



NATIONAL BOARD FOR TECHNICAL EDUCATION

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

NATIONAL DIPLOMA

IN

WOOD AND PAPER TECHNOLOGY

CURRICULUM AND COURSE SPECIFICATIONS

JUNE, 2026

PREFACE

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

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

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

ACKNOWLEDGEMENT

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

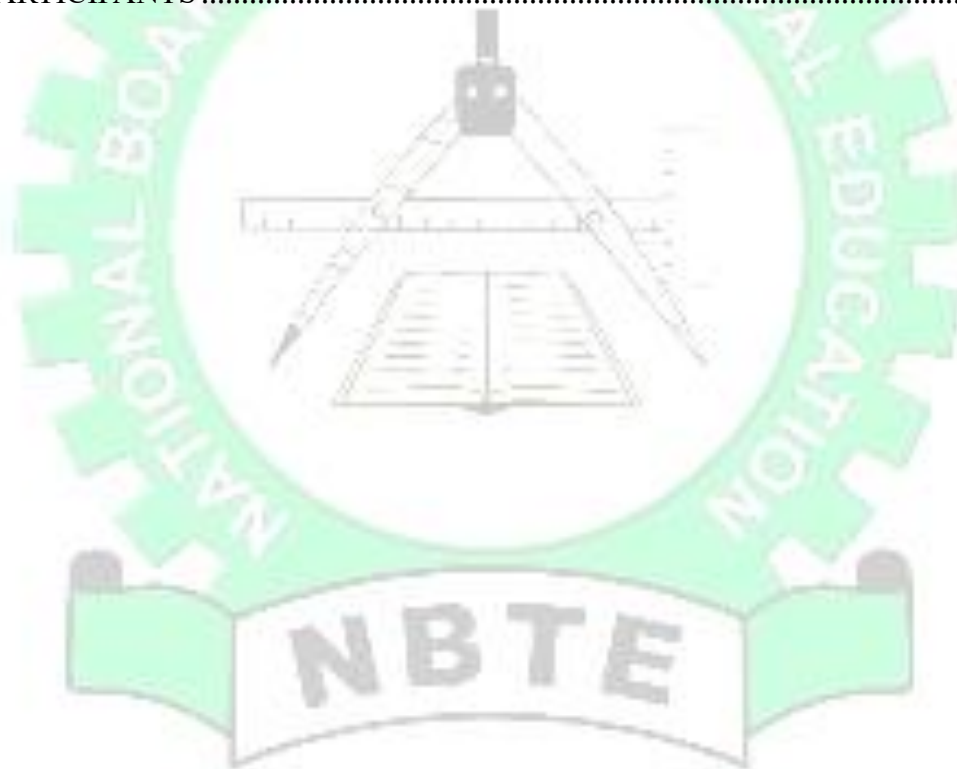
Special appreciation is extended to the curriculum specialists, resource persons, academic experts, professional bodies, regulatory agencies, employers, industry practitioners, development partners, and representatives of public and private sector organizations who participated actively in the skills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



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GENERAL INFORMATION

1.0 PROGRAMME NOMENCLATURE

National Diploma (ND) in Wood and Paper Technology

2.0 PROGRAMME GOAL

The programme is designed to produce competent middle level manpower with knowledge and practical skills in forestry, wood processing, wood products manufacturing, pulp and paper technology, sustainable resource management, entrepreneurship and emerging green technologies.

3.0 OBJECTIVES OF THE PROGRAMME

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

- i. Assist in chemical, biological and physical analysis of all wood and based products;
- ii. Assist in the industrial production of all wood-based products including pulp and paper, particleboard, plywood, fibre board;
- iii. Produce season timbers;
- iv. Assist in forest regeneration;
- v. Prevent deterioration of wood;
- vi. Participate in the design and construction of furniture;
- vii. Participate in forestry and wood business enterprises;
- viii. Assist in sustainable forest resources management;
- ix. Participate in the development of emerging green technologies;
- x. Participate in smart wood manufacturing.

4.0 ENTRY REQUIREMENTS

The minimum entry requirements for admission into the Wood and Paper Technology Programme are:

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

5.0 STRUCTURE AND DURATION OF THE PROGRAMME

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

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 Wood and Paper 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 or B.Sc./B.Tech in Wood and Paper Technology, Wood Science Technology, Pulp and Paper Technology or other related disciplines. Relevant industrial and teaching experience shall be an added advantage.

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 wood and paper technology. 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 (HOD).

The Head of Department shall possess at least a First and Master's Degree in Wood and Paper Technology 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 the National Diploma (ND) in Wood and Paper 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 72 and 80 semester credit units depending on the programme.

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

MARKS 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 Wood and Paper 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.	STB 111	Fungi, Plant and Animal Taxonomy	2	0	0	2	2
6.	STC 111	General Principles of Chemistry	2	0	0	2	2
7.	STP 111	Mechanics	2	0	1	3	3
8.	MTH 112	Algebra and Elementary Trigonometry	2	0	0	2	2
9.	GLT 111	General Laboratory Techniques I	1	0	1	2	2
10.	MEC 111	Technical Drawing	1	0	3	4	4
11.	MEC 113	Basic Workshop Technology and Practice	1	0	3	4	4
12.	AGR 101	Introduction to Agriculture	1	0	2	3	3
13.	WPT 111	Introduction to Wood and Paper Technology	1	0	2	3	3
TOTAL			20	0	15	35	35

Year I - Semester II

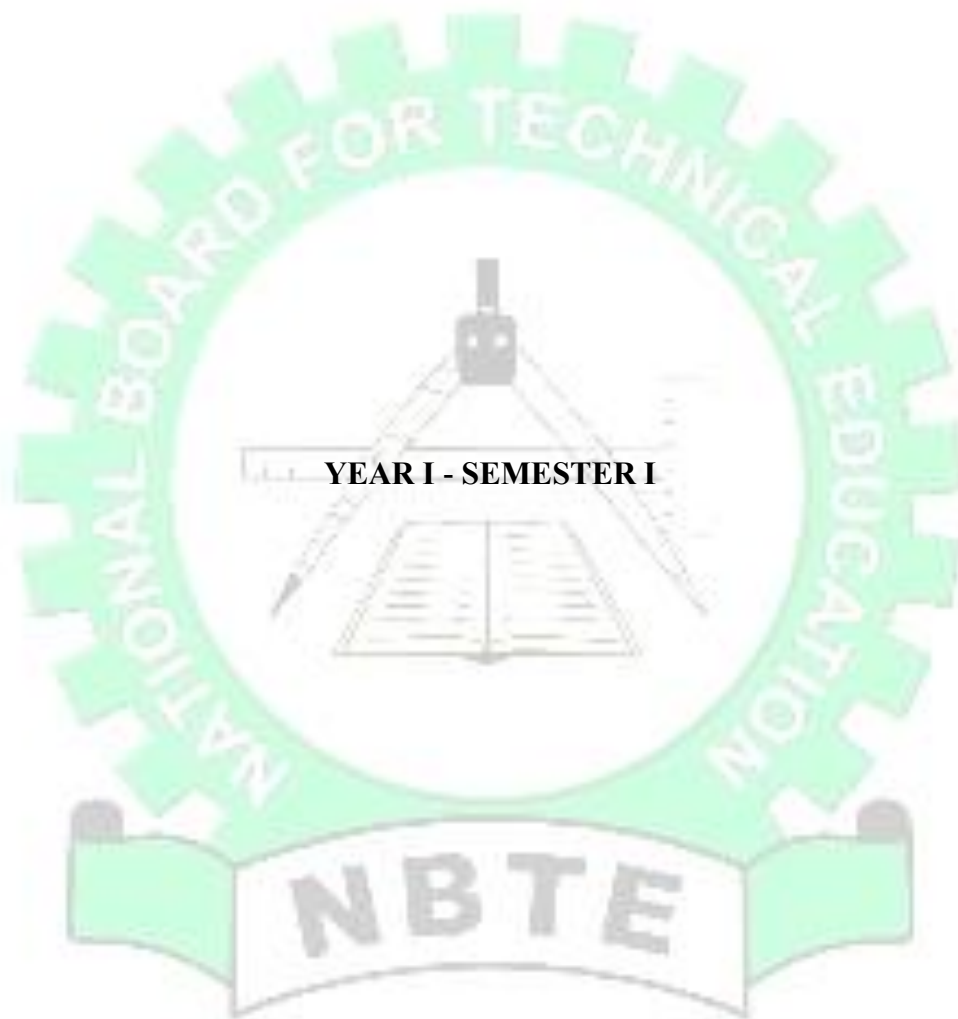
S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	GNS 102	Communication in English I	2	0	0	2	2
2.	GNS 121	Citizenship Education II	2	0	0	2	2
3.	ENT 126	Introduction to Entrepreneurship I	2	0	1	3	3
4.	STC 121	Organic Chemistry I	2	0	1	3	3
5.	FET 124	Non-Timber Forest Products	1	0	2	3	3
6.	WPT 121	Introduction to Timber Economics	2	0	0	2	2
7.	WPT 122	Wood Chemistry and Adhesive Technology	1	0	2	3	3
8.	WPT 123	Wood Preservation and Deterioration	1	0	2	3	3
9.	WPT 124	Introduction to Wood Processing Technology	1	0	2	3	3
10.	WPT 125	Wood Anatomy, Identification and Properties	1	0	2	3	3
11.	WPT 126	Furniture Design I	1	0	2	3	3
TOTAL			16	0	14	30	30

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 201	Research Methods and Experimental Design	1	0	1	2	2
4.	WPT 211	Pulp, Paper and Packaging Technology	1	0	2	3	3
5.	WPT 212	Wood Processing and Engineered Wood Products	1	0	2	3	3
6.	WPT 213	Wood Seasoning, Drying and Quality Control	1	0	2	3	3
7.	WPT 214	Forest Silviculture and Mensuration	1	0	2	3	3
8.	WPT 215	Basic Wood Physics	1	0	1	2	2
9.	WPT 216	Forest Engineering and Timber Harvesting	1	0	2	3	3
10.	WPT 217	Furniture Design II	1	0	3	4	4
11.	WPT 218	Students Industrial Work Experience Scheme (SIWES)	0	0	4	4	4
TOTAL			12	0	20	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.	WPT 221	Wood Products Marketing and Enterprise Development	1	0	1	2	2
3.	WPT 222	Climate-Smart Forestry and Forest Resource Management	1	0	2	3	3
4.	WPT 223	Wood Waste Utilization and Bioenergy Systems	1	0	2	3	3
5.	WPT 224	Technology of Wood Products	1	0	2	3	3
6.	WPT 225	Wood Testing, Utilization and Product Standards	1	0	2	3	3
7.	WPT 226	Emerging Trends in Wood, Paper and Green Technologies	1	0	2	3	3
8.	WPT 227	Smart Wood Manufacturing and Industry	1	0	2	3	3
9.	WPT 228	Project	0	0	4	4	4
TOTAL			9	0	17	26	26



INTRODUCTION TO WOOD AND PAPER TECHNOLOGY

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: INTRODUCTION TO WOOD AND PAPER TECHNOLOGY	COURSE CODE: WPT 111	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to provide students with the knowledge and skills in wood and paper technology.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the scope, importance and opportunities in wood and paper technology; 2.0 Know timber species, wood and paper products; 3.0 Demonstrate safe handling of wood materials and workshop equipment; 4.0 Know the basic wood processing and paper production operations; 5.0 Understand basic environmental and sustainable practices in wood and paper utilization.		

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: INTRODUCTION TO WOOD AND PAPER TECHNOLOGY			COURSE CODE: WPT 111		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide students with the knowledge and skills in wood and paper technology.						
General Objective 1.0: Understand the scope, importance and opportunities in wood and paper technology.						
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 history of pulp and paper technology. 1.2 Explain wood and paper technology. 1.3 Describe the scope of wood and paper technology. 1.4 Explain the importance of wood and paper technology industry. 1.5 Explain the role of downstream sector in the paper industry. 1.6 State career	- Discuss the history of pulp and paper technology. - Discuss wood and paper technology. - Explain the scope of wood and paper technology. - Discuss the importance of wood and paper technology industry. - Discuss the role of downstream sector in the	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify common wood and paper products. - Observe wood and paper products in laboratory/workshop. - Classify wood and paper products according to uses. - Prepare list of common wood and paper products found locally. - Identify major sectors in wood and paper technology	Guide students to: - Identify common wood and paper products. - Observe wood and paper products in laboratory/workshop. - Classify wood and paper products according to uses. - Prepare list of common wood and paper products found locally. - Identify major sectors in wood and	Timber samples, Specimen trays, Labels, Storage racks, Paper products NTFP samples

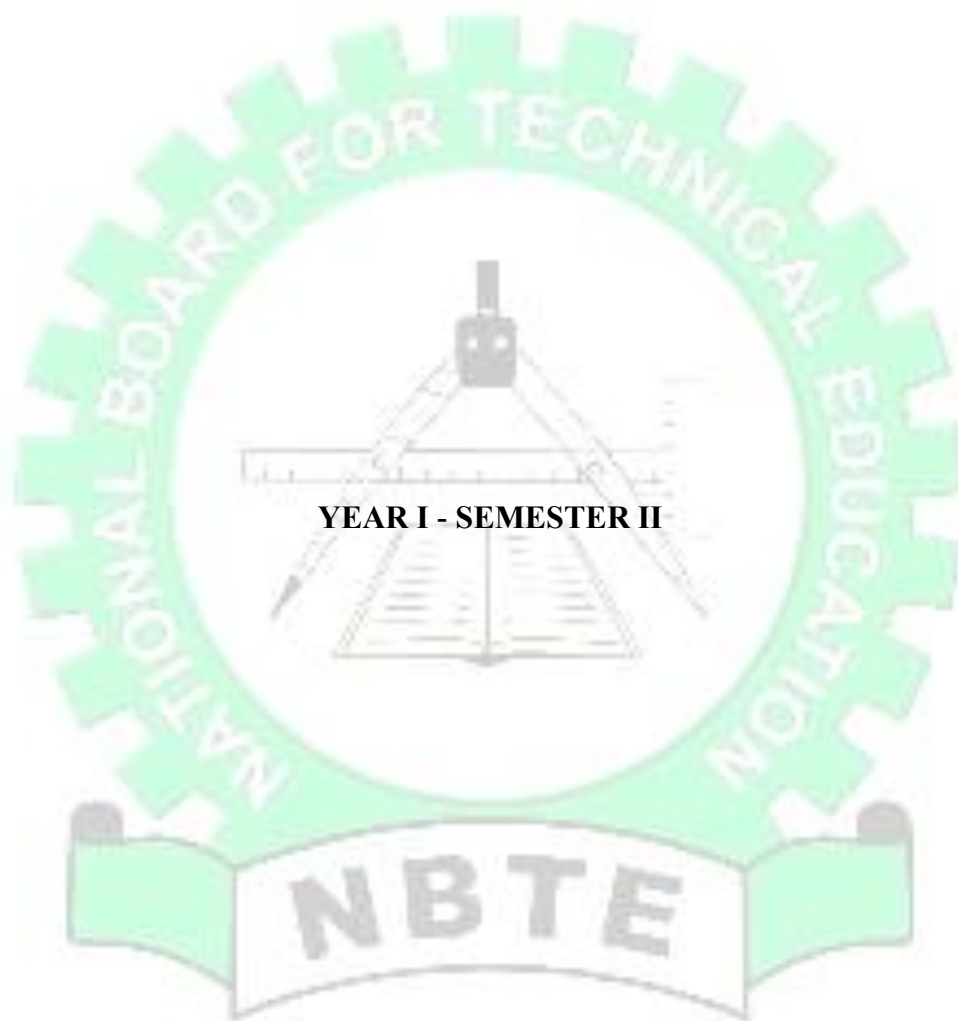
	opportunities in wood and paper technology. 1.7 Explain the role of forestry in wood and paper production. 1.8 Explain the relationship between forest resources and industrial development.	paper industry. • Explain career opportunities in wood and paper technology. • Discuss the role of forestry in wood and paper production. • Describe the relationship between forest resources and industrial development.		industry. • Participate in guided workshop familiarization exercise.	paper technology industry. • Participate in guided workshop familiarization exercise.	
General Objective 2.0: Know timber species, wood and paper products.						
4 – 6	2.1 Explain the major timber species used in wood and paper production. 2.2 Describe the characteristics of timber species. 2.3 Explain common indigenous timber species. 2.4 Explain common exotic timber species. 2.5 Distinguish hardwood from softwood species. 2.6 Describe the	• Describe the major timber species used in wood and paper production. • Explain the characteristics of timber species. • Discuss common indigenous timber species. • Discuss common exotic timber species. • Distinguish hardwood from softwood species.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify major timber species used in wood and paper production. • Identify common indigenous timber species. • Identify common exotic timber species. • Identify common wood products and their uses. • Classify paper products according to uses. • Prepare timber	Guide students to: • Identify major timber species used in wood and paper production. • Identify common indigenous timber species. • Identify common exotic timber species. • Identify common wood products and their uses. • Classify paper products according to uses.	Timber samples, Specimen trays, Labels, Storage racks, Paper products NTFP samples

	physical characteristics of timber species. 2.7 Describe common wood products and uses. 2.8 Describe different paper products and their uses. 2.9 Outline timber according to uses. 2.10 Explain the economic importance of timber.	• Explain the physical characteristics of timber species. • Discuss common wood products and uses. • Discuss different paper products and their uses. • Highlight timber according to uses. • Discuss the economic importance of timber.		specimen boards and labels.	Prepare timber specimen boards and labels.	
General Objective 3.0: Demonstrate safe handling of wood materials and workshop equipment;						
7 – 9	3.1 Explain workshop safety rules and regulations. 3.2 Describe common workshop hazards. 3.3 Describe causes of workshop accidents. 3.4 Explain safety precautions in handling tools and equipment. 3.5 Explain the	• Discuss workshop safety rules and regulations. • Explain common workshop hazards. • Discuss causes of workshop accidents. • Describe safety precautions in handling tools and equipment. • Discuss the importance of	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify workshop tools and equipment. • Identify common workshop hazards. • Demonstrate proper use of PPE. • Demonstrate safe handling of tools and materials. • Carry out workshop sanitation exercise. • Practice safe lifting and storage of wood materials. • Conduct workshop	Guide students to: • Identify workshop tools and equipment. • Identify common workshop hazards. • Demonstrate proper use of PPE. • Demonstrate safe handling of tools and materials. • Carry out workshop sanitation exercise. • Practice safe lifting and storage of	Workshop tools, PPEs, timber materials, safety signs, storage facilities.

	importance of personal protective equipment (PPE). 3.6 Describe the common workshop tools and equipment. 3.7 Explain safe storage of wood materials and tools.	personal protective equipment (PPE). - Discuss the common workshop tools and equipment. - Discuss safe storage of wood materials and tools.		hazard inspection. Demonstrate safe storage of tools after use.	wood materials. - Conduct workshop hazard inspection. - Demonstrate safe storage of tools after use.	
General Objective 4.0: Know the basic wood processing and paper production operations.						
10-12	4.1 Explain basic wood processing operations. 4.2 Describe stages involved in timber conversion. 4.3 Outline methods of timber conversion. 4.4 Explain common wood processing equipment and machines. 4.5 Describe the raw materials used in paper production. 4.6 Explain the basic pulp production processes. 4.7 Explain stages	- Describe basic wood processing operations. - Explain stages involved in timber conversion. - Discuss methods of timber conversion. - Describe common wood processing equipment and machines. - Explain the raw materials used in paper production. - Discuss the basic pulp production	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Observe timber conversion operations in workshop/sawmill. - Identify common wood processing machines and equipment. - Demonstrate simple timber measuring and cutting operations. - Identify raw materials used in paper production. - Identify common wood processing equipment and machines. - Observe stages of	Guide students to: - Observe timber conversion operations in workshop/sawmill. - Identify common wood processing machines and equipment. - Demonstrate simple timber measuring and cutting operations. - Identify raw materials used in paper production. - Identify common wood processing equipment and machines.	Workshop machines, Timber samples, Measuring tools, Paper samples, Videos, Sawmill, workshop charts. PPEs.

