3.5 Describe problems encountered in measurement of standing and felled	- Explain the purpose of measuring a tree and stand. - Describe how to measure standing and felled trees in plantations. - Describe problems encountered in measurement of standing and felled trees.	Marker, Marker board, Projector, Computer, Textbooks, Internet, etc.	Visit plantations and natural forests to measure standing and felled trees.	Guide students to visit plantations and natural forests to measure standing and felled trees.	Matchete, Girth tapes, Abney level, Improvise measuring poles, Haga altimeter, Improvised Christen's Hypsometer, Bark guage, Calipers, Increment borers, Relascope.

	3.6 Explain Computation of volume of trees/stand.					
General Objective 4.0: Understand the preparation of volume tables						
10-12	4.1 Explain volume table 4.2 Explain the different types of volume table 4.3 Explain the measurements required for volume table construction. 4.4 Explain the methods of volume table preparation, e.g graphical, analytical, regression, etc.	- Describe volume table - Describe the different types of volume table - Explain the measurements required for volume table construction. - Describe the methods of volume table preparation, e.g graphical, analytical, regression, etc.	Marker, Marker board, Projector, Computer, Textbooks, Internet, etc.	Prepare various volume tables	Demonstrate the preparation of various volume tables	Computer systems, Notebooks, Graph books.
General Objective 5.0: Understand sampling techniques in forestry						
13-15	5.1 Define sampling 5.2 Explain reasons for sampling in forestry. 5.3 Explain statistical terms used in sampling, e.g. mean, mode, median, harmonic mean, standard deviation, etc.	- Describe sampling - Discuss reasons for sampling in forestry. - Describe statistical terms used in sampling, e.g. mean, mode, median, harmonic mean, standard deviation, etc.	Marker, Marker board, Projector, Computer, Textbooks, Internet, etc.	Carry out sampling exercises in forest plantations and in natural forests.	Guide students to carry out sampling exercises in forest plantations and in natural forests.	Haga altimeter Improvised Christen's Hypsometer, Bark guage, Calipers, Increment borers.

	5.4 Explain different methods of sampling, e.g., random, systematic, purposive etc. 5.5 Explain methods of data presentation in forest sampling, e.g. graphs, histograms, charts, etc. 5.6 Explain how to carry out sampling techniques in forest plantations and in natural forests.	- Describe different methods of sampling, e.g., random, systematic, purposive etc. - Discuss methods of data presentation in forest sampling, e.g. graphs, histograms, charts, etc. - Explain how to carry out sampling techniques in forest plantations and in natural forests.				
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						



YEAR II SEMESTER II

SUSTAINABLE FOREST BUSINESS PRACTICES

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: SUSTAINABLE FOREST BUSINESS PRACTICES	COURSE CODE: FET 221	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with knowledge and skills to develop and manage sustainable forest-based businesses, identify market opportunities, and apply entrepreneurship principles to drive economic growth in Nigeria's forestry sector		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the nature, scope, and importance of forest business in the Nigerian economy; 2.0 Know forest products and services available for commercial utilization; 3.0 Know forest markets, market structure, and pricing mechanisms for forest products; 4.0 Understand entrepreneurship principles to establish and manage forest enterprises; 5.0 Know how to develop a basic business plan for a forest-based enterprise.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: SUSTAINABLE FOREST BUSINESS PRACTICES			COURSE CODE: FET 221		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills to develop and manage sustainable forest-based businesses, identify market opportunities, and apply entrepreneurship principles to drive economic growth in Nigeria's forestry sector						
GENERAL OBJECTIVE 1.0: Understand the nature, scope, and importance of forest business in the Nigerian economy						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Define forest business 1.2 Explain the scope of forest business. 1.3 Explain the role of forest business in rural livelihoods and poverty alleviation. 1.4 Describe the different sectors within Nigeria's forest industry (e.g., timber, NTFPs, ecotourism). 1.5 State the economic contributions of the forestry sector to Nigeria’s GDP. 1.6 Explain the potential for growth in Nigeria's forest business sector.	• Explain the definition and scope of forest business. • Discuss the role of forest business in rural livelihoods and poverty alleviation. • Identify the different sectors within Nigeria's forest industry (e.g., timber, NTFPs, ecotourism). • Outline the economic contributions of the forestry sector to Nigeria’s GDP. • Explain the potential for growth in Nigeria's forest	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	• Conduct a field visit to a forest-based business to observe its operations. • Identify and classify forest-based enterprises in Nigeria. • Classify forest-based enterprises in Nigeria. • Develop a SWOT analysis for a local forest enterprise. • Assess the economic viability of starting a forest business. • Participate in group discussions on developing forest business strategies.	Guide students to: • Conduct a field visit to a forest-based business to observe its operations. • Identify and classify forest-based enterprises in Nigeria. • Develop a SWOT analysis for a local forest enterprise. • Assess the economic viability of starting a forest	Marker, Marker board, Projector, Computer systems, Internet.

	1.7 Explain the challenges faced by the Nigerian forest business sector and its economic implications.	business sector. Describe the challenges faced by the Nigerian forest business sector and its economic implications.		Analyse the impact of deforestation on forest business opportunities through a case study.	business. - Participate in group discussions on developing forest business strategies. - Analyse the impact of deforestation on forest business opportunities through a case study.	
General Objective 2.0: Know forest products and services available for commercial utilisation.						
4-6	2.1 Classify timber and non-timber forest products (NTFPs) according to their uses. 2.2 Enumerate the global and local market trends for forest products. 2.3 Explain the classification systems for forest products (e.g., timber, NTFPs, forest services). 2.4 Identify the value chains for key forest products in Nigeria. 2.5 Discuss the impact of climate change on the availability and	- Classify timber and non-timber forest products (NTFPs) according to their uses (e.g., timber for construction, NTFPs for medicinal or food purposes). - Discuss global and local market trends for forest products, discussing the demand, pricing, and key international players in the market. - Explain the classification systems	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	- Participate in a field excursion to classify and collect samples of timber and NTFPs. - Conduct a market survey to assess the demand and supply for local forest products. - Prepare a classification report on forest products found in a given area. - Demonstrate the processing of a specific NTFP (e.g., Shea butter, gum	Guide students to: - Participate in a field excursion to classify and collect samples of timber and NTFPs. - Conduct a market survey to assess the demand and supply for local forest products. - Prepare a classification report on forest products found in	Marker, Marker board, Projector, Computer systems, Textbooks, Internet.

	marketability of forest products. 2.6 Outline the economic and environmental benefits of sustainable forest product use.	for forest products (e.g., timber, NTFPs, forest services) with examples of each category.		Arabic etc). • Develop a list of forest products and their uses in the local community. • Assess the commercial potential of a selected forest product through practical analysis.	a given area. • Demonstrate the processing of a specific NTFP (e.g., Shea butter, gum Arabic etc). • Develop a list of forest products and their uses in the local community. • Assess the commercial potential of a selected forest product through practical analysis.	
General Objective 3.0: Know forest markets, market structure, and pricing mechanisms for forest products						
7-10	3.1 Identify different market types for forest products (local, national, international). 3.2 Explain how market structures (perfect competition, oligopoly, monopoly) affect forest products pricing. 3.3 Explain the factors that influence the price of timber and NTFPs (e.g., quality, supply, demand).	• Explain how market structures (perfect competition, oligopoly, monopoly) affect the pricing of forest products, with examples of each market type in the forestry sector. • Discuss the factors that influence the price of timber and NTFPs,	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	• Conduct a market analysis of local forest products to understand pricing trends. • Perform a cost-benefit analysis to determine the profitability of selling timber or NTFPs. • Conduct a comparative pricing	Guide students to: • Conduct a market analysis of local forest products to understand pricing trends. • Perform a cost-benefit analysis to determine the profitability of selling timber or	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Journals.

	3.4 Discuss the role of government policies and regulations in forest product pricing. 3.5 Explain the impact of international trade agreements on forest product markets. 3.6 Explain the pricing mechanisms used in forest markets, including stumpage and market-based pricing.	including quality, supply, and demand. • Discuss the role of government policies and regulations in forest product pricing, focusing on laws that regulate logging, trade, and conservation.		exercise for forest products across different market levels. • Develop a pricing strategy for a forest-based business product. • Analyze price fluctuations of specific forest products in response to seasonal changes. • Participate in a role-playing exercise to negotiate prices for forest products in a simulated market.	NTFPs. • Conduct a comparative pricing exercise for forest products across different market levels. • Develop a pricing strategy for a forest-based business product. • Analyze price fluctuations of specific forest products in response to seasonal changes. • Participate in a role-playing exercise to negotiate prices for forest products in a simulated market.	
General Objective 4.0: know the value addition, processing, and storage methods in NTFPs						
11-12	4.1 Explain the components of a forest business plan (e.g., executive summary,	• Describe the components of a forest business plan,	Marker, Marker board, Projector,	• Develop a comprehensive business plan for a	Guide students on how to: • develop a	Marker Marker board

	financial plan, marketing plan). 4.2 Discuss the importance of a feasibility study in forest business planning. 4.3 Describe case studies of successful forest-based business ventures. 4.4 Identify the key financial indicators used to evaluate the success of a forest enterprise. 4.5 Explain the concept of sustainable business practices in the context of forest enterprises. 4.6 Explain the legal and regulatory requirements for establishing a forest-based business in Nigeria.	including the executive summary, financial plan, and marketing plan, with examples of each section. • Discuss the importance of a feasibility study in forest business planning, focusing on risk assessment, market research, and financial viability. • Describe case studies of successful forest-based business ventures, emphasizing the strategies and practices that led to their success.	Computer systems, Textbooks, Internet, etc.	proposed forest-based enterprise. • Conduct a market feasibility study to assess the viability of a forest business idea. • Prepare a financial plan, including cost estimates and projected income, for a forest enterprise. • Present a business plan to a panel of experts for feedback and evaluation. • Write a sustainability plan for a forest-based enterprise that includes environmental and economic considerations. • Participate in a group project to create a forest enterprise business plan	comprehensive business plan for a proposed forest-based enterprise. • conduct a market feasibility study to assess the viability of a forest business idea. • prepare a financial plan, including cost estimates and projected income, for a forest enterprise. • present a business plan to a panel of experts for feedback and evaluation. • write a sustainability plan for a forest-based enterprise that includes environmental	Projector Computer systems Textbooks Internet Journals Newspaper
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					and economic considerations. participate in a group project to create a forest enterprise business plan	
General Objective 5.0: Know the socio-economic role of NTFPs in rural economies						
13-15	5.1 Explain the role of entrepreneurship in forest business development. 5.2 Outline key entrepreneurial characteristics required for managing a successful forest enterprise. 5.3 Explain the different types of forest-based businesses and their structures (e.g., cooperatives, sole proprietorships etc). 5.4 Discuss the challenges and risks faced by entrepreneurs in the forest sector. 5.5 Explore funding options for forest enterprises (e.g., loans, grants, venture capital). 5.6 Explain the role of innovation and creativity	- Discuss the role of entrepreneurship in forest business development. - Identify key entrepreneurial characteristics required for managing a successful forest enterprise. - Explain the different types of forest-based businesses and their structures (e.g., cooperatives, sole proprietorships etc). - Discuss the challenges and risks faced by entrepreneurs in the forest sector. - Explore funding options for forest enterprises (e.g.,	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, etc.	- Develop a personal entrepreneurial profile to assess strengths and weaknesses in forest business management. - Create an innovation-driven business plan for a forest enterprise that incorporates modern technology. - Simulate a start-up forest business and manage its operations in a business game or case study. - Participate in an entrepreneurial group discussion to learn skills such as pitching,	Guide students to: - Develop a personal entrepreneurial profile to assess strengths and weaknesses in forest business management. - Create an innovation-driven business plan for a forest enterprise that incorporates modern technology. - Simulate a start-up forest business and manage its operations in a business game or case study.	Marker Marker board Projector Computer systems Textbooks Internet Journals Newspaper

	in forest entrepreneurship.	loans, grants, venture capital). • Discuss the role of innovation and creativity in forest entrepreneurship.		networking, and negotiating. • Conduct a risk assessment for a proposed forest-based business venture. • Launch a small-scale forest business project as part of a class assignment or community initiative.	• Participate in an entrepreneurial group discussion to learn skills such as pitching, networking, and negotiating. • Conduct a risk assessment for a proposed forest-based business venture. • Launch a small-scale forest business project as part of a class assignment or community initiative.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

PRECISION FOREST RESOURCE PLANNING AND MANAGEMENT

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: PRECISION FOREST RESOURCE PLANNING AND MANAGEMENT	COURSE CODE: FET 222	CONTACT HOURS: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is designed to provide the students with knowledge and skills of managing forest resources to ensure maximum output.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know forestry terms and the historical development of forestry in Nigeria 2.0 Know the preparation of working calendar and work plan 3.0 Understand the supply and demand of forest products 4.0 Understand methods of yield regulations in forestry 5.0 Know the concept of sustained yield 6.0 Know the preparation of work plan 7.0 Know the basic applications of precision techniques in forest management		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: PRECISION FOREST RESOURCE PLANNING AND MANAGEMENT			COURSE CODE: FET 222		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORETICAL: 1 HOURS/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 1 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide the students with knowledge and skills of managing forest resources to ensure maximum output.						
GENERAL OBJECTIVE 1.0: Know forestry terms and the historical development of forestry in Nigeria						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Define forest management 1.2 State the importance of forest management 1.3 Outline the objectives of forest management (eg, increased productivity, sustained yield, yield regulation, etc) 1.4 Explain the following forest management terms: i. Gestation period ii. Felling series iii. Compartment iv. Sub-compartment v. Coupe vi. Working cycle vii. Royalties viii. Sustained yield ix. Yield regulation	- Explain forest management and explain its role in the sustainable use and conservation of forest resources. - Outline the importance of forest management, emphasizing its contributions to biodiversity conservation, timber production, and ecosystem health. - Relate the early development of forest management in European countries (e.g., England,	Marker, Marker board, Projector, Weblinks, Textbooks, Internet, Charts, etc.			