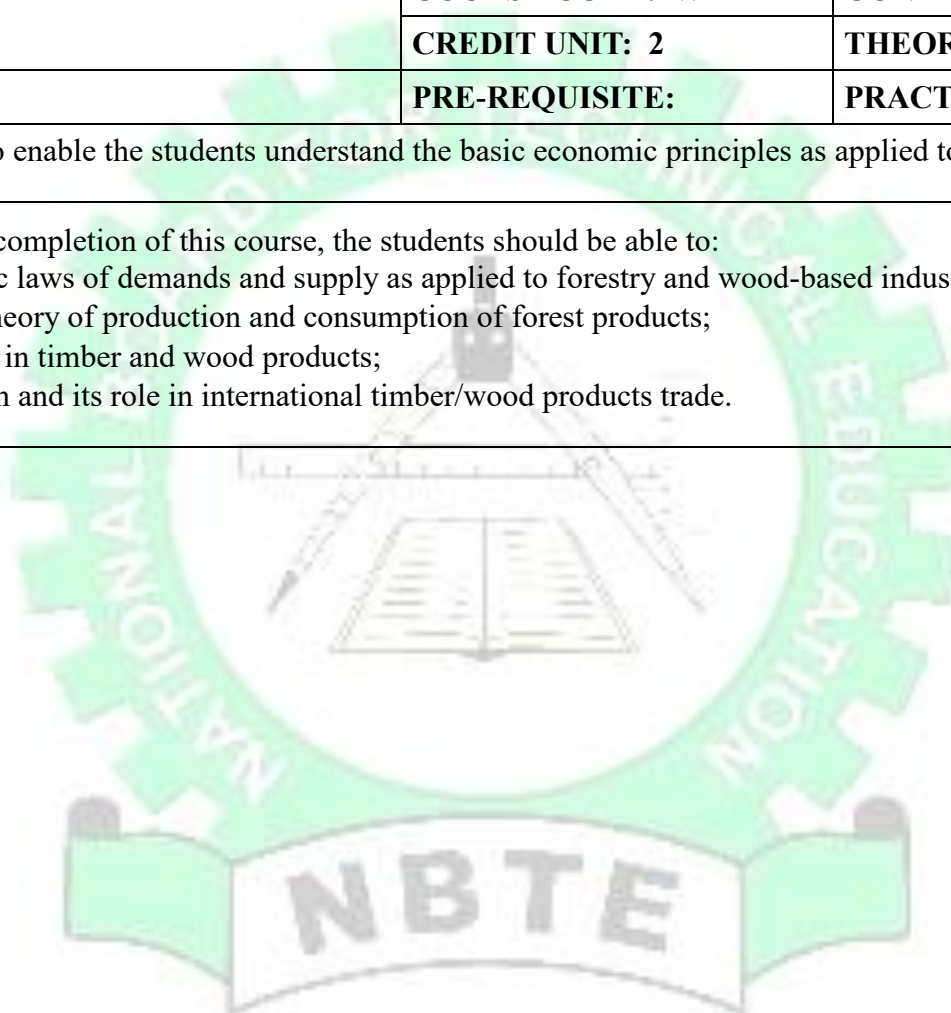
	involved in paper manufacturing. 4.8 List common products obtained from wood and paper industries. 4.9 Explain importance of value addition in wood processing.	- Describe stages involved in paper manufacturing. - List common products obtained from wood and paper industries. - Discuss importance of value addition in wood processing.		paper production through demonstration or video. - Identify common products obtained from wood and paper industries. - Classify processed wood products according to use. - Prepare simple report on observed wood and paper processing activities.	- Observe stages of paper production through demonstration or video. - Identify common products obtained from wood and paper industries. - Classify processed wood products according to use. - Prepare simple report on observed wood and paper processing activities.	
General Objective 5.0: Know how to apply basic environmental and sustainable practices in wood and paper utilization.						
13-15	5.1 Explain sustainable use of wood species. 5.2 Explain the effects of deforestation and poor forest management. 5.3 Describe the environmental impacts of wood processing activities. 5.4 Explain the	- Describe sustainable use of wood species. - Discuss the effects of deforestation and poor forest management. - Discuss the environmental impacts of wood processing activities. - Discuss the importance of afforestation and reforestation.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Perform waste sorting activities. - Sort wood waste materials according to use. - Identify reusable wood materials and by-products. - Demonstrate proper disposal of workshop waste materials. - Participate in tree planting or nursery activities.	Guide students to: - Perform waste sorting activities. - Sort wood waste materials according to use. - Identify reusable wood materials and by-products. - Demonstrate proper disposal of workshop waste materials. - Participate in tree planting or nursery	Wood waste materials, Seedlings, Nursery tools, Waste bins, Recycling materials, PPEs, Workshop.

	importance of afforestation and reforestation. 5.5 Describe waste management practices in wood industries. 5.6 Explain the importance of recycling in paper production. 5.7 Describe environmentally friendly wood utilization practices.	• Discuss waste management practices in wood industries. • Describe the importance of recycling in paper production. • Discuss environmentally friendly wood utilization practices.		• Demonstrate environmental sanitation practices in workshop. • Perform simple paper recycling. • Prepare simple report on sustainable wood utilization practices.	activities. • Demonstrate environmental sanitation practices in workshop. • Perform simple paper recycling. • Prepare simple report on sustainable wood utilization practices.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



INTRODUCTION TO TIMBER ECONOMICS

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: INTRODUCTION TO TIMBER ECONOMICS	COURSE CODE: WPT 111	CONTACT HOUR: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 2 HOURS/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL:
GOAL: This course is designed to enable the students understand the basic economic principles as applied to forestry and other wood industries		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the basic economic laws of demands and supply as applied to forestry and wood-based industries; 2.0 Understand the fundamental theory of production and consumption of forest products; 3.0 Understand international trade in timber and wood products; 4.0 Understand the banking system and its role in international timber/wood products trade.		



PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY							
COURSE TITLE: INTRODUCTION TO TIMBER ECONOMICS			COURSE CODE: WPT 111		CONTACT HOUR: 2 HOURS/WEEK		
			CREDIT UNIT: 2		THEORETICAL: 2 HOURS/WEEK		
YEAR: I SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 0		
COURSE SPECIFICATION: THEORETICAL							
GOAL: This Course is designed to enable the students understand the basic economic principles as applied to forestry and other wood industries							
General Objective 1.0: Understand the basic economic laws of demands and supply as applied to forestry and wood-based industries.							
THEORETICAL CONTENT				PRACTICAL CONTENT			
Week	Specific Learning Outcome		Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-4	1.1	State the Laws of demand.	• Discuss the Laws of demand.	Charts, posters, photographs, multimedia, timber samples, paper samples.			
	1.2	Explain factors affecting demand for timber and wood products.	• Discuss factors affecting demand for timber and wood products.				
	1.3	Distinguish between demand for timber and wood products.	• Distinguish between demand for timber and wood products.				
	1.4	Define the elasticity for demand of a commodity using timber and wood products as examples.	• Discuss the elasticity for demand of a commodity using timber and wood products as examples.				
	1.5	Differentiate between the various kinds of demand elasticities.					
	1.6	Explain the factors affecting price					

	elasticity of demand with particular reference to timber and wood products. 1.7 Explain the application of the concept of price elasticity of demand. 1.8 State the laws of supply. 1.9 Explain factors affecting the supply of timber in Nigeria. 1.10 Differentiate between short- and long-term demand of timber and wood products. 1.11 Explain the different kinds of market structures and their characteristics as related to timber trade. 1.12 Explain the applications of the equilibrium price concept e.g. government interventions in timber and wood products market with regards to labor wages. Timber taxation. Subsidies, price control.	• Differentiate between the various kinds of demand elasticities. • Discuss the factors affecting price elasticity of demand with particular reference to timber and wood products. • Discuss the application of the concept of price elasticity of demand e.g. in: - pricing policy. - Timber - Wood products taxation by government. • Discuss the laws of supply. • Discuss factors affecting the supply of timber in Nigeria. • Differentiate between short- and long-term demand of timber and wood				
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	1.13 Explain: i. Resource allocation through the price system. ii. Production goals in wood-based industries. iii. Factors of production etc. iv. Investment criteria in wood-based industries.	products. • Discuss the different kinds of market structures and their characteristics as related to timber trade e.g. pure competition; monopoly, oligopoly. • Discuss the applications of the equilibrium price concept e.g. government interventions in timber and wood products market with regards to labor wages. Timber taxation. Subsidies, price control. • Explain: - Resource allocation through the price system. - Production goals in wood-based industries. - Factors of production etc.				
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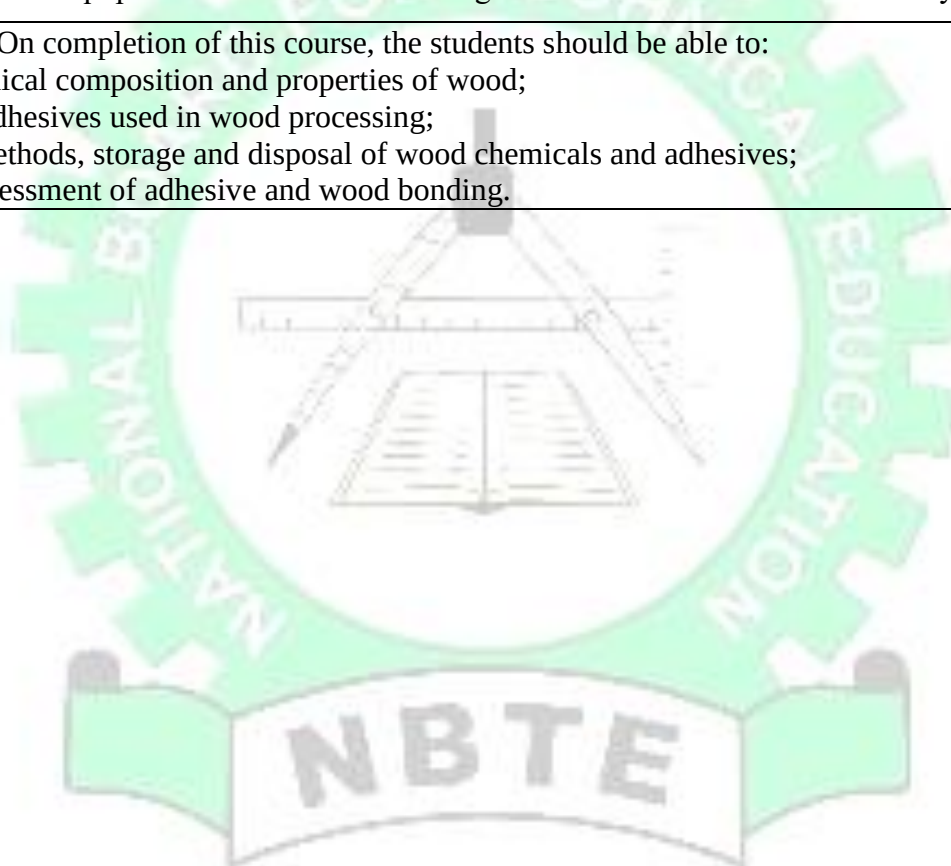
		- Investment criteria in wood-based industries.				
General Objective 2.0: Understand the fundamental theory of production and consumption of forest products.						
5 – 8	2.1 State the law of diminishing returns. 2.2 Explain the law in 2.1 above with reference to consumer and producer equilibrium in timber and wood products markets. 2.3 Explain the utility concept 2.4 Describe the advantages and disadvantages of the utility concept. 2.5 Explain the indifference curve approach. 2.6 Explain the theory of production with particular references to forest product utilization. 2.7 Define the term “production functions” with its mathematical expression.	• Discuss the law of diminishing returns. • Discuss the law in 2.1 above with reference to consumer and producer equilibrium in timber and wood products markets. • Describe the utility concept • Discuss the advantages and disadvantages of the utility concept. • Discuss the indifference curve approach. • Discuss the theory of production with particular references to forest product utilization. • Explain the term “production functions” with its	Charts, posters, photographs, multimedia, timber samples, paper samples.			

	2.8 Distinguish between the various stages in a production cycle (in wood and allied industries) pointing out their characteristics.	mathematical expression. Distinguish between the various stages in a production cycle (in wood and allied industries) with their characteristics.				
General Objective 3.0: Understand international trade in timber and wood products.						
9 – 12	3.1 Define international trade 3.2 Explain its requirements. 3.3 Explain timber trade contract 3.4 Describe the advantages and disadvantages of free trade and protection. 3.5 Explain balance of trade and balance of payment (foreign exchange transactions) in international trade. 3.6 Explain the ways of controlling deficit in balance of trade and payment.	- Explain international trade - Discuss its requirements. - Discuss timber trade contract - Explain the advantages and disadvantages of free trade and protection. - Discuss balance of trade and balance of payment (foreign exchange transactions) in international trade. - Discuss the ways of controlling deficit in balance of trade and payment.	Charts, posters, photographs, multimedia, timber samples, paper samples. Nigeria Forestry Commission Reports, photographs, organizational chart, projector, etc.			.
General Objective 4.0: Understand the banking system and its role in international timber/wood products trade.						
13-15	4.1 Explain the general	Discuss the general	Charts,			.

	functions of banks. 4.2 Explain the ownership and operation of the two broad kinds Banks- (Central Bank and Commercial Banks). 4.3 Explain the role of the two kinds of banks in 4.2 above.	functions of banks. • Describe the ownership and operation of the two broad kinds Banks- (Central Bank and Commercial Banks). • Discuss the role of the two kinds of banks in 4.2 above.	posters, photographs, multimedia, timber samples, paper samples.			
COURSE ASSESSMENT: Course work: 20% Test/Assignments: 20% Examination: 60% Total: 100%						

WOOD CHEMISTRY AND ADHESIVE TECHNOLOGY

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY.		
COURSE TITLE: WOOD CHEMISTRY AND ADHESIVE TECHNOLOGY	COURSE CODE: WPT 122	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip students with the knowledge and skills in basic wood chemistry and adhesive technology.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the basic chemical composition and properties of wood; 2.0 Know the preparation of adhesives used in wood processing; 3.0 Know the safe handling methods, storage and disposal of wood chemicals and adhesives; 4.0 Know the basic quality assessment of adhesive and wood bonding.		

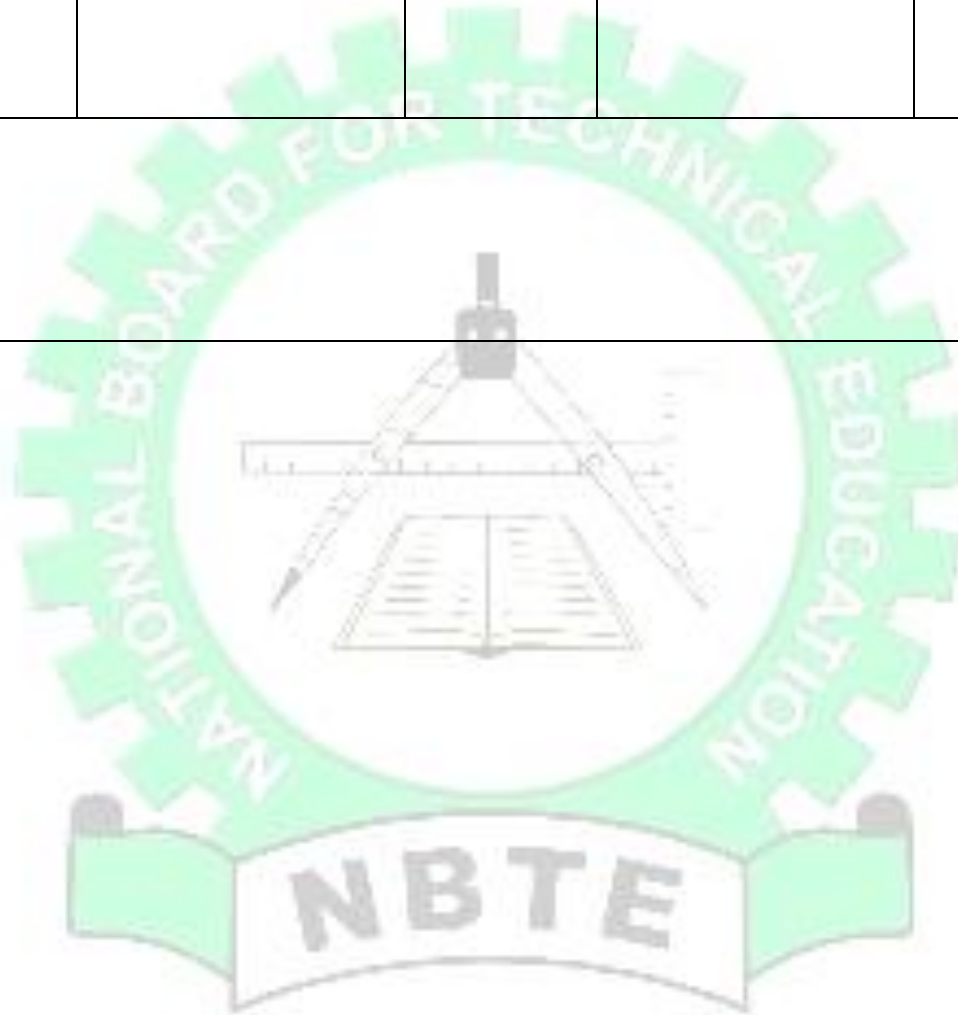


PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: WOOD CHEMISTRY AND ADHESIVE TECHNOLOGY			COURSE CODE: WPT 122		CONTACT HOURS: 3HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide students with the knowledge and skills in basic wood chemistry and adhesive technology.						
GENERAL OBJECTIVE 1.0: Understand the basic chemical composition and properties of 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 wood chemistry. 1.2 Explain the chemical composition of wood. 1.3 Describe the functions of cellulose, hemicellulose, lignin and extractives in wood. 1.4 Explain the relationship between wood chemistry and wood utilization.	- Discuss wood chemistry. - Describe the chemical composition of wood. - Discuss the functions of cellulose, hemicellulose, lignin and extractives in wood. - Discuss the relationship between wood chemistry and wood utilization.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify wood samples with different chemical characteristic. - Conduct a comparative analysis of chemical composition in wood species. - Prepare simple observation records on wood characteristics.	Guide students to: - Identify wood samples with different chemical characteristic. - Conduct a comparative analysis of chemical composition in wood species. - Prepare simple observation records on wood characteristics.	Timber specimens Labelled samples Moisture samples. Soxhlet etc.
General Objective 2.0: Know the preparation of adhesives used in wood processing.						
4 – 6	2.1 Explain wood adhesives. 2.2 Outline the natural adhesives used in wood processing.	- Discuss wood adhesives. - Describe the natural adhesives used in wood processing.	Charts, posters, photographs, multimedia, timber	- Identify the types of adhesives. - Identify the synthetic adhesives.	Guide students to - Identify the types of adhesives. - Identify the	Adhesive samples Labelled containers Timber

	2.3 List the synthetic adhesives used in wood processing. 2.4 State the characteristics of common adhesives. 2.5 Explain the process of adhesive preparation. 2.6 Explain the uses of adhesives in wood industry. 2.7 List the natural adhesives used in wood processing. 2.8 Explain the classification of adhesives according to application and uses.	• Explain the synthetic adhesives used in wood processing. • Discuss the characteristics of common adhesives. • Describe the process of adhesive preparation. • Discuss the uses of adhesives in wood industry. • Explain the natural adhesives used in wood processing. • Discuss the classification of adhesives according to application and uses.	samples, paper samples.	• Classify adhesives according to use. • Identify synthetic adhesives used in wood processing. • Prepare adhesive	synthetic adhesives. • Classify adhesives according to use. • Identify synthetic adhesives used in wood processing. • Prepare adhesive	samples.
General Objective 3.0: Know the safe handling methods, storage and disposal of wood chemicals and adhesives.						

7-10	3.1 Explain laboratory safety practices. 3.2 Explain hazards associated with wood chemicals and adhesives. 3.3 Explain different safe handling methods in adhesive application. 3.4 Explain different storage methods for wood chemicals and adhesives. 3.5 Explain disposal methods for wood chemicals and adhesives.	• Discuss laboratory safety practices. • Discuss hazards associated with wood chemicals and adhesives. • Discuss different safe handling methods in adhesive application. • Describe different storage methods for wood chemicals and adhesives. • Describe disposal methods for wood chemicals and adhesives.		• Apply safety laboratory practices in handling wood chemicals and adhesives. • Store wood chemicals and adhesives in the laboratory. • Dispose wood chemicals and adhesives safely.	Guide students to: • Apply safety laboratory practices in handling wood chemicals and adhesives. • Store wood chemicals and adhesives in the laboratory. • Dispose wood chemicals and adhesives safely.	Adhesives Clamps Timber materials, Mixing tools, Brushes.
General Objective 4.0: Know the basic quality assessment of adhesive and wood bonding.						
13-15	4.1 Explain the determination of qualitative adhesive joints in wood bonding. 4.2 Explain causes of weak bonding. 4.3 Explain factors affecting the quality of bonding quality. 4.4 Explain the importance of quality control in wood bonding. 4.5 Explain the defects associated with poor	• Describe the determination of qualitative adhesive joints in wood bonding. • Discuss causes of weak bonding. • Explain factors affecting the quality of bonding quality. • Discuss the importance of quality control in wood bonding. • Discuss the defects	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Determine the quality of adhesive joints in wood bonding. • Test bonded timber samples for strength. • Compare strong and weak adhesive joints. • Identify poorly bonded joints. • Inspect bonded wood samples for defects.	Guide students to: • Determine the quality of adhesive joints in wood bonding. • Test bonded timber samples for strength. • Compare strong and weak adhesive joints. • Identify poorly bonded joints.	Bonded wood Samples. Testing materials Wood joints, Workshop

	adhesive application.	associated with poor adhesive application.		• Prepare simple quality assessment records.	• Inspect bonded wood samples for defects. • Prepare simple quality assessment records.	
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



WOOD PRESERVATION AND DETERIORATION

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: WOOD PRESERVATION AND DETERIORATION	COURSE CODE: WPT 123	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to provide students with the knowledge and skills in wood degradation, biodeterioration and preservation.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand causes and agents of wood degradation; 2.0 Know biotic and abiotic agents associated with wood deterioration; 3.0 Know basic wood preservation methods and treatment techniques; 4.0 Know safe handling, storage and maintenance of treated wood materials; 5.0 Understand simple preservation effectiveness and sustainable wood protection practices.		

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: WOOD PRESERVATION AND DETERIORATION			COURSE CODE: WPT 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 provide students with the knowledge and skills in wood degradation, biodeterioration and preservation.						
GENERAL OBJECTIVE 1.0: Understand causes and agents of wood degradation.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 2	1.1 Explain wood deterioration. 1.2 Describe causes of wood deterioration. 1.3 Explain biological and environmental factors affecting wood degradation. 1.4 Explain effects of moisture on wood deterioration. 1.5 Describe economic importance of wood preservation. 1.6 Explain effects of degradation and wood quality.	• Discuss wood deterioration. • Explain causes of wood deterioration. • Describe biological and environmental factors affecting wood degradation. • Explain effects of moisture on wood deterioration. • Discuss economic importance of wood preservation. • Discuss effects of degradation and wood quality.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify healthy and deteriorated wood samples. • Identify biological and environmental factors affecting wood degradation. • Compare moisture content of wood samples. • Identify visible signs of wood deterioration. • Prepare simple observation notes on wood condition.	Guide students to: • Identify healthy and deteriorated wood samples. • Identify biological and environmental factors affecting wood degradation. • Compare moisture content of wood samples. • Identify visible signs of wood deterioration. Prepare simple observation notes on wood condition.	Wood samples, Observation sheet, Labelled specimens.
General Objective 2.0: Know biotic and abiotic agents associated with wood deterioration.						

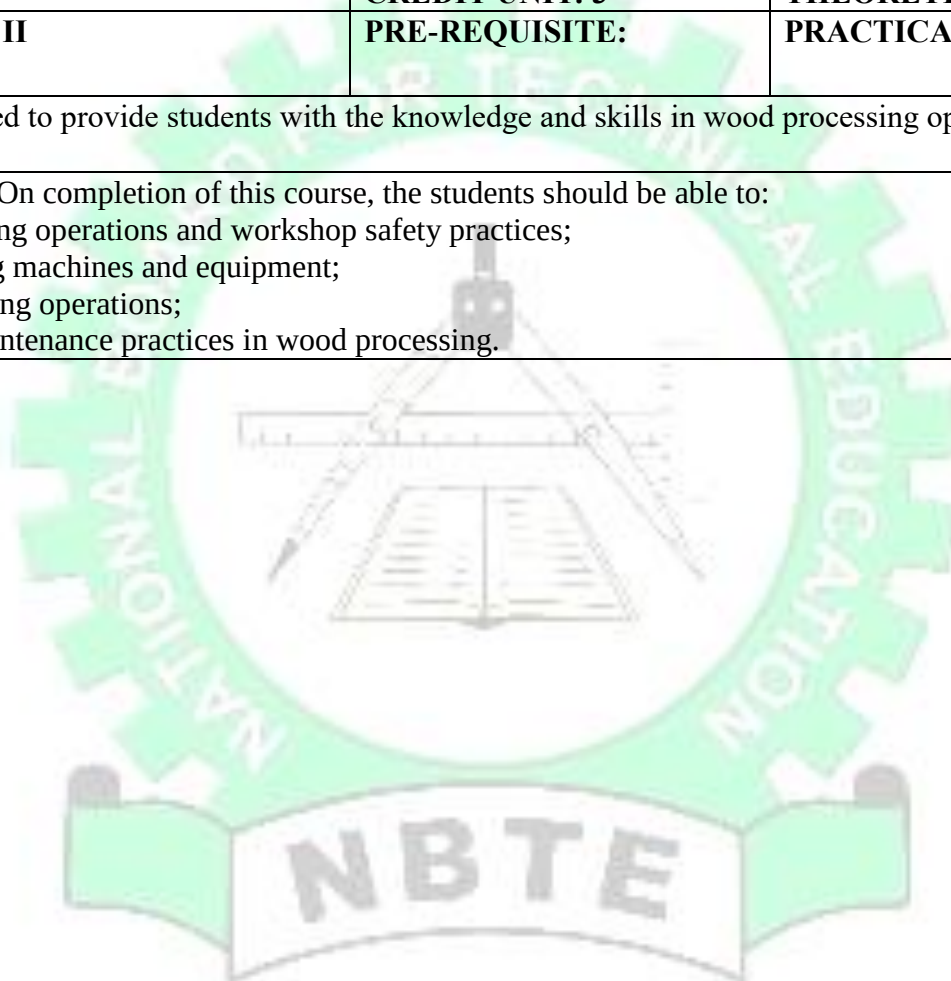
3 - 4	2.1 Explain insects affecting wood. 2.2 Explain fungal organisms affecting wood. 2.3 Explain fungal decay in wood. 2.4 Explain effects of biodeterioration agents on wood quality. 2.5 Explain abiotic factor associated with wood deterioration.	• Discuss insects affecting wood. • Describe fungal organisms affecting wood. • Describe fungal decay in wood. • Discuss effects of biodeterioration agents on wood quality. • Discuss abiotic factor associated with wood deterioration.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify insects affecting wood • Identify wood attacked by insects. • Identify fungal organisms affecting wood • Identify wood attacked by fungi • Identify borer holes and insect damage. • Identify abiotic factor associated with wood deterioration. • Prepare defect identification records.	Guide students to: • Identify insects affecting wood • Identify wood attacked by insects. • Identify fungal organisms affecting wood • Identify wood attacked by fungi • Identify borer holes and insect damage. • Identify abiotic factor associated with wood deterioration. • Prepare defect identification records.	Degraded wood samples Insect specimens Magnifying Lens labelled samples. Light microscope.
General Objective 3.0: Know basic wood preservation methods and treatment techniques.						
5 – 7	3.1 Explain wood treatment and wood preservation. 3.2 Explain wood preservation methods. 3.3 Explain importance of wood treatment. 3.4 Explain preservatives used in wood	• Discuss wood treatment and wood preservation. • Discuss wood preservation methods. • Discuss importance of wood treatment. • Describe preservatives used in wood protection. • Describe types of	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify preservatives used in wood protection. • Prepare simple preservative solution. • Demonstrate non pressure method of treatment eg. brushing, soaking, spraying, short dipping, diffusion,	Guide students to: • Identify preservatives used in wood protection. • Prepare simple preservative solution. • Demonstrate non pressure method of treatment eg. brushing, soaking,	Preservatives Pressure Impregnating machine Treatment tank. Brushes Gloves Wood samples. PPEs,

	3.5 protection. Explain types of treatment method i.e., Pressure and non-pressure. 3.6 Explain factors affecting wood treatment. 3.7 Explain necessary precautions during treatment and preservation.	treatment method i.e., Pressure and non-pressure. • Discuss factors affecting wood treatment. • Discuss necessary precautions during treatment and preservation.		sap displacement method of preservation. • Demonstrate pressure method full cell, modified full cell and empties cell method of treatment. • Demonstrate determination of absorption, penetration and retention. • Treat wood samples using preservatives Observe treated wood during drying. • Prepare preservative solution.	spraying, short dipping, diffusion, sap displacement method of preservation. • Demonstrate pressure method full cell, modified full cell and empties cell method of treatment. • Demonstrate determination of absorption, penetration and retention. • Treat wood samples using preservatives Observe treated wood during drying. • Prepare preservative solution.	etc.
General Objective 4.0: Know safe handling, storage and maintenance of treated wood materials.						
11 – 12	4.1 Explain hazards associated with preservatives. 4.2 Explain safety precautions during preservation. 4.3 Explain storage methods for treated	• Discuss hazards associated with preservatives. • Describe safety precautions during preservation. • Discuss storage methods for treated	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Demonstrate proper use of PPEs. • Demonstrate safe handling of treated wood. • Arrange treated wood on storage	Guide students to: • Demonstrate proper use of PPEs. • Demonstrate safe handling of treated wood. • Arrange treated	PPE Storage shed Waste bins Treatment area. Petri dish. Timber

	wood. 4.4 Explain handling procedures for treated wood.	wood. • Describe handling procedures for treated wood.		rack. • Carry out sanitation of treatment area.	wood on storage rack. • Carry out sanitation of treatment area.	grave yard.
General Objective 5.0: Understand simple preservation effectiveness and sustainable wood protection practices.						
13-15	5.1.Explain treatment: i. Effectiveness ii. Concentration iii. Penetration iv. Retention and. v. Absorption of preservative. 5.2.Explain sustainable wood protection practices. 5.3.Explain the environmental implications of poor wood preservation.	• Describe treatment: - Effectiveness - Concentration - Penetration - Retention and. - Absorption of preservative. • Discuss sustainable wood protection practices. • State the environmental implications of poor wood preservation.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Compare treated and untreated wood samples. • Observe deterioration differences between samples. • Prepare simple treatment assessment records. • Demonstrate proper wood maintenance practices.	Guide students to: • Compare treated and untreated wood samples. • Observe deterioration differences between samples. • Prepare simple treatment assessment records. • Demonstrate proper wood maintenance practices.	Treated wood samples, Untreated wood samples, Assessment sheet.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

INTRODUCTION TO WOOD PROCESSING TECHNOLOGY

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: INTRODUCTION TO WOOD PROCESSING TECHNOLOGY	COURSE CODE: WPT 124	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to provide students with the knowledge and skills in wood processing operations and safe use of machines.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand wood processing operations and workshop safety practices; 2.0 Know the wood processing machines and equipment; 3.0 Know basic wood processing operations; 4.0 Know simple machine maintenance practices in wood processing.		



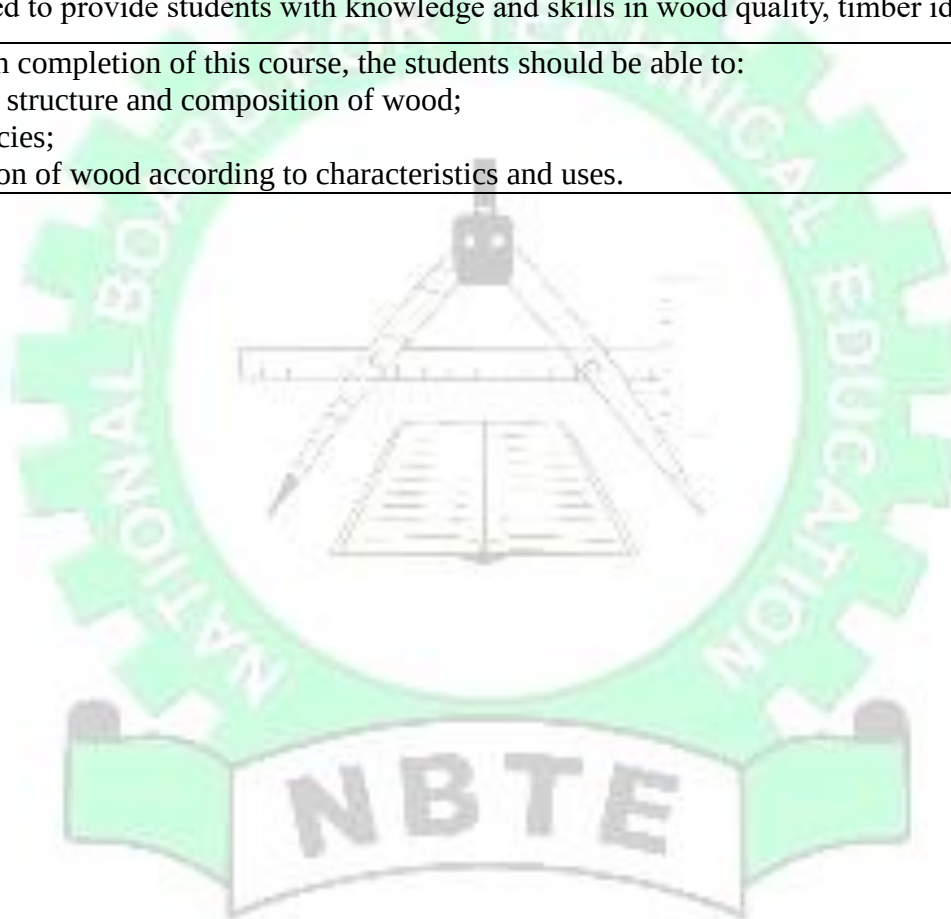
PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: INTRODUCTION TO WOOD PROCESSING TECHNOLOGY			COURSE CODE: WPT 124		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: I SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide students with the knowledge and skills in wood processing operations and safe use of machines.						
GENERAL OBJECTIVE 1.0: Understand wood processing operations and workshop safety practices.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 3	1.1 Explain wood processing technology. 1.2 Explain importance of wood processing industries. 1.3 Describe the hazards associated with wood processing. 1.4 Explain workshop safety rules in wood process. 1.5 Describe safety precautions during machine operation.	- Describe wood processing operations. - Explain the importance of wood processing industries. - State the hazards associated with wood processing. - Explain workshop safety procedures. - Explain safety precautions during machine operation.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify workshop safety signs - Identify PPE used during machine operations. - Demonstrate proper wearing of safety gears. - Demonstrate safe movement within the workshop. - Demonstrate workshop safety procedures.	Guide students to: - Identify workshop safety signs - Identify PPE used during machine operations. - Demonstrate proper wearing of safety gears. - Demonstrate safe movement within the workshop. - Demonstrate workshop safety procedures.	PPE, workshop, safety signs, first aid box, machine workshop.
General Objective 2.0: Know the wood processing machines and equipment.						
4 – 7	2.1 Describe wood processing machines. 2.2 Explain the functions of wood processing machines machines. 2.3 Describe the parts of	- Explain wood processing machines - State the functions of wood processing machines	Charts, posters, photographs, multimedia, timber samples,	- Identify the following: - circular saw. - band saw machine. - thickness planer.	Guide students to: - Identify the following: - circular saw. - band saw machine. - thickness planer.	Processing machines. Tools, Manuals,

	the processing machines. 2.4 Explain the functions of the machine components. 2.5 Explain the maintenance procedures of processing machines.	• Explain the parts of the processing machines • State the functions of the machine components. • Describe the maintenance procedures of processing machines.	paper samples. 	- spindle moulder. - drilling and boring machine. - machine parts and controls. • Identify parts of the processing machines. • Demonstrate: safe handling of machine tools. • Clean machine surfaces after operations	- spindle moulder. - drilling and boring machine. - machine parts and controls. • Identify parts of the processing machines. • Demonstrate: safe handling of machine tools. • Clean machine surfaces after operations.	Workshop Machine parts. Spindle Moulder,.
General Objective 3.0: Know basic wood processing operations.						
8 – 11	3.1 Explain wood processing operations. 3.2 Describe wood selection for processing. 3.3 Explain measuring and marking principles. 3.4 Describe the dimensioning requirements for wood products. 3.5 Explain safe preparation of timber for machine operation.	• Describe wood processing operations. • Explain timber selection criteria. • Describe measuring and marking techniques of wood. • Describe dimensioning procedures for wood products. • Describe safe preparation of timber for machine operation.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Select suitable timber for processing. • Measure timber using steel rule and measuring tape. • Mark timber using T- square and marking gauge. • Prepare timber for sawing operations. • Check timber dimensions before machining • Sort timber materials for processing.	Guide students to: • Select suitable timber for processing. • Measure timber using steel rule and measuring tape. • Mark timber using T- square and marking gauge. • Prepare timber for sawing operations. • Check timber dimensions before machining • Sort timber materials for processing.	Timber measuring tools, workbench, Marking tools. Wood, Measuring tape, Try square, Marking gauge, Steel rule.
General Objective 4.0: Know simple machine maintenance practices in wood processing.						