	x. Certification xi. Working calendar 1.5 Explain the problems of forest management in Nigeria (e.g, insecurity, lack of funds, manpower, professional ethics, protection etc.) 1.6 Relate early development of forest management in European countries, eg England, Germany, USA, etc. to the Nigerian experience. 1.7 Explain the successes and failures of various forest management techniques in Nigeria, e.g plantation forestry. 1.8 Explain the factors associated with forest management in Nigeria, e.g people, population, thinning, prescribed burning, selective logging etc. 1.9 Highlight the characteristics of compartment, working cycle, and coupe.	Germany, USA) to Nigeria's experience, discussing how forest management practices have evolved in both contexts. • Discuss the successes and failures of various forest management techniques in Nigeria, e.g plantation forestry. • Outline the factors associated with forest management in Nigeria, e.g people, population, thinning, prescribed burning, selective logging etc. • Discuss the characteristics of compartment, working cycle, and coupe				
General Objective 2.0: Know the preparation of working calendar and work plan						

4-6	2.1 State the objectives of working calendar 2.2 Outline the factors to be considered in the preparation of working calendar. 2.3 Explain how to prepare working calendar for various forest operations. 2.4 Define work plan 2.5 State the objectives of a work plan 2.6 Explain the procedures for the preparation of simple work plan, (eg survey of the forest, management of the area, etc) 2.7 Explain how to prepare a simple work plan for a plantation.	- Outline the objectives of a working calendar and work plan, explaining its role in organizing forest operations and ensuring timely and efficient resource management. - Use real-world examples of working calendars from forestry operations to illustrate their application. - Outline the factors to be considered in the preparation of a working calendar: Encourage student participation by asking them to identify additional factors based on local forest conditions. - Describe how to prepare a working calendar for various forest operations, covering tasks like planting, harvesting, and maintenance: Have students work in	Marker, Marker board, Projector, Weblinks, Textbooks, Internet, Charts, etc.	- Prepare working calendar for various forest operations - Prepare a simple work plan for a plantation.	Guide students to: - Prepare working calendar for various forest operations - Prepare a simple work plan for a plantation.	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Charts of an organisational structure.
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		groups to draft a working calendar for a hypothetical forest operation, presenting their calendar for class discussion.				
General Objective: 3.0 Understand the demand and supply of forest products						
7-9	3.1 Explain the general principles of demand and supply 3.2 Outline the factors affecting the supply and demand for forest products (e.g, long gestation period, availability of substitute, trend in population growth, taste, preference, income etc.) 3.3 Outline the factors of production in forestry (e.g land, capital, labour and entrepreneur) 3.4 Compare factors of production in forestry with that of other agricultural sectors of the economy. 3.5 Explain money returns in forestry enterprise 3.6 Describe the use of compound interest in	• Discuss the principles of demand and supply in forestry, covering how market demand and available supply affect the pricing of forest products. • Describe factors affecting supply and demand for forest products (e.g., gestation period, substitutes, population growth). • Discuss how income, preferences, and availability influence market trends in forestry.	Marker, Marker board, Projector, Weblinks, Textbooks, Internet, Charts, etc.			

	money returns in forestry enterprise. 3.7 Define royalties 3.8 Explain the role of royalties in forestry revenue collection in Nigeria.					
General Objective 4.0: Understand methods of yield regulation in forestry						
10-11	4.1 Define yield regulation 4.2 Explain yield regulation in even and uneven forests, by area, by volume, etc. 4.3 Explain Brandis, French method, Austrian Von Mantels Formulae, Judices methods in yield regulation. 4.4 State the merits and demerits of the methods in 4.3 above.	• Explain yield regulation • Describe yield regulation in even and uneven forests, by area, by volume, etc. • Explain Brandis, French method, Austrian Von Mantels Formulae, Judices methods in yield regulation. • Outline the merits and demerits of the methods in 4.3 above.	Marker, Marker board, Projector, Weblinks, Textbooks, Internet, Charts, etc.			
General Objective 5.0: Know the concept of sustained yield						
12-13	5.1 Define sustained yield 5.2 Explain the need for sustained yield management in Nigeria 5.3 Explain the roles of ICT in forest management.	• Explain sustained yield • Discuss the need for sustained yield management in Nigeria	Marker, Marker board, Projector, Weblinks, Textbooks, Internet,			

		Explain the roles of ICT in forest management.	Charts, etc.			
General Objective 6.0: Know the preparation of work plan						
14	6.1 Define work plan 6.2 State the objectives of work plan 6.3 Explain the procedures of preparation of a simple work plan (e.g Survey of the forest, management of the area etc) 6.4 Explain how to prepare a simple work plan for an artificial forest	- Explain work plan and its importance in organizing and managing forestry tasks. - Outline the objectives of a work plan, such as resource allocation, task scheduling, and goal achievement in forest management. - Describe the procedures for preparing a simple work plan, including steps like surveying the forest and area management. Have students create a sample work plan for forest management.	Marker, Marker board, Projector, Weblinks, Textbooks, Internet, Charts, etc.	Prepare a simple work plan for an artificial forest	Guide students on how to prepare a simple work plan for an artificial forest	Marker, Marker board, Projector, Computer systems, Internet, Charts.
General Objective: 7.0 Know the basic application of precision techniques in forest management						
15	7.1 List the following precision techniques in forest management: i. Remote Sensing ii. Geographic Information	Outline the precision techniques in forest management (e.g., Remote Sensing, GIS, LiDAR, Automated	Marker, Marker board, Projector, Weblinks, Textbooks, Internet,	- Apply the precision tools in forest management - Apply basic forest inventory and	Guide students to: apply the precision tools in forest management	Marker, Marker board, Projector, Computer systems, Internet,