12 – 15	4.1 Explain maintenance needs of workshop machines. 4.2 Explain how to apply cleaning practices. 4.3 Describe lubrication of moving parts of a machine. 4.4 Explain how to tighten loose components. 4.5 Describe how to sharpen cutting tools. 4.6 Explain how to check electrical connections and store machines properly.	• Discuss maintenance needs of workshop machines. • Describe how to apply cleaning practices. • Describe lubrication of moving parts of a machine. • Explain how to tighten loose components • Describe how to sharpen cutting tools • Describe how to check electrical connections and store machines properly.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Maintain workshop machines. • Apply cleaning practices to a machine. • Apply simple lubrication of moving parts of a machine. • Tighten loose components • Sharpen cutting tools. • Check electrical connections • Store machines properly.	Guide students to: • Maintain workshop machines. • Apply cleaning practices to a machine. • Apply simple lubrication of moving parts of a machine. • Tighten loose components • Sharpen cutting tools. • Check electrical connections • Store machines properly.	Lubricants Brushes Grinder, vacuum cleaner Rust removal, Sharpening stones Insulated gloves, Storage racks etc.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

WOOD ANATOMY, IDENTIFICATION AND PROPERTIES

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY.		
COURSE TITLE: WOOD ANATOMY, IDENTIFICATION AND PROPERTIES	COURSE CODE: WPT 125	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to provide students with knowledge and skills in wood quality, timber identification and classification.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the anatomical structure and composition of wood; 2.0 Know common timber species; 3.0 Understand the classification of wood according to characteristics and uses.		



NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: WOOD ANATOMY, IDENTIFICATION AND PROPERTIES			COURSE CODE: WPT 125		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 knowledge and skills in wood quality, timber identification and classification.						
GENERAL OBJECTIVE 1.0: Understand the anatomical structure and composition of wood.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 5	1.1 Explain wood anatomy. 1.2 Describe structure of wood. 1.3 Explain the parts of a tree stem. 1.4 Explain the functions of bark, cambium, sapwood, heartwood and pit. 1.5 Describe annual growth rings and grain patterns. 1.6 Explain the difference between hardwood and softwood structure. 1.7 Explain the cellular composition of wood. 1.8 Describe the factors	• Explain the concept of wood anatomy • Explain the structure of wood. • Describe the parts of a tree stem. • Discuss the functions of bark, cambium, sapwood, heartwood and pit functions of bark, • Explain the annual growth rings and grain patterns.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify parts of tree stem using specimens. • Observe sapwood and heartwood • Observe growth rings and grain pattern. • Prepare labelled diagrams of wood structure. • Handle wood specimens for observation.	Guide students to: • Identify parts of tree stem using specimens. • Observe sapwood and heartwood • Observe growth rings and grain pattern. • Prepare labelled diagrams of wood structure. • Handle wood specimens for observation.	Timber samples, specimen boards, labelled charts, magnifying lens, workshop specimens. Light microscope. Anatomy laboratory.

	affecting wood growth and structure.	• State the difference between hardwood and softwood structure. • Discuss the cellular composition of wood. • State factors affecting wood growth and structure.				
General Objective 2.0: Know common timber species						
6 -10	2.1 Explain the common indigenous timber species. 2.2 Describe the common exotic timber species. 2.3 Describe the colour, grain, texture and odour of timber species. 2.4 Distinguish hardwood from softwood species.	• Discuss the common indigenous timber species. • Explain the common exotic timber species • Explain the colour, grain, texture and odour of timber species. • Differentiate hardwood from softwood species.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify common indigenous timber species. • Identify common exotic timber species. • Classify timber into hardwood and softwood groups. • Prepare timber specimen boards and labels. • Compile timber identification records.	Guide students to: • Identify common indigenous timber species. • Identify common exotic timber species. • Classify timber into hardwood and softwood groups. • Prepare timber specimen boards and labels. • Compile timber identification records.	Timber specimens, Labels, Specimen trays, Timber catalogue, Workshop material.

General Objective 3.0: Understand the classification of wood according to characteristics and uses

11 -15	3.1 Explain timber characteristics and uses 3.2 Explain the importance of timber classification 3.3 Explain wood classification according to density and uses. 3.4 Explain commercial importance of timber species. 3.5 Describe how to classify timber based on end uses.	• Describe timber characteristics and uses • State the importance of timber classification • Discuss wood classification according to density and uses. • State commercial importance of timber species. • Explain timber classification based on end uses	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Classify wood according to density and uses. • Classify timber based on end uses.	Guide students to: • Classify wood according to density and uses. • Classify timber based on end uses.	Timber specimens, Labels, Specimen trays, Timber catalogue, Workshop materials.
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COURSE ASSESSMENT:

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

FURNITURE DESIGN I

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: FURNITURE DESIGN I	COURSE CODE: WPT 126	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to provide students with knowledge and skills in furniture design.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the concepts, history, and principles of furniture design; 2.0 Know the principles of furniture design; 3.0 Know furniture design drawings using appropriate drafting techniques; 4.0 Understand ergonomics and anthropometric considerations in furniture design; 5.0 Know creativity and presentation skills in furniture design projects.		



PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: FURNITURE DESIGN I			COURSE CODE: WPT 126	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 knowledge and skills in furniture design.						
GENERAL OBJECTIVE 1.0: Understand the concepts, history, and principles of furniture design.						
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 meaning and scope of furniture design. 1.2 Describe the historical development of furniture. 1.3 Explain traditional and contemporary furniture styles. 1.4 Explain the principles and elements of design. 1.5 Explain the functions of furniture in the society.	• Discuss furniture design concepts. • Explain the historical development of furniture using furniture samples. • Discuss furniture designs from different historical periods. • Explain the principles and elements of design. • Discuss the functions of furniture in the society.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify different furniture styles and their periods of development. • Classify traditional and modern furniture designs. • Analyze furniture using principles of design. • Observe functional characteristics of furniture products. • Interpret visual features of furniture forms. • Present simple furniture design concepts using	Guide students to: • Identify different furniture styles and their periods of development. • Classify traditional and modern furniture designs. • Analyze furniture using principles of design. • Observe functional characteristics of furniture products. • Interpret visual	Design catalogues, Furniture photographs, Sketchbooks, Presentation boards, Drawing materials.

				sketches and illustrations.	features of furniture forms. • Present simple furniture design concepts using sketches and illustrations.	
General Objective 2.0: Know the principles of furniture design.						
4 – 6	2.1 Describe the key elements of furniture design. 2.2 Explain the principles of balance and proportion in furniture design. 2.3 Describe freehand sketches of furniture. 2.4 Explain the color combination concepts in furniture design. 2.5 Explain the creative furniture design concepts.	• Explain the key elements of furniture design • State the principles of balance and proportion in furniture design. • Explain freehand sketches of furniture. • Discuss the color combination concepts in furniture design • Discuss the creative furniture design concepts	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Produce freehand sketches of furniture items. • Apply balance and proportion in furniture sketches. • Demonstrate proper shading techniques in drawings. • Use color combinations appropriately in furniture concepts. • Create original furniture design ideas. • Prepare neat and organized design presentations. • Develop furniture concept sheets using design principles.	Guide students to: • Produce freehand sketches of furniture items. • Apply balance and proportion in furniture sketches. • Demonstrate proper shading techniques in drawings. • Use color combinations appropriately in furniture concepts. • Create original furniture design ideas. • Prepare neat and organized design presentations. • Develop furniture concept sheets using	Sketch pads, Drafting tools, Coloring materials, Erasers, Display boards. Studio Drawing boards.

					design principles.	
General Objective 3.0: Know furniture design drawings using appropriate drafting techniques.						
7 – 9	3.1 Explain orthographic projections. 3.2 Explain isometric drawings. 3.3 Describe working drawings for furniture. 3.4 Explain dimensioning techniques. 3.5 Describe furniture design drawings.	- Describe orthographic projections. - Describe isometric drawings. - Explain working drawings for furniture. - Describe dimensioning techniques. - Describe working drawings for furniture.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Draw orthographic projections of furniture items. - Produce isometric and pictorial furniture drawings. - Prepare complete furniture working drawings. - Carry out drawing assignments regularly. - Apply correct dimensioning and scaling methods. - Interpret furniture construction drawings - Use drafting instruments correctly and safely. - Produce computer-aided furniture drawings where facilities are available.	Guide students to: - Draw orthographic projections of furniture items. - Produce isometric and pictorial furniture drawings. - Prepare complete furniture working drawings. - Carry out drawing assignments regularly. - Apply correct dimensioning and scaling methods. - Interpret furniture construction drawings - Use drafting instruments correctly and safely. - Produce computer-aided furniture drawings where facilities are available.	Drafting tables. Drawing instruments Plotting sheets. Computers with CAD softwares installed.
General Objective 4.0: Understand ergonomics and anthropometric considerations in furniture design.						
10 – 12	4.1 Explain ergonomics in	Discuss ergonomic principles.	Charts, posters,	Measure body dimensions	Guide students to: Measure body	Chairs and desks

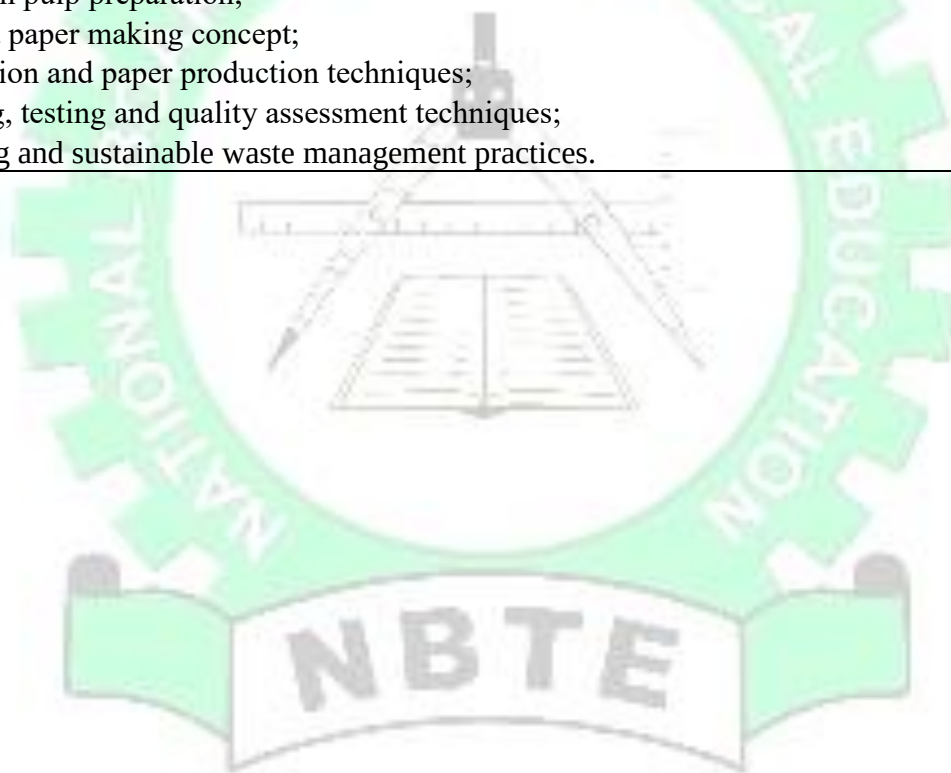
	furniture design. 4.2 Describe anthropometric measurements. 4.3 Explain standard furniture dimensions. 4.4 Describe furniture based on user comfort. 4.5 Explain furniture usability.	• Explain anthropometric measurements. • Explain the standard furniture dimensions. • Explain furniture based on user comfort. • Explain furniture usability.	photographs, multimedia, timber samples, paper samples.	accurately for furniture design. • Determine standard furniture measurements. • Design furniture based on user comfort requirements. • Evaluate ergonomic suitability of furniture items. • Arrange furniture layouts for convenience and safety. • Carry out ergonomic assessment exercises. • Use furniture samples for analysis. • Analyze furniture usability. • Analyze user interaction with furniture products. • Produce ergonomic furniture sketches and models.	dimensions accurately for furniture design. • Determine standard furniture measurements. • Design furniture based on user comfort requirements. • Evaluate ergonomic suitability of furniture items. • Arrange furniture layouts for convenience and safety. • Carry out ergonomic assessment exercises. • Use furniture samples for analysis. • Analyze furniture usability. • Analyze user interaction with furniture products. • Produce ergonomic furniture sketches and models.	Measuring devices, Human body charts. Design worksheets, Furniture models.
General Objective 5.0: Know creativity and presentation skills in furniture design projects.						

13 – 15	5.1.Explain innovative furniture ideas. 5.2.Explain furniture concepts. 5.3.Explain design portfolios. 5.4.Describe furniture design concepts.	• Explain innovative furniture ideas. • Discuss furniture concepts • Explain design portfolios • Discuss furniture design concepts.	Presentation boards. Design studios. Portfolio samples Multimedia equipment. Design journals.	• Prepare furniture design portfolios. • Participate in furniture design assignments and group projects. • Present furniture projects confidently before an audience. • Apply creative thinking in solving furniture design problems.	• Prepare furniture design portfolios. • Participate in furniture design assignments and group projects. • Present furniture projects confidently before an audience. • Apply creative thinking in solving furniture design problems.	Display boards. Projector Portfolio files. Computers Design software.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



PULP, PAPER AND PACKAGING TECHNOLOGY

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY.		
COURSE TITLE: PULP, PAPER AND PACKAGING TECHNOLOGY	COURSE CODE: WPT 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 designed to provide students with the knowledge and skills on pulp preparation, paper production and recycling process.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know raw materials used in pulp preparation; 2.0 Know pulp production and paper making concept; 3.0 know simple pulp preparation and paper production techniques; 4.0 Understand paper finishing, testing and quality assessment techniques; 5.0 Understand paper recycling and sustainable waste management practices.		



PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: PULP, PAPER AND PACKAGING TECHNOLOGY			COURSE CODE: WPT 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 designed to provide the students with knowledge and skills in pulp preparation, paper production and recycling.						
GENERAL OBJECTIVE 1.0: Know raw materials used in pulp preparation.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 3	1.1 Explain pulp processing. 1.2 Describe raw materials used in pulp making. 1.3 Describe pulp production. 1.4 Explain stages in paper production. 1.5 Explain the importance of paper industry.	- Describe pulp and paper technology concepts. - Explain raw materials used in paper production. - Explain pulp production. - Outline the stages in paper production. - State the importance of paper industry.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify wood pulp and waste paper materials production. - Identify the raw materials used in pulp making. - Classify raw materials according to their use. - Identify the various stages involved in pulp making.	Guide students to: - Identify wood pulp and waste paper materials production. - Identify the raw materials used in pulp making. - Classify raw materials according to their use. - Identify the various stages involved in pulp making.	Pulp samples, Bamboo fibre, Waste paper, Wood chips.
General Objective 2.0: Know pulp production and paper making concept.						
4 – 6	2.1 Describe fibre	Explain the	Charts,	Identify pulp	Guide students	Paper

	characteristics in paper production. 2.2 Describe the pulp materials used in paper production. 2.3 Describe the types of paper products. 2.4 Explain the classification of paper products according to uses. 2.5 Describe the properties of different paper products. 2.6 Explain the industrial uses of paper products.	characteristics of a good fibre material. • Explain the pulp materials used in paper production. • Describe various paper products and their samples. • Explain paper classification methods. • Discuss the properties of paper products. • Explain the industrial uses of paper products.	posters, photographs, multimedia, timber samples, paper samples.	materials used in paper production. • Identify writing paper, packaging paper, tissue paper and specialty paper. • Compare texture and thickness of paper samples. • Classify paper products according to industrial use. • Prepare simple paper specimen collection.	to: • Identify pulp materials used in paper production. • Identify writing paper, packaging paper, tissue paper and specialty paper. • Compare texture and thickness of paper samples. • Classify paper products according to industrial use. • Prepare simple paper specimen collection.	samples, pulp materials, specimen board, labels.
General Objective 3.0: know simple pulp preparation and paper production techniques.						
7– 9	3.1 Explain pulp preparation method. 3.2 Describe stages involved in paper production. 3.3 Explain paper sheet formation techniques.	• Describe pulp preparation methods. • Explain paper production stages. • Describe paper sheet formation	Charts, posters, photographs, multimedia, timber samples, paper	• Prepare simple pulp. • Carry out paper sheet formation using mould and deckle. • Press paper	Guide students to: • Prepare simple pulp. • Carry out paper sheet formation	Waste paper mould and deckle drying rack pressing board water container

	3.4 Explain paper pressing and drying methods. 3.5 Describe safety precautions during paper processing.	process. • Discuss paper pressing and drying methods • State safety precautions during paper processing.	samples.	sheets to remove excess water. • Dry paper sheets properly • Produce simple paper. • Sheet from recycled materials. • Practice workshop safety during pulp production.	using mould and deckle. • Press paper sheets to remove excess water. • Dry paper sheets properly • Produce simple paper. • Sheet from recycled materials. • Practice workshop safety during pulp production.	wood chips Digester
General Objective 4.0: Understand paper finishing, testing and quality assessment techniques.						
10– 12	4.1 Explain paper finishing methods. 4.2 Explain quality characteristics of paper. 4.3 Explain paper strength and durability. 4.4 Explain paper defects and causes. 4.5 Explain quality assessment in paper production.	• Describe paper finishing methods • Describe paper quality characteristics. • Discuss paper strength and durability. • Describe paper defects and causes. • Discuss quality assessment in	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify defective paper samples. • Carry out trimming and finishing of paper sheets. • Inspect paper quality after production.	Guide students to: • Identify defective paper samples. • Carry out trimming and finishing of paper sheets. • Inspect paper quality	Paper samples Ruler Cutting tools Assessment sheet.

		paper production.			after production.	
General Objective 5.0: Understand paper recycling and sustainable waste management practices.						
13-15	5.1 Explain paper recycling process. 5.2 Describe the importance of recycling in paper industry. 5.3 Explain waste paper management practices. 5.4 Describe the environmental importance of paper recycling. 5.5 Explain the sustainable paper production practices.	- Describe paper recycling concepts. - State the importance of recycling in paper industry. - Discuss waste paper management methods. - Discuss environmental importance of recycling. - Describe the sustainable paper production practices.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Sort waste paper according to type. - Carry out recycling of waste paper. - Produce recycled paper sheet. - Prepare simple waste paper inventory. - Dispose unusable paper properly.	Guide students to: - Sort waste paper according to type. - Carry out recycling of waste paper. - Produce recycled paper sheet. - Prepare simple waste paper inventory. - Dispose unusable paper properly.	Waste paper, recycling container, mould and deckle, waste bin
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						

WOOD PROCESSING AND ENGINEERED WOOD PRODUCTS

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: WOOD PROCESSING AND ENGINEERED WOOD PRODUCTS	COURSE CODE: WPT 212	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 designed to provide students with knowledge and skills in wood processing and quality assessment of engineered wood materials and advanced woodworking operations.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand advanced wood processing operations; 2.0 Know raw materials and engineered wood products; 3.0 Know wood machining and processing operations; 4.0 Know bonding, lamination and fabrication techniques for engineered wood products; 5.0 Understand quality control, handling and storage practices for engineered wood products.		



PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: WOOD PROCESSING AND ENGINEERED WOOD PRODUCTS			COURSE CODE: WPT 212		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 designed to provide students with knowledge and skills in wood processing and quality assessment of engineered wood materials and advanced woodworking operations						
GENERAL OBJECTIVE 1.0: Understand advanced wood processing operations.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 2	1.1 Explain wood processing technology. 1.2 Explain engineered wood products. 1.3 State advantages of engineered wood over solid wood. 1.4 Describe the following sawing operations: i. planning and surfacing. ii. veneering and lamination. 1.5 Explain particle board and medium density fibre board (MDF) production and finishing technique. 1.6 State industrial uses of engineered	• Discuss wood processing technology concepts • Describe engineered wood products • Outline advantages of engineered wood over solid wood. • Explain the following sawing operations: - planning and surfacing. - veneering and lamination. • Describe particle board and medium density fibre board	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify plywood, MDF, particle board and fibreboard. • Identify veneer sheets and laminated wood products. • Identify particle board and laminated veneer lumber (LVL) • Carry out the following operations; - planning and surfacing - veneering and lamination.	Guide students to: • Identify plywood, MDF, particle board and fibreboard. • Identify veneer sheets and laminated wood products. • Identify particle board and laminated veneer lumber (LVL) • Carry out the following operations; - planning and surfacing - veneering and	Plywood, MDF, Particleboard, Veneer sheets, Laminated wood products. Wood chips, Resin,. Sand paper, Polish, Hot press, Measuring tools.

	wood products. 1.7 Outline safety precautions in wood processing.	(MDF) production and finishing technique. • Explain industrial uses of engineered wood products. • State safety precautions in wood processing.		• Produce medium-density fibreboards with uniform texture, aesthetically appealing and durable wood products. • Compare solid wood and engineered wood products. • Demonstrate safe handling of engineered wood materials.	lamination. • Produce medium-density fibreboards with uniform texture, aesthetically appealing and durable wood products. • Compare solid wood and engineered wood products. • Demonstrate safe handling of engineered wood materials.	
General Objective: 2.0 Know raw materials and engineered wood products.						
3 – 5	2.1 Describe the raw materials used in engineered wood production. 2.2 Describe the characteristics of engineered wood materials. 2.3 Explain the production principles of plywood and particle board. 2.4 Explain the	• Outline the raw materials used in engineered wood production. • Explain the characteristics of engineered wood materials. • Discuss the production principles of plywood and particle board. • Discuss the	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify the raw materials used in engineered wood production. • Produce particle board, ply wood with cross-laminated strength. • Identify veneer sheets used in	Guide students to: • Identify the raw materials used in engineered wood production. • Produce particle board, ply wood with cross-laminated strength. • Identify veneer	Veneer sheets Fibres wood particles Engineered boards Wood fibres MDF press Hot press Wood strands Resin.

	production principles of MDF and fibre board. 2.5 Explain laminated veneer lumber techniques. 2.6 Describe adhesives used in engineered wood production.	production principles of MDF and fibre board. - Describe laminated veneer lumber techniques. - Explain adhesives used in engineered wood production.		plywood production. - Produce laminated veneer lumber. - Identify adhesives used in engineered wood production - Compare thickness and density of engineered wood products.	sheets used in plywood production. - Produce laminated veneer lumber. - Identify adhesives used in engineered wood production - Compare thickness and density of engineered wood products.	
General Objective 3.0: Know wood machining and processing operations.						
6 – 9	3.1 Explain machining operations for engineered wood products. 3.2 Describe the following: - Panel cutting, - Planning - Surfacing - Shaping procedures. 3.3 Explain drilling, turning and boring operation for engineered wood. 3.4 Explain shaping, sanding and	- Describe machining techniques for engineered wood products. - Explain the following: - panel cutting - planning, - surfacing - shaping methods. - Describe drilling, turning and boring operation	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Carry out machining operations. - Demonstrate use of routers for grooves and decorative edges. - Produce shaping wood on a lathe. - Produce smooth and size timber.	Guide students to: - Carry out machining operations. - Demonstrate use of routers for grooves and decorative edges. - Produce shaping wood on a lathe. - Produce smooth and size timber.	Engineered boards Measuring tools Woodworking machines Drill press Safety gear Clamps Bits Polish Sand paper Band and Circular saw Raw timber.

	finishing procedures. 3.5 Explain machine safety during advanced processing.	for engineered wood. - Describe shaping, sanding and finishing procedures. - Explain machine safety during advanced processing				
General Objective 4.0: Know bonding, lamination and fabrication techniques for engineered wood products.						
10-12	4.1 Describe bonding techniques in engineered wood product. 4.2 Describe how bonding techniques are used in the construction of engineered wood products. 4.3 Explain lamination principles in engineered wood products. 4.4 State the key processes involved in fabricating engineered wood products. 4.5 Explain clamping and pressing procedure in engineered wood products.	- Explain bonding techniques in engineered wood product. - Explain how bonding techniques are used in the construction of engineered wood products. - Explain lamination principles in engineered wood products. - Outline the key processes involved in fabricating engineered wood products. - Explain clamping and pressing	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Apply adhesive to engineered wood materials. - Demonstrate veneer bonding operation with minimal defects. - Produce laminated boards with enhanced strength and durability. - Fabricate furniture panels, beams and composite structures. - Inspect bonded materials for alignment.	Guide students to: - Apply adhesive to engineered wood materials. - Demonstrate veneer bonding operation with minimal defects. - Produce laminated boards with enhanced strength and durability. - Fabricate furniture panels, beams and composite structures. - Inspect bonded materials for alignment.	Adhesives, veneer sheets, clamps, laminated boards, applicator, laminating press, workshop machines, Assembly jigs, Cutting tools, io-based adhesives, and protective gear.

	4.6 Explain possible way to promote sustainability in engineered wood products. 4.7 State precautions during fabrication of engineered wood products.	procedure in engineered wood products. • Explain possible way to promote sustainability in engineered wood products. • Outline the precautionary measures during fabrication of engineered wood products.				
General Objective 5.0: Understand quality control, handling and storage practices for engineered wood products.						
13-15	5.1 Explain quality control in engineered wood production. 5.2 State application of quality control checks. 5.3 Explain common defects in engineered wood products. 5.4 Describe proper handling and correct storage procedures. 5.5 Explain industrial standards for engineered wood products.	• Discuss quality control in engineered wood production • Outline application of quality control checks • Describe common defects in engineered wood products. • Explain proper handling and correct storage procedures. • Discuss industrial standards for engineered wood products.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify defects in engineered wood products. • Inspect engineered boards for quality assurance. • Arrange engineered boards for storage. • Prepare simple quality assessment record.	Guide students to: • Identify defects in engineered wood products. • Inspect engineered boards for quality assurance. • Arrange engineered boards for storage. • Prepare simple quality assessment record.	Engineered boards. Storage rack, assessment sheet, Lifting equipment, Trolleys, Storage rack, record books, digital logs.

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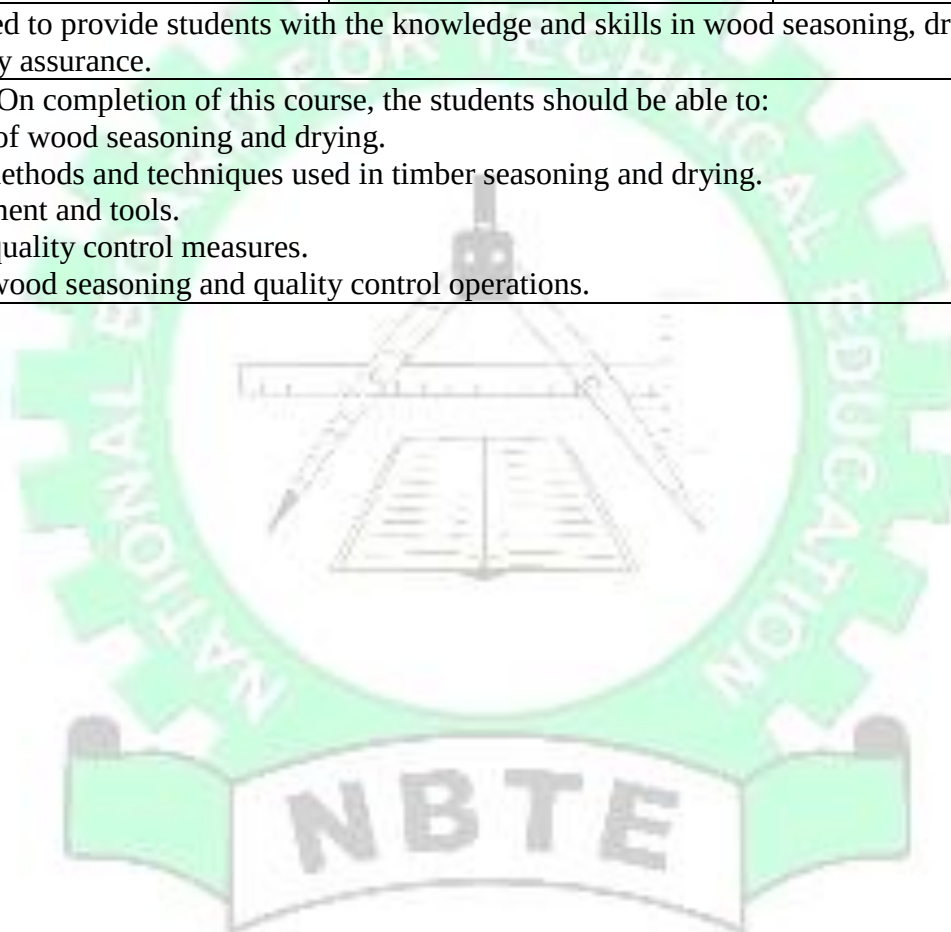
COURSE ASSESSMENT

Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						
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WOOD SEASONING, DRYING AND QUALITY CONTROL

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: WOOD SEASONING, DRYING AND QUALITY CONTROL	COURSE CODE: WPT 213	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 designed to provide students with the knowledge and skills in wood seasoning, drying, moisture control, grading, inspection, and quality assurance.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the principles of wood seasoning and drying. 2.0 Understand the different methods and techniques used in timber seasoning and drying. 3.0 Know wood drying equipment and tools. 4.0 Know drying defects and quality control measures. 5.0 Know safety measures in wood seasoning and quality control operations.		



PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: WOOD SEASONING, DRYING AND QUALITY CONTROL			COURSE CODE: WPT 213		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 designed to provide students with the knowledge and skills in wood seasoning, drying, moisture control, grading, inspection, and quality assurance.						
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GENERAL OBJECTIVE 1.0: Understand the principles of wood seasoning and drying.						
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 meaning of wood seasoning and drying. 1.2 Describe the structure of wood in relation to moisture movement. 1.3 Differentiate between free water and bound water. 1.4 Explain the importance of seasoning in timber utilization. 1.5 Describe the effects of improper drying on wood quality.	• Discuss the concepts using diagrams and wood samples. • Explain the structure of wood in relation to moisture movement. • State the difference between free water and bound water. • State the importance of seasoning in timber utilization. • State the effects of improper drying on wood quality.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify seasoned and unseasoned timber. • Observe moisture movement in wood samples. • Identify physical changes occurring during wood seasoning and drying. • Demonstrate proper handling of wood samples.	Guide students to: • Identify seasoned and unseasoned timber. • Observe moisture movement in wood samples. • Identify physical changes occurring during wood seasoning and drying. • Demonstrate proper handling of wood samples.	Fresh wood samples, Seasoned timber samples, Magnifying lens, Laboratory benches, Demonstration on charts.

GENERAL OBJECTIVE 2.0: Understand the different methods and techniques used in timber seasoning and drying.						
3 – 6	2.1 Explain air seasoning methods. 2.2 Describe kiln seasoning techniques. 2.3 Explain different types of timber kilns. 2.4 Describe factors affecting drying rate. 2.5 Explain how to prepare timber for drying operations.	• Explain air seasoning methods • Explain kiln drying procedures. • Describe different kiln designs. • State factors affecting drying rate. • Describe how to prepare timber for drying operations.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Stack timber properly for air seasoning. • Identify different types of timber kilns. • Prepare timber for kiln drying operations. • Operate simple wood drying systems safely. • Monitor timber arrangement for effective air circulation. • Compare air drying and kiln drying procedures. • Organize field visits to drying facilities. • Demonstrate safe handling during seasoning operations.	Guide students to: • Stack timber properly for air seasoning. • Identify different types of timber kilns. • Prepare timber for kiln drying operations. • Operate simple wood drying systems safely. • Monitor timber arrangement for effective air circulation. • Compare air drying and kiln drying procedures. • Organize field visits to drying facilities. • Demonstrate safe handling during seasoning operations.	Timber boards Stickers/spacers Kiln equipment PPEs Workshop Tools Workshop facilities.
GENERAL OBJECTIVE 3.0: Know wood drying equipment and moisture content determination methods						
7 – 10	3.1 Explain moisture content determination methods.	• Describe moisture content determination	Charts, posters, photographs, multimedia,	• Identify moisture meters • Determine wood	Guide students to: • Identify moisture meters	Digital moisture meters Laboratory

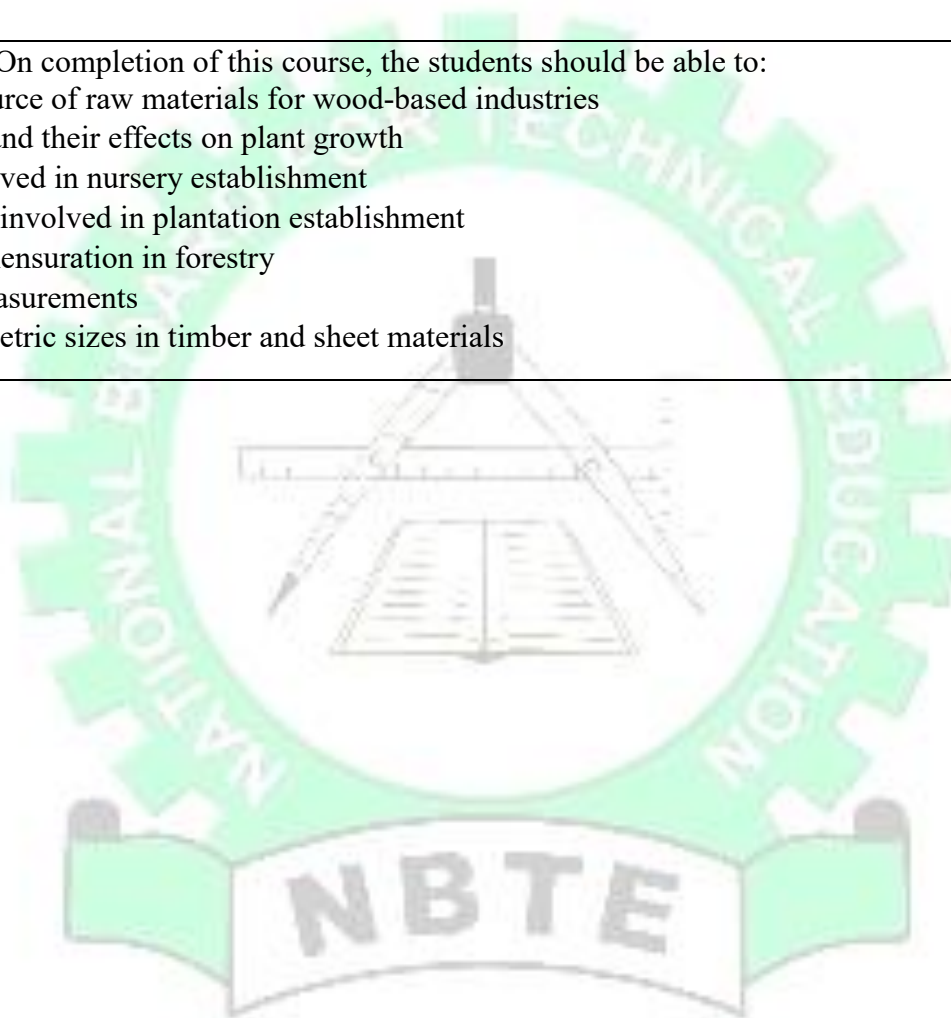
	3.2 Explain the use of moisture meters. 3.3 Describe oven-dry moisture testing method. 3.4 Describe how to monitor kiln temperature and humidity. 3.5 Explain how to interpret drying schedules.	methods. • Discuss the use of moisture meters. • Explain oven-dry moisture testing method. • Explain how to monitor kiln temperature and humidity. • Explain how to interpret drying schedules.	timber samples, paper samples.	moisture content using oven-dry method. • Record drying data accurately. • Monitor kiln temperature and humidity. • Operate drying equipment safely. • Maintain simple drying equipment.	• Determine wood moisture content using oven-dry method. • Record drying data accurately. • Monitor kiln temperature and humidity. • Operate drying equipment safely. • Maintain simple drying equipment.	ovens. Kiln monitoring devices. Data sheets Timber specimens.
GENERAL OBJECTIVE 4.0: Know Drying Defects and Appropriate Quality Control Measures.						
11 – 12	4.1 Explain common drying defects. 4.2 Describe causes of wood defects. 4.3 Describe methods of preventing defects. 4.4 Describe timber grading standards. 4.5 Explain timber quality inspection.	• Discuss common drying defects • Discuss causes of drying defects. • Explain methods of preventing defects • Discuss timber grading procedures. • Discuss how to carry out timber quality inspection exercises.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify common drying defects in timber. • Examine causes of wood drying defects. • Grade timber according to quality standards. • Inspect timber for quality assurance purposes. • Prepare simple quality inspection reports. • Apply corrective measures to minimize drying defects.	Guide students to: • Identify common drying defects in timber. • Examine causes of wood drying defects. • Grade timber according to quality standards. • Inspect timber for quality assurance purposes. • Prepare simple quality inspection reports. • Apply corrective measures to minimize drying defects.	Defective timber specimens Measuring tapes. Calipers Grading manuals Inspection sheets. Measuring devices.

GENERAL OBJECTIVE 5.0: Know safety measures in wood seasoning and quality control operations.						
13 – 15	5.1.Explain safe workshop practices. 5.2.Explain how to maintain drying equipment. 5.3.Describe how to use protective equipment. 5.4.Explain team work during drying operations. 5.5.Describe the application of safety regulations in timber processing environments.	• Discuss safe workshop practices. • Describe the maintenance of drying equipment. • Describe the use of protective equipment • Discuss team work during drying operations. • Describe the application of safety regulations in timber processing environments.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Use personal protective equipment correctly. • Maintain drying equipment properly. • Apply safety regulations during drying operations. • Handle timber and equipment responsibly. • Demonstrate cleanliness and orderliness in the workshop. • Evaluate students' compliance with safety regulations.	Guide students to: • Use personal protective equipment correctly. • Maintain drying equipment properly. • Apply safety regulations during drying operations. • Handle timber and equipment responsibly. • Demonstrate cleanliness and orderliness in the workshop. • Evaluate students' compliance with safety regulations.	PPEs Fire extinguishers Maintenance kits First aid materials. Other workshop facilities First aid box.
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

FOREST SILVICULTURE AND MENSURATION

PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: FOREST SILVICULTURE	COURSE CODE: WPT 214	CONTACT HOURS: 3 HOURS/WEEK

AND MENSURATION	CREDIT UNIT: 3	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip the students with the knowledge and skills in introductory nursery technology and tree measurement.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the forest as the source of raw materials for wood-based industries 2.0 Know soil characteristics and their effects on plant growth 3.0 Know the techniques involved in nursery establishment 4.0 Understand the operations involved in plantation establishment 5.0 Know the importance of mensuration in forestry 6.0 Know how to take tree measurements 7.0 Understand the standard metric sizes in timber and sheet materials		



PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: FOERST SILICULTURE AND MENSURATION			COURSE CODE: WPT 214		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 designed to equip the students with the knowledge and skills in introductory nursery technology and tree measurement.						
GENERAL OBJECTIVE 1.0: know the forest as the source of raw materials for wood-based industries.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 2	1.1 Define silviculture. 1.2 Describe the major types of forests in Nigeria. 1.3 Define Pure and Mixed Stands. 1.4 Distinguish between Pure and Mixed Stands. 1.5 Explain the merits and demerits of Pure and Mixed Stands. 1.6 Explain factors affecting tree growth e.g., light, air, water, temperature soil etc. 1.7 Describe the pattern of tree growth (diameter, height, volume).	• Explain the term. silviculture. • Explain the major types of forests in Nigeria. • Explain Pure and Mixed Stands. • Differentiate between Pure and Mixed Stands. • State the merits and demerits of Pure and Mixed Stands. • State factors affecting tree growth e.g., light, air, water, temperature soil etc. • Explain factors affecting tree	Charts, posters, photographs, multimedia, timber samples, paper samples.			

		growth e.g., light, air, water, temperature soil etc. • Explain the pattern of tree growth (diameter, height, volume).				
General Objective 2.0: know soil characteristics and their effects on plant growth.						
3-4	2.1 Explain the terms soil, soil content, water table and soil profile. 2.2 Describe the process of soil formation. 2.3 Explain the terms soil texture, soil structure and soil moisture. 2.4 Explain the effects of soil texture, soil structure and soil moisture on tree growth. 2.5 Distinguish between the various soil types – sandy, loam and clay. 2.6 Explain the characteristics of the soil types in 2.5 above 2.7 Explain the effects of soil characteristics on tree growth.	• Define the terms soil, soil content, water table and soil profile. • Explain the process of soil formation. • Define the terms soil texture, soil structure and soil moisture. • Outline the effects of soil texture, soil structure and soil moisture on tree growth. • State the difference between the various soil types – sandy, loam and clay. • State the characteristics of the soil types above • Discuss the effects of soil characteristics on tree growth.	Charts, posters, photographs, multimedia, timber samples, paper samples.			

General Objective 3.0: Know the techniques involved in nursery establishment.						
5-7	3.1 Explain the importance of seed in plantation establishment. 3.2 Explain sources of seeds, methods of collection and handling as well as their effects on seedling performance. 3.3 Describe the types of forest nurseries. 3.4 State the factors considered in selecting sites for nursery establishment 3.5 Describe the various operations involved in nursery establishment –site preparation, bed making, sowing etc. 3.6 Explain the various kinds of forest nursery stocks.	• State the importance of seed in plantation establishment. • Explain sources of seeds, methods of collection and handling and their effects on seedling performance. • Explain the types of forest nurseries. • State the factors considered in selecting sites for nursery establishment. • Explain the various operations involved in nursery establishment e.g., site preparation, bed making, sowing etc. • Explain the various kinds of forest nursery stocks.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Establish forest nursery.	• Guide the establishment process of nursery.	Hand trowel, Wheel barrow, Manure, Polythene Pots.
General Objective 4.0: Understand the operations involved in plantation establishment.						
8	4.1 Describe the stages of site preparation. 4.2 Describe the methods of site preparation. 4.3 Describe the timing of operations	• Explain the stages of site preparation. • Explain the methods of site preparation. • Explain the timing of operations	Charts, posters, photographs, multimedia, timber samples,	• Perform an experiment to break seed dormancy using chemicals, scarification, hot	• Guide the student to perform an experiment to break seed dormancy	Seed, Chemicals, Water.

	4.4 Describe the importance of timing. 4.5 Describe the general layout of a plantation. 4.6 Explain breaking of seed dormancy. 4.7 Describe the various methods of planting. 4.8 Describe the following types of planting techniques: - Replacement planting - Tungya planting - Enrichment planting etc. 4.9 Explain the requirements for adopting any of the techniques described in 4.5 above. 4.10 Explain the term “tending” 4.11 Describe the different tending operations such as weeding, deaming, pruning, thinning, 4.12 Explain the role of tending methods on timber growth.	• Explain the importance of timing. • Explain the general layout of a plantation. • Describe breaking of seed dormancy. • Explain the various methods of planting. • Explain the following types of planting techniques - replacement planting - tungya planting - enrichment planting. • State the requirements for adopting any of the techniques describe above. • Describe the term tending. • Explain the different tending operations weeding deaming pruning, thinning, protection in plantation. • State the role of the tending method on timber growth.	paper samples.	water treatment etc.	using chemicals, scarification, hot water treatment etc.	
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General Objective 5.0: know the importance of mensuration in forestry.						
9 – 10	5.1. Define Mensuration. 5.2. Explain the purpose of mensuration. 5.3. Explain the terms: variables, estimates, and error in mensuration. 5.4. Explain the sources of errors in mensuration. 5.5. Distinguish between discrete and continuous variable in mensuration. 5.6. Explain the rules for minimizing bias in mensuration.	• Explain the term Mensuration. • State the purpose of mensuration. • Explain the terms variables, estimates, and error in mensuration. • Describe the sources of error in mensuration. • State the Difference between discrete and continuous variable in mensuration. • Describe the rules for minimizing bias in rounding off in mensuration.	Charts, posters, photographs, multimedia, timber samples, paper samples.			
General Objective 6.0: know how to take tree in measurements.						
11 – 12	6.1 Describe the general guide to breast height measurements (diameter and girth). 6.2 Describe the appropriate instruments for breast height measurements such as tapes, steel or linen (diameter/ girth tapes), calipers etc. 6.3 Describe the direct measurements of	• Outline the general guide to breast height measurements (diameter and girth) in Nigeria. • Explain the appropriate instruments for breast height measurements – tapes, steel or linen (diameter/ girth tapes), calipers.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Take direct measurements of girths and diameter of trees. • Calibrate a Christen's hypsometer for use. • Determine tree heights using appropriate instruments.	• Take direct measurements of girths and diameter of trees. • Calibrate a Christen's hypsometer for use. • Determine tree heights using	Tapes, Steel or linen (diameter/ Girth tapes), calipers. Rulers, tapes, Hypsometer, Altimeters Processing kit (knives, Scalders,

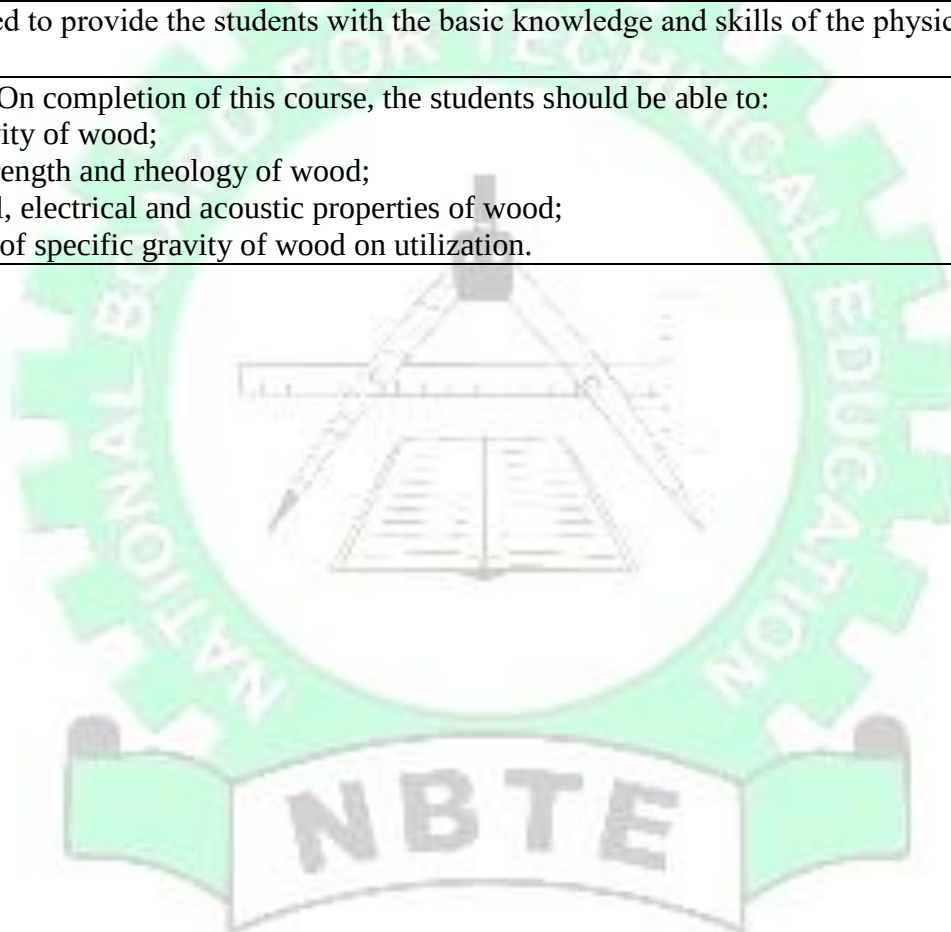
	girths and diameter of trees. 6.4 Explain the conversion of girths to diameter using appropriate formulae from imperial to metric and vice –versa e.g. II-girth $II^{iid}=3.4^{11}$. 6.5 girth where $d=$ diameter in the case of diameter tapes. For girthing tapes $I^{ii}d = 4^{11}$ girth. 6.6 Explain the basic principles of tree height measurements-trigonometric and geometric. 6.7 Describe the instrument for measuring tree heights e.g. rulers, tapes, hypsometer, altimeters. 6.8 Explain the preparation and calibration of a Christen's hypsometer for use. 6.9 Describe the accurate measurement of lengths of fell trees using relevant instruments.	• Explain the direct measurements of girths and diameter of trees. • Explain the conversion of girths to diameter using appropriate formulae from imperial to metric and vice –versa e.g. II-girth $II^{iid}=3.4^{11}$. • girth where $d=$ diameter in the case of diameter tapes. For girthing tapes $I^{ii}d = 4^{11}$ girth. • Explain the basic principles of tree height measurements-trigonometric and geometric. • Explain the instrument for measuring tree heights e.g. rulers, tapes, hypsometer, altimeters. • Describe the preparation and calibration of a Christen's hypsometer for use. • Explain the accurate		• Measure lengths of fell trees accurately using relevant instrument. • Determine area of a tree or stand given the girth(s) or diameter (s) using relevant formulae. • Determine cross sectional area of logs or belts whether circular or elliptical. • Determine tree volumes and log volumes by first determining the cross-sectional area and then multiply by length or height as the case may be. • Determine volume of a stand of tree and volume of a number of logs or belts. • Determine volume of pieces of timber when the dimensions are given.	appropriate instruments. • Measure lengths of fell trees accurately using relevant instrument. • Determine area of a tree or of a stand given the girth(s) or diameter (s) using relevant formulae. • Determine cross sectional area of logs or belts whether circular or elliptical. • Determine tree volumes and log volumes by first determining the cross-sectional area and then multiply by length or height as the	plucker), Egg candler, Weighing scales.
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	6.10 Describe the determination of area of a tree or of a stand given the girth(s) or diameter (s) using relevant formulae. $X = \frac{\pi d^2}{4}$ if cross section is circular to. X Convert to sq ft. section is circular to. $X = \frac{\pi}{4 (144)} = 0.005454 \text{ dbh}^2$ L = The metric system. X in m² = g = 0.0000784d² ? 6.11 Describe the determination of cross-sectional area of logs or belts whether circular or elliptical. 6.12 Describe the determination of tree volumes and log volumes by first determining the cross-sectional area and then multiply by length or height as the case may be. 6.13 Describe the determination of volume of a stand of	measurement of lengths of felled trees using relevant instrument. • Explain the determination of area of a tree or of a stand given the girth(s) or diameter (s) using relevant formulae. • $X = \frac{\pi d^2}{4}$ if cross section is circular to. • X Convert to sq ft. section is circular to. • $X = \frac{\pi}{4 (144)} = 0.005454 \text{ dbh}^2$ • L = The metric system. • X in m² = g = 0.0000784d² ? • Explain the determination of cross sectional area of logs or belts whether circular or elliptical. • Explain the determination of tree volumes and log volumes by first determining the cross-sectional area and then multiply by length or height as the			case may be. • Determine volume of a stand of tree and volume of a number of logs or belts. • Determine volume of pieces of timber when the dimensions are given.	
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	trees and volume of a number of logs or belts. 6.14 Describe the determination of volume of pieces of timber when the dimensions are given.	case may be. • Explain the determination of volume of a stand of trees and volume of a number of logs or belts. • Explain the determination of volume of pieces of timber when the dimensions are given.				
General Objective 7.0: Understand the standard metric sizes in timber and sheet materials.						
13 - 15	7.1 Explain how to distinguish between actual and nominal dimensions e.g., of sawn wood. 7.2 Explain the standard metric sizes of timber and sheet materials. 7.3 Describe the units by which timber and sheet materials are sold. 7.4 Explain the basis and techniques of tallying and specifications.	• Differentiate between actual and nominal dimensions e.g., of sawn wood. • Explain the standard metric sizes of timber and sheet materials. • Explain the units by which timber and sheet materials are sold. • Explain the basis and techniques of tallying and specifications • Compare with situation in Nigeria.	Charts, posters, photographs, multimedia, timber samples, paper samples.			
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

BASIC WOOD PHYSICS

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: BASIC WOOD PHYSICS	COURSE CODE: WPT 215	CONTACT HOURS: 2 HOURS/WEEK
	CREDIT UNIT: 2	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 1 HOUR/WEEK
GOAL: This course is designed to provide the students with the basic knowledge and skills of the physical properties of wood species in relation to utilization.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the specific gravity of wood; 2.0 Know the elasticity, strength and rheology of wood; 3.0 Understand the thermal, electrical and acoustic properties of wood; 4.0 Understand the effects of specific gravity of wood on utilization.		



PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: BASIC WOOD PHYSICS			COURSE CODE: WPT 215		CONTACT HOURS: 1 HOURS/WEEK	
			CREDIT UNIT:3		THEORETICAL: 1HOUR/WEEK	
YEAR: II SEMESTER: I			PRE-REQUISITE:		PRACTICAL: 1 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide students with the basic knowledge and skills of the physical properties of wood species in relation to utilization.						
GENERAL OBJECTIVE 1.0: Know the specific gravity of 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 nominal and “oven dry” specific gravity of wood. 1.2 Explain the relationships between nominal and oven dry specific gravity of wood. 1.3 Explain the difference between wood density and specific gravity.	• Explain nominal and “oven dry” specific gravity of wood. • State the relationships between nominal and oven dry specific gravity of wood. • State the difference between wood density and specific gravity.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Determine wood density. • Identify common methods of determining density, basic density and specific gravity. • Determine nominal and oven dry specific gravity of wood.	Guide students to: • Determine wood density. • Identify common methods of determining density, basic density and specific gravity. • Determine nominal and oven dry specific gravity of wood.	Wood samples Analytical balance. Oven Measuring beaker. String Wax Water
General Objective 2.0: Know the elasticity, strength and rheology of wood.						
4 – 7	2.1 Explain various strength properties of wood and relate these to grain direction. 2.2 Define the elastic	• Explain various strength properties of wood and relate these to grain direction. • State the elastic	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Determine the strength and elastic properties of wood	Guide student to determine the strength and elastic properties of wood.	Wood samples, Universal testing machine.

	constants of wood. 2.3 Explain how to determine the strength and elastic properties of wood. 2.4 Explain the concepts of creep and relaxation in wood.	constants of wood. - Explain how to determine the strength and elastic properties of wood. - Discuss the concepts of creep and relaxation in wood.				
General Objective 3.0: Understand thermal, electrical and acoustic properties of wood.						
8 – 11	3.1 Explain thermal properties of wood. 3.2 Explain specific heat capacity of wood. 3.3 Explain electrical properties of wood. 3.4 Explain acoustic properties of wood. 3.5 Explain how to relate the properties to applications.	- Discuss thermal properties of wood. - Discuss specific heat capacity of wood. - State the electrical properties of wood. - State the acoustic properties of wood. - State the relationship between the properties and the applications	Charts, posters, photographs, multimedia, timber samples, paper samples.		.	
General Objective 4.0: Understand the effects of specific gravity of wood on utilization.						
12 – 15	4.1 Explain the effects of specific gravity on the strength and elasticity of wood. 4.2 Explain the relationship of specific gravity of	- Describe the effects of specific gravity on the strength and elasticity of wood. - Discuss the relationship of	Charts, posters, photographs, multimedia, timber samples, paper samples.			

	wood to its anatomical features. 4.3 Explain the determination of the relationships between strength and elasticity of wood.	specific gravity of wood to its anatomical features. • Discuss the determination of the relationships between strength and elasticity of wood.				
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



FOREST ENGINEERING AND TIMBER HARVESTING

PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: FOREST ENGINEERING AND TIMBER HARVESTING	COURSE CODE: WPT 216	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 4	THEORETICAL: 1 HOUR/WEEK
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to provide students with the knowledge and skills to manage and harvest forest resources efficiently while ensuring environmental sustainability and safety.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know technical competence in the use of modern tools, machinery and methods for efficient timber harvesting; 2.0 Understand sustainable practices that balance economic productivity with environmental conservation; 3.0 Know the safety protocols in handling of equipment and operations in forest environment; 4.0 Understand resource management through planning, monitoring and optimizing forest utilization; 5.0 Know practical skills and knowledge relevant to forestry and timber enterprises.		



PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: FOREST ENGINEERING AND TIMBER HARVESTING				COURSE CODE: WPT 216		CONTACT HOURS: 3
				CREDIT UNIT: 3		HOURS/WEEK
YEAR: II SEMESTER: I				PRE-REQUISITE:		THEORETICAL: 1 HOUR/WEEK
PRACTICAL: 2 HOURS/WEEK						
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to provide students with the knowledge and skills to manage and harvest forest resources efficiently while ensuring environmental sustainability and safety.						
GENERAL OBJECTIVE 1.0: Know the technical competence in the use of modern tools, machinery and methods for efficient timber harvesting.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1-3	1.1 Explain modern tools and machinery used in timber harvesting. 1.2 Explain safety procedures in operating timber harvesting machinery. 1.3 Describe how to operate chainsaws and other cutting tools effectively. 1.4 Discuss the application of mechanized harvesting methods (feller, bunchers, harvesters etc.). 1.5 Explain maintenance and service machinery in timber	- Describe modern tools and machinery used in timber harvesting. - Discuss safety rules in operating timber. - Describe how to operate chainsaws and other cutting tools effectively. - Describe the application of mechanized harvesting methods (feller, bunchers, harvesters etc. - Describe maintenance and service machinery	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify modern tools and machinery used in timber harvesting. - Apply safety measures consistently during practice. - Operate chainsaws and other cutting tools effectively. - Maintain machinery in timber harvesting - Service machinery in	Guide students to: - Identify modern tools and machinery used in timber harvesting. - Apply safety measures consistently during practice. - Operate chainsaws and other cutting tools effectively. - Maintain machinery in timber harvesting - Service	Samples of tools, PPE, Chainsaw, fuel, Lubricants, Timber logs, Timber harvesting machine, Tool kits, Spare parts, Field data.

	harvesting. 1.6 Explain the efficiency of different timber harvesting methods.	in timber harvesting. • Explain the efficiency of different timber harvesting methods.		timber harvesting	machinery in timber harvesting	
General Objective 2.0: Understand the sustainable practices that balance economic productivity with environmental conservation.						
4-6	2.1 Explain Sustainable harvesting methods. 2.2 Explain reforestation and afforestation of soil and water conservation. 2.3 Describe contour planting, mulching and watershed protection 2.4 Explain waste reduction in timber processing. 2.5 Explain Community based forest management.	• Discuss Sustainable harvesting methods. • Describe reforestation and afforestation soil. • Explain contour planting, mulching and watershed protection. • Discuss waste reduction in timber processing. • Discuss Community based forest management	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Harvest timber while minimizing environmental damage. • Demonstrate competence in restoring forest cover after utilization. • Maintain soil fertility and protect water sources during harvesting operation. • Design agroforestry systems that enhance productivity and conservation. • Develop competence in reducing waste while	Guide students to: • Harvest timber while minimizing environmental damage. • Demonstrate competence in restoring forest cover after utilization. • Maintain soil fertility and protect water sources during harvesting operation. • Design agroforestry systems that enhance productivity and conservation. • Develop competence in reducing waste	Stakeholders meeting, Sawmill equipment, GIS maps. Demonstration maps, Farm tools, Seedlings, Logging tools.

				maximizing timber utilization. • Develop skill in communities for sustainable forest management.	while maximizing timber utilization. • Develop skill in communities for sustainable forest management.	
General Objective 3.0: Know the safety protocols in handling of equipment and operations in forest environment.						
7-9	3.1 Explain safe handling of equipment. 3.2 Describe personal protective equipment (PPE). 3.3 Explain First Aid and Emergency response. 3.4 Explain Fire safety precaution in forests. 3.5 Explain the concept of safe timber harvesting. 3.6 Explain ergonomics and manual handling of timber. 3.7 Explain hazard identification in timber harvesting. 3.8 Explain safe use of vehicles and machinery. 3.9 Explain	• Explain safe handling of equipment. • Explain personal protective equipment (PPE) • Explain First Aid and Emergency response • Explain fire prevention and firefighting techniques. • Discuss the concept of safe timber harvesting. • Explain ergonomics and manual handling of timber. • Explain hazard	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Operate forestry equipment safely and efficiently. • Achieve competence in wearing and maintaining PPEs during timber harvesting. • Conduct drills on handling injuries, snake bites, and accidents. • Control forest fires.	Guide students to: • Operate forestry equipment safely and efficiently. • Achieve competence in wearing and maintaining PPEs during timber harvesting. • Conduct drills on handling injuries, snake bites, and accidents. • Control forest fires.	Chainsaws, Axes, Fire extinguishers, Water pumps, Fire beaters, Logging tools, Ropes, Wedges, Field excursions, Forestry vehicles. PPEs etc.

	environmental safety and awareness principles.	identification in timber harvesting • Explain safe use of vehicles and machinery. • Explain environmental safety and awareness principles.				
General Objective 4.0: Understand resource management through planning, monitoring and optimising forest utilization.						
10-12	4.1 Explain forest resource management planning. 4.2 Explain forest growth monitoring. 4.3 Explain optimizing timber utilization. 4.4 Explain forest health monitoring. 4.5 Explain Economic analysis of forest use. 4.6 Explain Climate change mitigation. 4.7 Explain government policy regarding forest resource management.	• Discuss forest resource management planning. • Discuss forest growth monitoring • Discuss how to optimize timber utilization. • Discuss forest health monitoring. • Discuss Economic analysis of forest use. • Discuss Climate change mitigation. • Describe government policy regarding	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Design forest management plans that balance conservation and utilization. • Monitor forest growth • Predict yield, Competence in maximising timber yield and minimising wastage. • Evaluate economic viability of forest utilization by; - integratin	Guide students to: • Design forest management plans that balance conservation and utilization. • Monitor forest growth • Predict yield, Competence in maximising timber yield and minimising wastage. • Evaluate economic viability of forest utilization by; - integrating community input into	Inspection tools, Protective gear, calculators, policy document, Carbon models, Sawmill equipment, Processing manual. Etc.

		forest resource management.		g community input into forest resource planning. - integrating the knowledge forests climate change mitigation strategies	forest resource planning - integrating the knowledge forests climate change mitigation strategies.	
General Objective 5.0: Know practical skills and knowledge relevant to forestry and timber enterprises.						
13-15	5.1 Explain Forestry and timber enterprise. 5.2 Explain tree identification. 5.3 Explain timber harvesting technologies. 5.4 Explain forest inventory and mensuration. 5.5 Explain Forest mapping. 5.6 Explain wood utilization planning using remote sensing and GIS.	• Discuss Forestry and timber enterprise. • Describe tree identification. • Describe timber harvesting technologies. • Discuss forest inventory and mensuration. • Discuss Forest mapping. • Discuss wood utilization planning using	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Recognize tree species. • classify tree species. • Apply safe and efficient timber harvesting practices. • Conduct forest inventory • Estimate	Guide students to: • Recognize tree species. • classify tree species. • Apply safe and efficient timber harvesting practices. • Conduct forest inventory • Estimate timber volume. • Apply sustainable practices in	Sawmill equipment, Logging tools, Calipers, . PPEs, Terrain models, Transport maps. GIS software. Biodiversity datasets. Vegetation map,. GIS fire models.

	5.7 Explain degradation and deforestation monitoring using drone and satellite. 5.8 Explain road network optimization in the forest. 5.9 Explain GIS application in forest governance and certification. laws, regulations, and economic aspects of forestry.	remote sensing and GIS. • Describe degradation and deforestation monitoring using drone and satellite. • Discuss road network optimization in the forest. • Discuss GIS application in forest governance and certification. laws, regulations, and economic aspects of forestry.		timber volume. • Apply sustainable practices in processing timber for commercial use. • Produce accurate forest map. • Carry out excursions to identify tree species. • Show boundaries, road and features. • Report deforestation trends. • Design efficient and environmentally sound harvest plans.	processing timber for commercial use. • Produce accurate forest map. • Carry out excursions to identify tree species. • Show boundaries, road and features. • Report deforestation trends. • Design efficient and environmentally sound harvest plans.	
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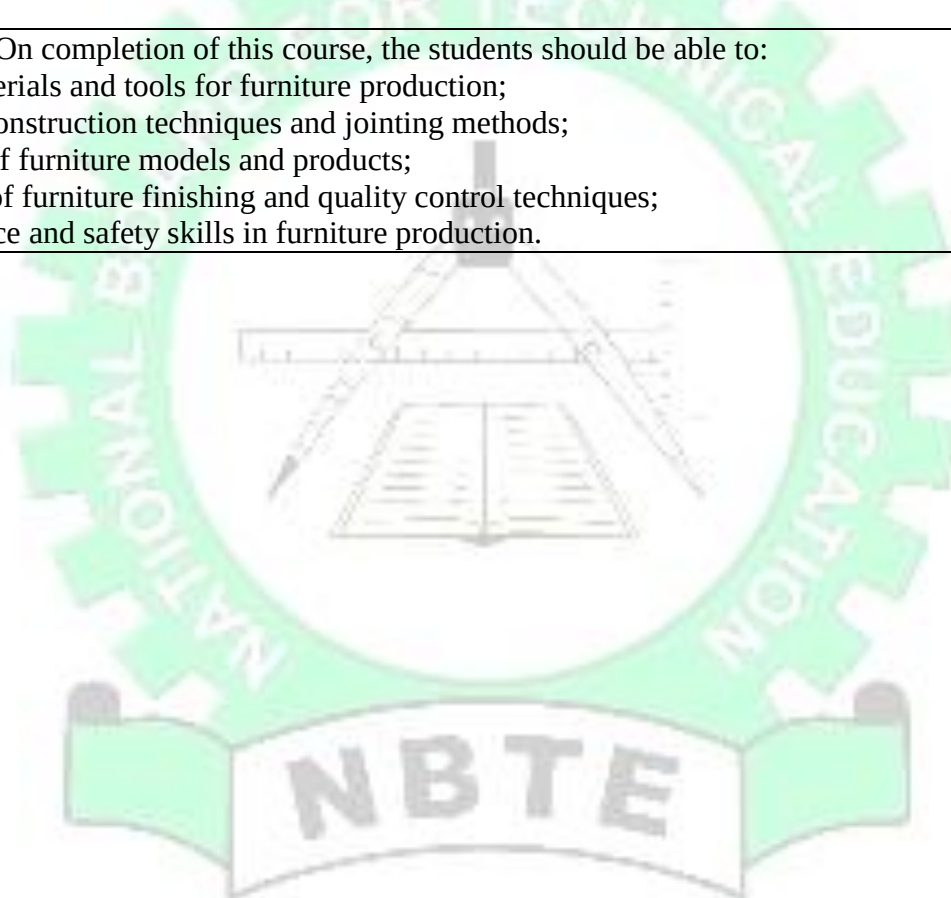
COURSE ASSESSMENT

Course Work:	10%
Tests:	10%
Practical	40%
Examination:	40%
Total:	100%



FURNITURE DESIGN II

PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: FURNITURE DESIGN II	COURSE CODE: WPT 217	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 students with knowledge and skills in furniture production, finishing, quality control, and entrepreneurship.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the suitable materials and tools for furniture production; 2.0 Understand furniture construction techniques and jointing methods; 3.0 Know the production of furniture models and products; 4.0 Know the application of furniture finishing and quality control techniques; 5.0 Understand maintenance and safety skills in furniture production.		



PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: FURNITURE DESIGN II			COURSE CODE: WPT 217		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 students with knowledge and skills in furniture production, finishing, quality control, and entrepreneurship						
GENERAL OBJECTIVE 1.0: Know the suitable materials and tools for furniture production.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1-2	1.1 Explain furniture materials and their properties. 1.2 Describe the appropriate wood species for furniture. 1.3 List hand and machine tools used in furniture making. 1.4 Explain the uses of furniture fittings and adhesives. 1.5 Enumerate the maintenance procedures of furniture tools.	- Explain materials used in furniture making. - Explain the appropriate wood species for furniture. - State hand and machine tools used in furniture making. - State uses of furniture fittings and adhesives. - Describe the maintenance procedures of furniture tools	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify furniture materials - Select appropriate wood species for furniture construction. - Identify hand and machine tools used in furniture making. - Operate furniture workshop tools correctly. - Maintain furniture tools and equipment. - Apply safety precautions during tool handling. - Select suitable adhesives and	Guide students to: - Identify furniture materials - Select appropriate wood species for furniture construction. - Identify hand and machine tools used in furniture making. - Operate furniture workshop tools correctly. - Maintain furniture tools and equipment. - Apply safety precautions during tool handling. - Select suitable adhesives and fittings for	Hand tools Machine tools Pieces of timber Lubricants Safety equipment and materials.

				fittings for furniture production. • Arrange workshop tools and materials appropriately.	furniture production. • Arrange workshop tools and materials appropriately.	
General Objective: 2.0 Understand furniture construction techniques and jointing methods.						
3-6	2.1 Describe types of wood joints. 2.2 Explain the methods of wood joints. 2.3 Describe the assembling of wood components. 2.4 Describe furniture construction techniques. 2.5 Describe the application of modern furniture production methods.	• Explain wood joint production. • Explain furniture assembly techniques. • Explain the assembling of wood components. • Explain furniture construction techniques • Explain how to apply modern furniture production methods.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Produce common furniture joints accurately • Assemble furniture components • Apply appropriate construction techniques in furniture making • Use clamps, adhesives, and fasteners properly. • Interpret construction drawings during production. • Construct simple furniture frames and structures. • Demonstrate accuracy and precision in furniture assembly.	Guide students to: • Produce common furniture joints accurately • Assemble furniture components • Apply appropriate construction techniques in furniture making • Use clamps, adhesives, and fasteners properly. • Interpret construction drawings during production. • Construct simple furniture	Chisels and saws, . Clamps, Wood glue, Measuring tools, Workshop benches.

					frames and structures. • Demonstrate accuracy and precision in furniture assembly.	
General Objective 3.0: Know the production of furniture models and products.						
7-10	3.1 Describe furniture prototypes. 3.2 Describe the process of combining aesthetics with functionality in furniture model. 3.3 Describe evaluation process of completed furniture items. 3.4 Describe how to improve furniture designs based on feedback.	• Explain furniture model prototypes • Explain the process of combining aesthetics with functionality in furniture model • Explain evaluation process of completed furniture items. • Explain how to improve furniture designs based on feedback.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Construct simple household furniture items. • Produce furniture prototypes and models. • Combine aesthetics and functionality in furniture products. • Evaluate completed furniture items. • Revise a furniture designs using feedback obtained from users. • Modify furniture designs based on practical observations. • Demonstrate proper machine handling during furniture production.	Guide students to: • Construct simple household furniture items. • Produce furniture prototypes and models. • Combine aesthetics and functionality in furniture products. • Evaluate completed furniture items. • Revise a furniture designs using feedback obtained from users. • Modify furniture designs based	Woodworking machines Timber boards Fasteners Work tables PPE materials.

					on practical observations. • Demonstrate proper machine handling during furniture production.	
General Objective 4.0: Know the application of furniture finishing and quality control techniques.						
11-12	4.1 Describe furniture finishing materials. 4.2 Describe surface preparation techniques. 4.3 Explain furniture finishing operations. 4.4 Explain how to correct minor finishing defects	• Describe furniture finishing methods. • Explain surface preparation techniques. • Describe furniture finishing methods • Describe furniture defect correction techniques.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Prepare furniture surfaces for finishing • Apply paints, varnishes, and polishes correctly • Inspect furniture quality • Operate finishing equipment safely • Correct defects in furniture finishing • Inspect finished furniture products for quality assurance • Maintain cleanliness during finishing operations.	Guide students to: • Prepare furniture surfaces for finishing • Apply paints, varnishes, and polishes correctly • Inspect furniture quality • Operate finishing equipment safely • Detect and correct defects in furniture finishing • Inspect finished furniture products for quality assurance • Maintain cleanliness	Brushes and spray guns, Finishing chemicals, Sanding machines, cleaning materials, Protective clothing, Sandpaper, Paints and varnishes, Spray equipment

					during finishing operations.	
General Objective 5.0: Understand maintenance and safety skills in furniture production.						
13-15	5.1.Explain basic workshop safety practices. 5.2.Explain furniture equipment maintenance. 5.3.Explain the concept of team work in furniture production.	- Describe workshop safety procedures. - Describe the maintenance of furniture equipment. - Explain the concept of team work in furniture production.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Demonstrate the importance of consistent safe workshop practices. - Maintain furniture machines and equipment properly. - Demonstrate the correct use of PPE. - Demonstrate the importance of team work during production activities. - Demonstrate leadership and responsibility in workshop operations.	Guide students to: - Demonstrate the importance of consistent safe workshop practices. - Maintain furniture machines and equipment properly. - Demonstrate the correct use of PPE. - Demonstrate the importance of team work during production activities. - Demonstrate leadership and responsibility in workshop operations.	Calculators, Safety boots and gloves, Maintenance kits, First aid box, Workshop manuals. Workshop facilities.
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						



WOOD PRODUCTS MARKETING AND ENTERPRISE DEVELOPMENT

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: WOOD PRODUCTS MARKETING AND ENTERPRISE DEVELOPMENT	COURSE CODE: WPT 221	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 students with the knowledge and skills in marketing, enterprise development and value addition in wood and paper products.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the basic enterprise and product marketing practices in wood and paper industry 2.0 Understand costing, pricing and record keeping techniques for wood and paper products 3.0 Know product development, packaging and promotion techniques 4.0 Know customer relations, sales and market survey practices 5.0 Understand business planning and enterprise management practices.		