	Systems (GIS) iii. LiDAR (Light Detection and Ranging) iv. Forest Inventory and Monitoring v. Forest Management Decision Support Systems (DSS) vi. Automated Harvesting Systems vii. Precision Silviculture viii. Forest Carbon Monitoring ix. Soil Moisture and Nutrient Monitoring x. Machine Learning and AI in Forest Management 7.2 State the importance of the above listed tools in forest management 7.3 Explain the application of each of the tools listed above in 7.1 to forest management	Harvesting Systems). • Outline the importance of these precision tools in forest management, focusing on their role in improving efficiency, sustainability, and decision-making. • Discuss the application of each tool in forest management, using real-life examples or case studies to show how each tool aids in tasks like inventory monitoring, carbon tracking, and precision silviculture.	Charts, etc.	monitoring methods to collect data on forest composition and health using precision techniques	• Apply basic forest inventory and monitoring methods to collect data on forest composition and health using precision techniques	Charts.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

PRECISION FORESTRY AND SUSTAINABLE RESOURCE UTILISATION

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: PRECISION FORESTRY AND SUSTAINABLE RESOURCE UTILISATION	COURSE CODE: FET 223	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 3 HOURS/WEEK
GOAL: This course is designed to provide the student with the knowledge and skills to harvest, convert, treat, preserve and utilise timber and other wood products		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know methods of harvesting timbers, poles, posts and fuel wood 2.0 Understand the production processes for various types of wood products 3.0 Know the different types of saws and sawmills. 4.0 Know common timber defects 5.0 Understand the significance of moisture content of wood 6.0 Understand the importance of timber preservation		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: PRECISION FORESTRY AND SUSTAINABLE RESOURCE UTILISATION			COURSE CODE: FET 223		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide the student with the knowledge and skills to harvest, convert, treat, preserve and utilise timber and other wood products						
GENERAL OBJECTIVE 1.0: know methods of harvesting timbers, poles, posts and fuel wood						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-3	1.1 Explain common terms used in timber harvesting: i. logging ii. de-limbing (shedding) iii. bucking (cross cutting) iv. hauling v. skidding vi. landing etc. 1.2 Describe the plan and process for timber harvesting 1.3 Describe logging and relogging operations: i. Felling ii. Limbing iii. bucking iv. debarking	• Explain common terms used in timber harvesting: — logging — de-limbing (shedding) — bucking (cross cutting) — hauling — skidding — landing etc. • Describe the plan and process for timber harvesting • Describe logging and relogging operations: — Felling — Limbing — bucking	Marker Marker board Projector Computer systems Textbooks Internet	• Carry out logging operations: i. felling ii. limbing iii. bucking, iv. debarking, v. skidding etc • Apply forestry precision techniques in timber harvesting such as: i. Artificial Intelligence (AI) ii. Precision Felling and Cutting iii. Automated	Guide students to: • Carry out logging operations: vi. felling vii. limbing viii. bucking, ix. debarking, x. skidding etc • Apply forestry precision techniques in timber harvesting such as: xv. Artificial Intelligence (AI)	Chainsaw, Harvester (Cut-to-Length Machine), Skidder, Forwarder, Sawmill, (Circular Saw Band Saw), Wood Chipper, Wood Splitter, Log Loader, Timber processing machine, Log debarker, Forklift pallet, Jacks wood, Sawing table,

	v. skidding 1.4 Explain loading and haulage of logs 1.5 Describe the three major means of log transportation haulage: i. By rail (train) ii. By water iii. By road (trailer) 1.6 Explain the application of forestry precision techniques in timber harvesting such as: i. Artificial Intelligence (AI) ii. Precision Felling and Cutting iii. Automated Harvesters iv. Cable Logging and Aerial Yarding v. Tree Selection Tools vi. Guided Harvesting with Drones vii. Mechanical Harvesters for Poles viii. Controlled Cutting and Thinning ix. Biomass Monitoring x. Efficient Collection Systems xi. Precision Thinning	— debarking — skidding • Explain loading and haulage of logs • Describe the three major means of log transportation haulage: — By rail (train) — By water — By road (trailer) • Explain the application of forestry precision techniques in timber harvesting such as: — Artificial Intelligence (AI) — Precision Felling and Cutting — Automated Harvesters — Cable Logging and Aerial Yarding — Tree Selection Tools — Guided Harvesting with Drones — Mechanical Harvesters for Poles		Harvesters iv. Cable Logging and Aerial Yarding v. Tree Selection Tools vi. Guided Harvesting with Drones vii. Mechanical Harvesters for Poles viii. Controlled Cutting and Thinning ix. Biomass Monitoring x. Efficient Collection Systems xi. Precision Thinning xii. Variable Density Harvesting xiii. Real-Time Monitoring xiv. Digital Inventory & Management using Terrestrial Laser Scanning (TLS)	xvi. Precision Felling and Cutting xvii. Automated Harvesters xviii. Cable Logging and Aerial Yarding xix. Tree Selection Tools xx. Guided Harvesting with Drones xxi. Mechanical Harvesters for Poles xxii. Controlled Cutting and Thinning xxiii. Biomass Monitoring xxiv. Efficient Collection Systems xxv. Precision Thinning xxvi. Variable Density Harvesting xxvii. Real-Time Monitoring xxviii. Digital	Log transporter (Truck/Trailer), GPS and GIS Mapping equipment, Drones (for Aerial Surveying), Hydraulic timber loader.
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	xii. Variable Density Harvesting xiii. Real-Time Monitoring xiv. Digital Inventory & Management using Terrestrial Laser Scanning (TLS)	— Controlled Cutting and Thinning — Biomass Monitoring — Efficient Collection Systems — Precision Thinning — Variable Density Harvesting — Real-Time Monitoring — Digital Inventory & Management using Terrestrial Laser Scanning (TLS)			Inventory & Management using Terrestrial Laser Scanning (TLS)	
General Objective 2.0: Understand the production processes for various types of wood products						
4-6	2.1 Explain the processes of harvesting poles (felling, debarking etc.) 2.2 Explain the processes of treating poles for various uses (e.g transmission poles, fencing, etc.) 2.3 Explain the conversion of logs to sawn timber. 2.4 Explain the stages involved in plywood and particle board production 2.5 Explain the process of pulpwood and paper production 2.6 Explain the application	- Describe the processes of harvesting poles, explaining key steps such as felling, debarking, and transportation, and their importance for different pole uses (e.g., transmission poles, fencing). - Describe the processes of treating poles for various uses, focusing on	Marker Marker board Projector Computer Textbooks Internet	Apply forestry precision tools in the production of wood products	Guide students on how to apply forestry precision tools in the production of wood products	Machete, Debarking knife, Wood preservative chemicals.

	of forestry precision tools in the production of wood products	preservatives and treatment methods for poles used in construction, transmission lines, and fencing. Describe the conversion of logs to sawn timber, explaining the sawing process, types of sawmills and application of forestry tools				
General Objective 3.0: Know the different types of saws and sawmills						
7-9	3.1 Explain the saws used in conversion of timbers: i. circular saw ii. band saw (horizontal/vertical) 3.2 Describe the general layout of a saw-mill 3.3 Explain a flow diagram of sawmill using band mill as the principal timber conversion machine. 3.4 Describe the process of charcoal production 3.5 Explain the uses of charcoal 3.6 State the advantages and	- Describe the saws used in conversion of timbers - Explain a flow diagram of a sawmill using a band mill as the principal timber conversion machine. - Describe the process of charcoal production - State the advantages and disadvantages of charcoal production - Explain the use of AI in sawmill operations	Marker, Marker board, Projector, Computer, Textbooks, Internet, etc.	- Draw and label a flow diagram of sawmill using band mill as the principal timber conversion machine. - Apply the use of AI in sawmill operations	- Guide students to draw a well labelled flow diagram of sawmill - using band mill as the principal timber conversion machine	Multimedia projector, Computer system, Charts, Video clips.

	disadvantages of charcoal production 3.7 Explain the use of AI in sawmill operations					
General Objective 4.0: Know common timber defects						
10-11	4.1 Explain timber defects such as wane, knot, crack, store, bowing, cupping, etc. 4.2 Explain the effect of timber defects on timber 4.3 Explain techniques for detecting and measuring timber defects using tools like calipers, scanners, and visual inspection 4.4 Outline strategies to mitigate or repair common timber defects in various wood products 4.5 State the appropriate uses for timber with defects	- Describe timber defects such as wane, knot, crack, store, bowing, cupping, etc. - Describe the effect of timber defects on timber - Explain techniques for detecting and measuring timber defects using tools like calipers, scanners, and visual inspection - Outline strategies to mitigate or repair common timber defects in various wood products - Explain the appropriate uses for timber with defects	Marker, Marker board, Projector, Computer, Textbooks, Internet, etc.	- Identify timber defects such as wane, knot, crack, store, bowing, cupping, etc. - Apply basic techniques for detecting and measuring timber defects using tools like calipers, scanners, and visual inspection	Guide student to: - Identify timber defects such as wane, knot, crack, store, bowing, cupping, etc. - Apply basic techniques for detecting and measuring timber defects using tools like calipers, scanners, and visual inspection	Machete, Debarking knife, Wood circular saw, Band saw, Lathe machine, Samples of defected wood, Drawing books, Pencils.
General Objective 5.0: Understand the significance of moisture content of wood						
12-13	5.1 Explain the various forms in which water exist in wood, (e.g tree water,	Describe the various forms in which water exist in	Marker, Marker board,	Apply Oven Drying Method, Hygrometer Method,	Guide students to: Apply Oven Drying Method,	Machete, Debarking knife,

	absorbed water, hygroscopic water) 5.2 Explain the equilibrium moisture content of fibre saturation point. 5.3 Explain moisture content of wood 5.4 Explain wood seasoning 5.5 Explain various seasoning methods, (e.g, air seasoning, kiln seasoning) 5.6 Explain the importance of seasoning timber 5.7 Describe a flow diagram of a typical air seasoning 5.8 shade.	wood, (e.g tree water, absorbed water, hygroscopic water) • Explain the equilibrium moisture content of fibre saturation point. • Explain moisture content of wood • Explain wood seasoning • Describe various seasoning methods, (e.g, air seasoning, kiln seasoning) • Explain the importance of seasoning timber • Describe a flow diagram of a typical air seasoning • shade.	Projector, Computer, Textbooks, Internet, etc.	Electromagnetic (Microwave or Radiofrequency) etc to determine moisture content of wood samples. • Determine the moisture content of wood using appropriate mathematical models • Carry out wood seasoning using the appropriate method • Draw a flow diagram of a typical air seasoning shade.	Hygrometer Method, Electromagnetic (Microwave or Radiofrequency) etc to determine moisture content of wood samples. • Determine the moisture content of wood using appropriate mathematical models • Carry out wood seasoning using the appropriate method • Draw a flow diagram of a typical air seasoning shade.	Wood circular saw, Band saw, Lathe machine, Samples of defected wood, Drawing books, Pencils.
General Objective 6.0: understand the importance of timber preservation						
14-15	6.1 Explain natural durability of timber 6.2 Explain the importance of preservation in wood utilisation 6.3 Explain the types of preservatives applied to wood, e.g:	• Discuss the natural durability of timber, discussing factors like species, climatic conditions, and environmental exposure that affect the lifespan of timber	Marker Marker board Projector Computer Textbooks Internet	• Apply preservatives using the methods in 6.4	• Guide students on how to apply preservatives using the methods in 6.4	Machete, Debarking knife, Wood circular saw, Band saw, Lathe machine, Samples of

i. Water soluble salt preservation ii. Oil preservative iii. Hot air or solvent type preservative 6.4 Describe methods of applying preservatives: i. Non-pressure methods ii. Brushing iii. Spraying iv. Dipping and steeping v. Open tank method vi. Pressure methods vii. Full cell process viii. Empty cell method ix. Lowry process	in its natural state. • Discuss the importance of preservation in wood utilization, focusing on how preservatives extend the useful life of wood, reduce decay, and enhance performance in different environments.				defected wood, Drawing books, Pencils, Water soluble Salt, Preservation oil , Preservatives, Hot air.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 60% Total: 100%					

SILVICULTURE AND FOREST CONSERVATION TECHNIQUES II

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY		
COURSE TITLE: SILVICULTURE AND FOREST CONSERVATION TECHNIQUES II	COURSE CODE: FET 224	CONTACT HOURS: 4 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOURS/WEEK
YEAR: II SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 3
GOAL: This course is designed to equip students with knowledge and skills of nursery and plantation technology		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the scope of nursery technology; 2.0 Know the criteria for choosing sites and species; 3.0 Know pre-planting activities and planting operations; 4.0 Know tending operations; 5.0 Know the silvicultural characteristics of important tree species; 6.0 Know the various types of silvicultural systems and how they operate; 7.0 Know forest regeneration methods.		

PROGRAMME: NATIONAL DIPLOMA IN FORESTRY AND ENVIRONMENTAL TECHNOLOGY						
COURSE TITLE: SILVICULTURE AND FOREST CONSERVATION TECHNIQUES II			COURSE CODE: FET 224		CONTACT HOURS: 4 HOURS/WEEK	
			CREDIT UNIT: 4		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 3 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of nursery and plantation technology						
GENERAL OBJECTIVE 1.0: Understand the scope of nursery technology						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Define the following terms: i. seed collection ii. seed processing iii. seed storage 1.2 Explain 1.1 above based on climate zones (warmer and drier zones) 1.3 Describe seed testing methods 1.4 Explain seed dormancy 1.5 Explain causes of seed dormancy 1.6 Describe the methods of breaking seed dormancy of common tree species. E.g, scarification, pre-chilling, chemical treatment etc	• Explain seed collection, seed processing and seed storage • Describe seed testing methods • Explain seed dormancy • Discuss causes of seed dormancy • Describe the methods of breaking seed dormancy of common tree species • Explain the effectiveness of various pest management strategies, such as chemical, biological,	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Machete, etc.	• Collect, process and store seeds • Prepare different types of nursery stock e.g ✓ Stumps ✓ Potted plants ✓ Striplings ✓ Vegetative propagation (budding, grafting, cutting, layering, tissue culture etc) • Test seeds to ascertain their viability and germination percentage • Prepare nursery seed beds and	• Guide students on how to: • collect, process and store seeds • prepare different types of nursery stock e.g: - Stumps - Potted plants - Striplings - Vegetative propagation (budding, grafting, cutting, layering, tissue culture etc) • test seeds to ascertain their	Knife Tree bicycle Seed tray Ladder Mats, etc

1.7	Describe the preparation of different types of nursery stock e.g: stumps, potted plants, striplings, vegetative propagation (budding, grafting, cutting, layering, tissue culture etc)	and cultural controls, using real-life case studies to show how these strategies have been implemented successfully in Nigeria.		potting mixture and filling of polypots with potting mixture	viability and germination percentage	
1.8	Describe methods of nursery seed bed preparation.	• Explain preventive and control measures to manage invasive pest species, including quarantine protocols, early detection systems, and Integrated Pest Management (IPM) approaches.		• Prick seedlings from germination boxes to polypots	• prepare nursery seed beds and potting mixture and filling of polypots with potting mixture	
1.9	Explain nursery seed beds, potting mixture and nursery polypots filling.			• Water seedling by using watering cans or by irrigation systems		
1.10	Describe raising of seedlings in germination boxes	• Discuss pest management plan for a forest area using IPM and prevention protocols based on the specific pests encountered.		• Apply the tending operations listed in 1.13.	• prick seedlings from germination boxes to polypots	
1.11	Explain Prickling of seedlings from germination boxes to polypots.			• Sterilize and inoculate nursery beds using heat treatment and mycorrhizal inoculants	• water seedling by using watering cans or by irrigation systems	
1.12	Explain watering of seedlings using watering cans or by irrigation systems			• Keep nursery records, calendar, register, etc		
1.13	Describe general nursery tending operations:			• Determine the nursery area for raising a given number of		
	i. Shading			• planting stock in a given espacement		
	ii. Weeding					

	iii. Root pruning iv. Culling v. Thinning etc 1.14 Explain sterilization and inoculation of nursery beds. Eg. Heat treatment (sterilization) and application of mycorrhizal inoculants (inoculation) 1.15 Explain how to keep nursery records, calendar, register etc. 1.16 Describe how to determine nursery area for raising a given number of planting stock in a given espacement					
General Objective 2.0: Know the criteria for choosing sites and species						
3-5	2.1 Explain the factors that determine choice of tree species and site, eg, For species: i. Growth rate ii. Resistance to disease etc. For site: i. Soil type ii. Topography iii. Drainage iv. Climate etc.	Describe the factors that determine choice of tree species and site, eg, For species: — Growth rate — Resistance to disease etc. For site: — Soil type — Topography — Drainage	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Machete, etc.			

	2.2 List the methods for selecting species for various sites, e.g: - Plant indicator - Correlation of species - Requirement with site species trials etc. 2.3 Explain the methods in 2.2 above	— Climate etc. - Outline the methods for selecting species for various sites, e.g: — Plant indicator — Correlation of species — Requirement with site species trials etc. - Describe the methods in 2.2 above				
General Objective 3.0: Know pre-planting activities and planting operations.						
6-8	3.1 Explain demarcation of planting area 3.2 Explain the various methods of site clearing: - Manual - Mechanical - Chemical - Control burning 3.3 Explain how to prepare ground for planting	- Describe demarcation of planting area - Describe the various methods of site clearing: - Manual - Mechanical - Chemical - Control burning - Describe how to prepare ground for planting	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Machete, etc.	- Demarcate planting area - Apply the various methods of site clearing: - Manual - Mechanical - Chemical - Control burning - Prepare ground for planting - Layout and peg a planting site - Apply various planting methods: - Direct sowing	Guide students to: - Demarcate planting area - Apply the various methods of site clearing: - Manual - Mechanical - Chemical - Control burning - Prepare ground for planting - Layout and peg a planting site	Pegs, Planting hoes, Garden fork, Hand trowel, Hand gloves, Tape, Plant lifters, Protective clothing, Knapsack, Wheelbarrow.

				ii. Planting of stumps with dibbler iii. Planting of potted seedling	• Apply various planting methods: iv. Direct sowing v. Planting of stumps with dibbler vi. Planting of potted seedling	
General Objective 4.0: 4.0 Know tending operations						
9-10	4.1 Explain the following operations in the tending of a young plantation: i. Weeding ii. Survival count iii. Fertilizer application iv. Cleaning v. Pruning vi. Brushing vii. Fire tracing viii. Thinning ix. Beating-up 4.2 Explain the importance of tending operations in the growth and health of forests 4.3 Explain the timing and techniques of tending operations	• Describe the following operations in the tending of a young plantation: — Weeding — Survival count — Fertilizer application — Cleaning — Pruning — Brushing — Fire tracing — Thinning — Beating-up • Discuss the importance of tending operations in the growth and health of forests • Discuss the timing and techniques of tending operations	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Machete, etc.	• Apply the following operations in the tending of a young plantation: i. Weeding ii. Fertilizer application iii. Beating-up iv. Cleaning v. Pruning vi. Brushing vii. Fire tracing viii. Thinning	Guide students to: • Apply the following operations in the tending of a young plantation: ix. Weeding x. Fertilizer application xi. Beating-up xii. Cleaning xiii. Pruning xiv. Brushing xv. Fire tracing xvi. Thinning	Pegs, Planting hoes, Garden fork, Hand trowel, Hand gloves, Tape, Plant lifters, Protective clothing, Knapsack, Wheelbarrow.

General Objective 5.0: Know the silvicultural characteristics of important tree species						
11-12	5.1 Explain the silvicultural characteristics of important tree species in Nigeria, viz: <i>Nauclea diderrichii</i> (opepe) <i>Triplochiton scleroxylon</i> (obeche) <i>Terminalia ivorensis</i> (idigbo) <i>Terminalia superba</i> (Afara) <i>Milicia excelsa</i> (Iroko) <i>Tectonia grandis</i> (Teak) <i>Gmelina arborea</i> (Gmelina) <i>Khaya ivorensis</i> (Mahogany) <i>Entandrophragma</i> spp <i>Azadirachta indica</i> (Neem) <i>Acacia</i> spp <i>Eucalyptus</i> spp <i>Pinus</i> spp <i>Adansonia</i> spp <i>Vitellaria paradoxa</i> <i>Dalbergia</i> spp <i>Prosopis</i> spp <i>Tamarindus indica</i> <i>Parkia biglobosa</i> <i>Faidherbia albida</i>	- Discuss the silvicultural characteristics of important tree species in Nigeria, viz: — <i>Nauclea diderrichii</i> (opepe) — <i>Triplochiton scleroxylon</i> (obeche) — <i>Terminalia ivorensis</i> (idigbo) — <i>Terminalia superba</i> (Afara) — <i>Milicia excelsa</i> (Iroko) — <i>Tectonia grandis</i> (Teak) — <i>Gmelina arborea</i> (Gmelina) — <i>Khaya ivorensis</i> (Mahogany) — <i>Entandrophragma</i> spp — <i>Azadirachta indica</i> (Neem) — <i>Acacia</i> spp — <i>Eucalyptus</i> spp — <i>Pinus</i> spp — <i>Adansonia</i> spp	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Machete, etc.	- Identify the features of tree species in 5.1 - Demonstrate various tending operations in a forest or nursery setting, including shading, weeding, and pruning. - Apply thinning techniques to a forest plot, explaining the impact of thinning on tree growth, light distribution, and resource allocation. - Conduct soil tests to determine the nutrient levels and water retention of forest soils, then apply fertilizers or other amendments as necessary. - Monitor and assess the effectiveness of tending operations by tracking changes	Guide students to: - Identify the features of tree species in 5.1 - Demonstrate various tending operations in a forest or nursery setting, including shading, weeding, and pruning. - Apply thinning techniques to a forest plot, explaining the impact of thinning on tree growth, light distribution, and resource allocation. - Conduct soil tests to determine the nutrient levels and water retention of forest soils, then apply fertilizers or other amendments as necessary. - Monitor and assess the effectiveness of	Charts,, Computer systems Notebooks, Machete.

	5.2 Explain 5.1 with regards to natural distribution, regeneration (Natural and Artificial) and pathological problems 5.3 State the economic importance of the trees in 5.1	— <i>Vitellaria paradoxa</i> — <i>Dalbergia spp</i> — <i>Prosopis spp</i> — <i>Tamarindus indica</i> — <i>Parkia biglobosa</i> — <i>Faidherbia albida</i> - Describe 5.1 with regards to natural distribution, regeneration (Natural and Artificial) and pathological problems - Outline the economic importance of the trees in 5.1		in growth rate, biodiversity, and forest health over time. Create a tending schedule for a specific forest type, factoring in the age of trees, site conditions, and management goals for sustainable forest productivity.	tending operations by tracking changes in growth rate, biodiversity, and forest health over time. Create a tending schedule for a specific forest type, factoring in the age of trees, site conditions, and management goals for sustainable forest productivity.	
General Objective 6.0: Know the various types of silvicultural systems and how they operate						
13-14	6.1 Explain silvicultural system 6.2 Describe the following silvicultural systems: - coppice system - coppice with standard - Malaysian uniform system - Including TSS (Tropical Shelter wood System) - Enrichment planting - Line planting - Group planting	- Explain silvicultural system - Describe the following silvicultural systems: - coppice system - coppice with standard - Malaysian uniform system - Including TSS (Tropical Shelter wood System)	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Machete, etc.	- Identify the silvicultural system in 6.2 - Carry out tree planting - Identify stands established under different silvicultural systems.	Guide students to: - Identify the silvicultural system in 6.2 - Carry out tree planting - Identify stands established under different silvicultural systems.	Notepad, Tree seeds

	viii. Direct sowing ix. Taungya system etc 6.3 Describe the systems listed in 6.2 above in relation to agro-forestry as a multiple land use system	— Enrichment planting — Line planting — Group planting — Direct sowing — Taungya system etc • Describe the systems listed in 6.2 above in relation to agro-forestry as a multiple land use system				
General Objective 7.0: Know forest regeneration methods						
15	7.1 Explain some of the common forest regeneration methods in Nigeria: - Selection system - Tropical shelter wood system - Enrichment planting - Line planting - Group planting - Direct planting - Agri-silvicultural systems 7.2 Explain the conditions under which the methods in 7.1 above maybe adopted. 7.3 Explain natural and artificial regeneration	• Describe some of the common forest regeneration methods in Nigeria: - Selection system - Tropical shelter wood system - Enrichment planting - Line planting - Group planting - Direct planting - Agri-silvicultural systems • Discuss the conditions under which the methods in 7.1 above maybe adopted. • Describe natural and artificial regeneration	Marker, Marker board, Projector, Computer systems, Textbooks, Internet, Machete, etc.	• Identify the regeneration methods 7.1 • Carry out planting and maintenance using some of the common methods highlighted in 7.1	Guide students to: - coordinate field trip/tour to forestry - establishments to identify the system as stated in 7.1 - Carry out planting and maintenance using some of the common methods highlighted in 7.1	Watering can, Wheel barrow, Head pans, Hand trowel, Hand gloves.

	techniques 7.4 Explain different type of stands 7.5 Describe the structure of each stand in 7.4 7.6 State the advantages and disadvantages of each system of regeneration. 7.7 Describe the various types of competition that may exist among the plants in the various silvicultural systems. (E.g competition for light, water, soil, and nutrients)	techniques • Explain different type of stands • Describe the structure of each stand in 7.4 • State the advantages and disadvantages of each system of regeneration. • Describe the various types of competition that may exist among the plants in the various silvicultural systems. (E.g competition for light, water, soil, and nutrients)				
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

LIST OF MINIMUM FACILITIES AND EQUIPMENT FOR ND/HND FORESTRY AND ENVIRONMENTAL TECHNOLOGY

A DRAWING ROOM/ SURVEY EQUIPMENT

S/N	TOOLS, MATERIALS & EQUIPMENT	QUANTITY
1.	Drawing Boards / Stools	30
2.	Drafting set	5
3.	T- Square	10
4.	Set square	10
5.	Protractors	10
6.	Lettering set	10
7.	Stereoscope	4
8.	Prismatic compass	3
9.	Ranging Poles	10
10.	Chain	2
11.	Metric Tape	2
12.	Planimeters	1
13.	Theodolite and Staff	1
14.	Scale Rulers	15
15.	Set of Arrows	30

16.	Levels	10
17.	Pantograph	10
18.	GPS	4

B METEOROLOGICAL STATION

S/N	ITEM	QUANTITY REQUIRED
1.	Stevenson's Screen	1
2.	Thermo hydrographs	1
3.	Maximum and Minimum Thermometers	2
4.	Rain gauge	2
5.	Measuring glasses	2
6.	Wind vane	2
7.	Anemometer	1
8.	Evaporimeter	1
9.	Hygrometer	2
10.	Barometer	2

C AUDIO VISUAL ROOM EQUIPMENT

SN	EQUIPMENT	QUANTITY REQUIRED
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1.	Video Recorder	2
2.	Slide Projector	2
3.	Overhead Projector	2
4.	Film Projector	2
5.	Magnetic Board	2
6.	Public Address System	1
7.	Smart TV	2
8.	Cameras	3
9.	Enlarger	1
10.	Photo dryer	1
11.	Photo cutter	1
12.	Tables for Drawing	5
13.	Drawing pencils	Various
14.	Drawing pens	Various
15.	Water colour	Various
16.	Display Cabinets / Boards	Various

D PEST CONTROL EQUIPMENT

SN	EQUIPMENT	QUANTITY REQUIRED
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1.	Knapsack Pressure Sprayer	2
2.	Motorized mist sprayer	1
3.	Handy sprayer	5
4.	Hand sprayer with container	5
5.	Flood jet nozzles	5
6.	Boom sprayer	1

E FARM MACHINERY

1.	Tractors	2
2.	Disc plough	2
3.	Disc harrows	3
4.	Disc ridgers	3
5.	4 wheel trailer	2
6.	Stump jumper	1
7.	Earth scoop	1
8.	Rotavators	1
9.	Versatile cultivators	1
10.	Mould board ridgers	1

11.	Tractor pulley	1
12.	Versatile seed loader	1
13.	Seed drill	1
14.	Seed cleaner	1
15.	Seed grader	1
16.	Cutter bay mower	1
17.	Rotary slasher	1
18.	Fertilizer spreader	1
19.	Sub soiler	1
20.	Spike tooth harrow	1

F NURSERY TOOLS

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 EQUIPMENT

1.	Working benches with vice	10
2.	Band saw	2
3.	Surface planner	2
4.	Thicknessing planer	2
5.	Drilling machine	2

METAL WORKSHOP

SN	EQUIPMENT	QUANTITY REQUIRED
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
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I MAINTENANCE WORKSHOP (ND, HND)

SN	EQUIPMENT	QUANTITY REQUIRED
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	Various

J IRRIGATION EQUIPMENT (ND, HND)

SN	EQUIPMENT	QUANTITY REQUIRED
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 EQUIPMENT (ND, HND)

SN	EQUIPMENT	QUANTITY REQUIRED
1.	Power saw	2
2.	Bow saw	4
3.	Axe	10
4.	Matchet	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

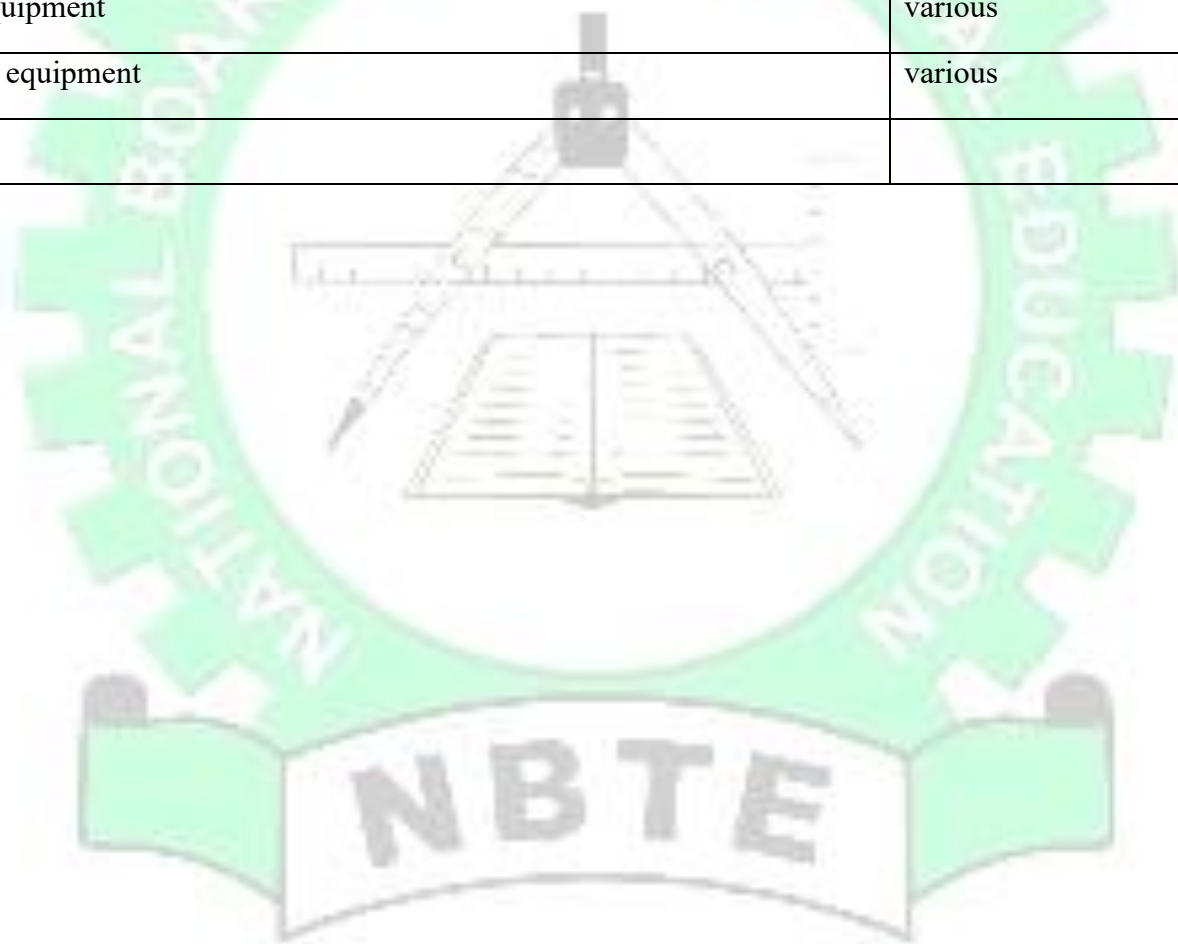
L MENSURATION EQUIPMENT (ND, HND)

SN	EQUIPMENT	QUANTITY REQUIRED
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 OTHERS (ND, HND)

S/N	EQUIPMENT	QUANTITY REQUIRED
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	various
9.	Firefighting equipment	various



LIST OF WORKSHOP PARTICIPANTS

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