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: WOOD PRODUCTS MARKETING AND ENTERPRISE DEVELOPMENT			COURSE CODE: WPT 221		CONTACT HOURS: 2 HOURS/WEEK	
			CREDIT UNIT: 2		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 1 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is design to provide students with the knowledge and skills in marketing, enterprise development and value addition in wood and paper products						
GENERAL OBJECTIVE 1.0: Understand wood enterprise and product marketing in wood and paper industry.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1-3	1.1 Describe wood enterprise. 1.2 Explain the enterprise opportunities across wood value chain. 1.3 Explain product lines (timber, plywood, paper, packaging). 1.4 Explain product marketing principles. 1.5 Explain market research techniques. 1.6 Describe value addition in wood and paper industry. 1.7 Explain branding strategies. 1.8 Explain pricing methods. 1.9 Explain the use of possible distribution channels.	• Explain wood enterprise. • Describe enterprise opportunities. • Explain products lines (timber, plywood, paper, packaging). • Discuss product marketing principles • Describe market research techniques • Explain value addition in wood and paper industry. • Discuss branding strategies.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify marketable wood and paper products.	• Guide the students in identifying wood enterprises.	Wood products, paper products, market survey sheet, social media, sample advert, design tools recycled paper products.

	1.10 Explain products promotion through marketing practices. 1.11 Explain the characteristics of marketable products. 1.12 Explain the importance of packaging, quality assurance and logos. 1.13 Explain wholesalers, retailers, online platforms, export routes. 1.14 Explain workplace ethics in enterprise.	• Describe pricing methods. • Explain the use of possible distribution channels. • Discuss products promotion through marketing practices. • Describe the characteristics of marketable products. • Describe importance of packaging, quality assurance and logos. • Describe wholesalers, retailers, online platforms, export routes. • Discuss workplace ethics in enterprise.				
General Objective 2.0: Understand costing, pricing and record keeping techniques for wood and paper products.						
4– 7	2.1 Explain costing techniques for wood and paper product. 2.2 Explain pricing strategies. 2.3 Explain the importance	• Describe costing techniques for wood and paper product. • Discuss pricing	Charts, posters, photographs, multimedia, timber samples,	• Maintain records of sales, purchases and production. • Input and manage records digitally.	Guide students to: • Maintain records of sales, purchases and	Calculator costing sheet, sales record book.

	of record keeping e.g., sales purchases and production. 2.4 Describe plain expenditure and sales records. 2.5 Explain the use of digital tools for financial management. 2.6 Explain the analysis of financial performance. Explain how to prepare financial reports for decision-making. 2.7 Explain the application of inventory management techniques. 2.8 Explain simple profit and loss estimation. 2.9 Explain the importance of business records.	strategies. • Discuss the importance of record keeping e.g., sales purchases and production. • Explain plain expenditure and sales records. • Describe the use of digital tools for financial management. • Discuss the analysis of financial performance. Explain how to prepare financial reports for decision-making. • Describe the application of inventory management techniques. • Discuss simple profit and loss estimation. • Discuss the importance of business records.	paper samples.	• Estimate simple profit/loss margin. • Prepare simple sales record sheet. • Interpret financial data and assess profitability. • Prepare financial reports for decision-making. • Apply inventory management techniques.	production. • Input and manage records digitally. • Estimate simple profit/loss margin. • Prepare simple sales record sheet. • Interpret financial data and assess profitability. • Prepare financial reports for decision-making. • Apply inventory management techniques.	
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General Objective 3.0: Know product development, packaging and promotion techniques.						
8 – 10	3.1 Explain product development methods 3.2 Describe packaging of wood and paper products 3.3 Explain branding and labelling practices 3.4 Describe promotion of products 3.5 Explain the importance of product presentation.	• Explain product development methods. • Describe packaging and branding of wood and paper products. • Discuss branding and labelling practices • Discuss product promotion. • State the importance of product promotion.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Package simple wood or paper product • Prepare simple product label. • Arrange products for exhibition or display. • Carry out promotional presentation.	• Package simple wood or paper product • Prepare simple product label. • Arrange products for exhibition or display. • Carry out promotional presentation.	Packaging materials, labels, sample products.
General Objective 4.0: Know customer relations, sales and market survey practices.						
11– 12	4.1 Explain customer relations. 4.2 Describe product sales techniques 4.3 Explain market survey methods 4.4 Explain communication in business 4.5 Describe importance of customer satisfaction.	• Discuss customer service relation • Describe product sales techniques. • Discuss market survey methods. • Describe communication in business. • State importance of customer satisfaction.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Conduct simple market survey on wood products • Carry out customer interaction during product sale • Record customer preferences • Present simple product information to customer • Prepare simple market survey	Guide students to: • Conduct simple market survey on wood products • Carry out customer interaction during product sale • Record customer preferences • Present simple product	Survey sheet, Notebook, Sample products

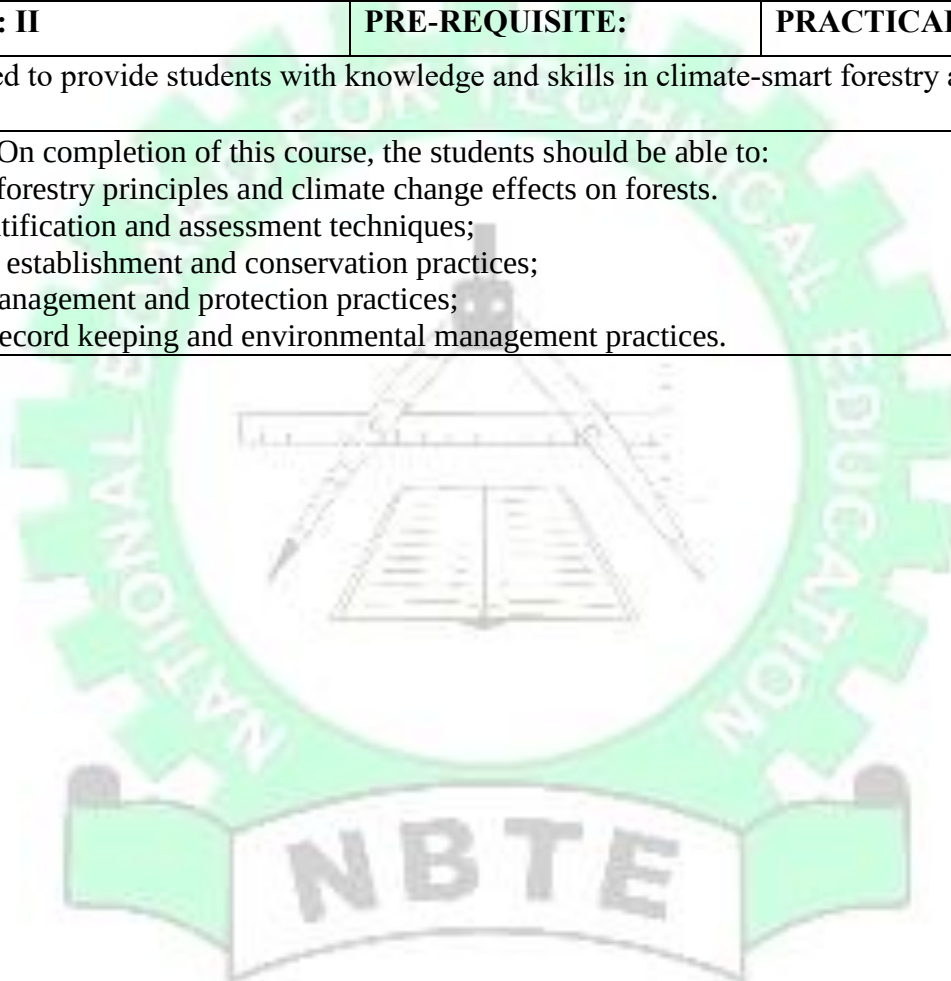
				report.	information to customer • Prepare simple market survey report.	
General Objective 5.0: Understand business planning and enterprise management practices.						
13 – 15	5.1.Explain business planning. 5.2.Explain the preparation of business plan. 5.3.Explain the development of business ideas. 5.4.Explain enterprise management principles. 5.5.Explain enterprise structures. 5.6.Explain resource management in enterprise 5.7.Explain work place discipline in business 5.8.Describe sustainability in an enterprise. 5.9.Explain evaluation of enterprise performance.	• Discuss business planning. • Describe the preparation of business plan. • Discuss the development of business ideas. • Discuss enterprise management principles. • Discuss enterprise structures. ○ Describe resource management in enterprise ○ Discuss work place discipline in business ○ Discuss sustainability in an enterprise. ○ Describe evaluation of enterprise performance.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Prepare simple business idea for wood or paper enterprise. • Prepare simple business plan • Organize simple business records. • Demonstrate teamwork in enterprise activity • Prepare enterprise checklist. • Create marketing plans and promotional campaigns. • Assess enterprise success and recommend improvements.	Guides students to: • Prepare simple business idea for wood or paper enterprise. • Prepare simple business plan • Organize simple business records. • Demonstrate teamwork in enterprise activity • Prepare enterprise checklist. • Create marketing plans and promotional campaigns. Assess enterprise success and recommend improvements.	Business template, notebook, checklist sheets, Evaluation tools, Survey forms, Spreadsheets, Calculator Accounting books. Computer systems.

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



CLIMATE-SMART FORESTRY AND FOREST RESOURCE MANAGEMENT

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: CLIMATE-SMART FORESTRY AND FOREST RESOURCE MANAGEMENT	COURSE CODE: WPT 222	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 provide students with knowledge and skills in climate-smart forestry and forest resources management.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand climate-smart forestry principles and climate change effects on forests. 2.0 Know Forest resource identification and assessment techniques; 3.0 Know climate-smart forest establishment and conservation practices; 4.0 Know sustainable forest management and protection practices; 5.0 Know Forest monitoring, record keeping and environmental management practices.		



PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: CLIMATE-SMART FORESTRY AND FOREST RESOURCE MANAGEMENT			COURSE CODE: WPT 222		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 provide students with knowledge and skills in climate-smart forestry and forest resource management.						
GENERAL OBJECTIVE 1.0: Understand climate-smart forestry principles and climate change effects on forests.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 3	1.1 Explain climate-smart forestry. 1.2 Explain effect of climate change on forest resources. 1.3 Describe mitigation practices. 1.4 Explain forest resilience and adaptation. 1.5 Describe the importance of climate-smart practices in forestry.	• Discuss climate-smart forestry concepts • Discuss effects of climate change on forests • Discuss mitigation practices. • Explain forest resilience and adaptation. • State importance of climate-smart practices in forestry.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify visible environmental indicators affecting forests. • Observe degraded and healthy forest conditions. • Compare effects of erosion and deforestation on forest land. • Prepare simple observation notes on environmental conditions.	Guide students to: • Identify visible environmental indicators affecting forests. • Observe degraded and healthy forest conditions. • Compare effects of erosion and deforestation on forest land. • Prepare simple observation notes on environmental conditions.	Forest maps, Field notebook, charts
General Objective 2.0: Know Forest resource identification and assessment techniques.						

4– 6	2.1 Describe methods of Forest resource assessment 2.2 Describe the importance of forest resource inventory 2.3 Describe forest identification resources 2.4 Explain importance of sustainable forest assessment.	• Explain methods of forest assessment methods • Explain tree measurement procedures. • Explain forest identification resources • Explain the importance of sustainable forest assessment.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify timber and non-timber forest resources • Measure tree diameter using diameter tape • Estimate tree height using simple method • Record forest resources observed in the field. • Prepare simple forest inventory record.	Guide students to: • Identify timber and non-timber forest resources • Measure tree diameter using diameter tape • Estimate tree height using simple method • Record forest resources observed in the field. • Prepare simple forest inventory record.	Diameter tape, measuring tape, field notebook.
General Objective 3.0: Know climate-smart forest establishment and conservation practices.						
7– 9	3.1 Explain climate-smart plantation practices 3.2 Explain afforestation and reforestation techniques 3.3 Describe soil and water conservation in forestry 3.4 Explain nursery management for climate adaptation 3.5 Describe conservation	• Describe climate-smart plantation practices • Discuss afforestation and reforestation techniques • Discuss soil and water conservation in forestry • Describe nursery management for climate adaptation • Explain conservation	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Plant tree seedlings in designated area • Carry out mulching around planted trees • Apply simple erosion control measures • Water seedlings appropriately • Participate in afforestation exercise • Demonstrate forest sanitation practices.	Guide students to: • Plant tree seedlings in designated area • Carry out mulching around planted trees • Apply simple erosion control measures • Water seedlings appropriately • Participate in	Seedlings, hoe, watering can, mulching materials.

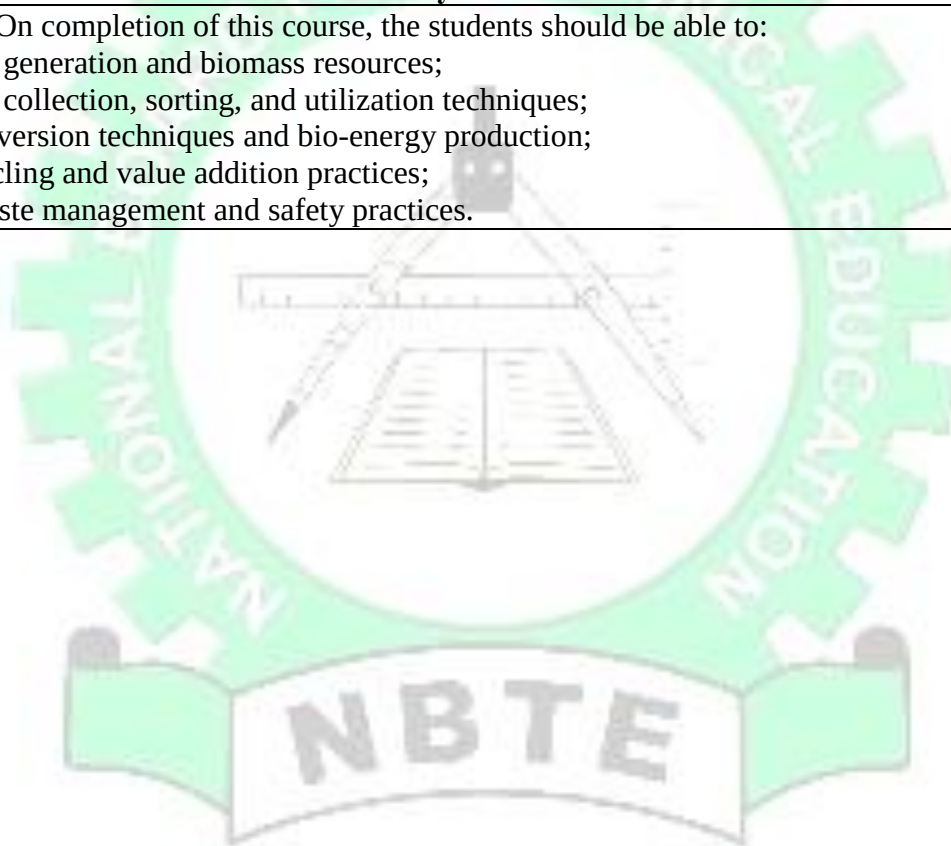
	practices for forest protection.	practices for forest protection.			afforestation exercise • Demonstrate forest sanitation practices.	
General Objective 4.0: Know sustainable forest management and protection practices.						
10 – 12	4.1 Describe the principles of sustainable forest management. 4.2 Explain factors that are detrimental to forest health 4.3 Explain Forest fire prevention practices 4.4 Explain pest and disease management in forests 4.5 Explain environmental conservation practices.	• Explain the principles of sustainable forest management • State factors that are detrimental to forest health • Explain fire prevention methods. • Explain pest and disease management in forests • Explain environmental conservation practices	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify signs of forest degradation • Carry out simple fire control burning • Remove weeds around plantation area • Identify diseased or damaged trees • Participate in forest sanitation exercise.	Guide students to: • Identify signs of forest degradation • Carry out simple fire control burning • Remove weeds around plantation area • Identify diseased or damaged trees • Participate in forest sanitation exercise.	Fire beater, field tools, plantation site.
General Objective 5.0: Know Forest monitoring, record keeping and environmental management practices.						
13 – 15	5.1 Explain Forest monitoring procedures 5.2 Explain forest records and its importance 5.3 Explain environmental reporting methods 5.4 Explain sustainable forest management practices	• Discuss Forest monitoring procedures • Describe forest records and its importance • Discuss environmental reporting methods	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Prepare simple forest monitoring record • Carry out survival count in plantation area • Record environmental observations	Guide students to: • Prepare simple forest monitoring record • Carry out survival count in plantation area	Monitoring sheet, field notebook, plantation site Drone.

	5.5 Explain environmental stewardship in forestry.	• Explain sustainable forest management practices • Discuss environmental stewardship in forestry.		• Prepare simple conservation checklist • Participate in environmental sanitation activity.	• Record environmental observations • Prepare simple conservation checklist • Participate in environmental sanitation activity.	
Course Assessment: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



WOOD WASTE UTILIZATION AND BIOENERGY SYSTEMS

PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY			
COURSE TITLE: WOOD WASTE UTILIZATION AND BIOENERGY SYSTEMS	COURSE CODE: WPT 223	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 the knowledge and skills in bio-energy production and wood biomass utilisation for value addition and environmental sustainability			
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand wood biomass generation and biomass resources; 2.0 Understand wood biomass collection, sorting, and utilization techniques; 3.0 Apply simple biomass conversion techniques and bio-energy production; 4.0 Apply wood biomass recycling and value addition practices; 5.0 Understand sustainable waste management and safety practices.			



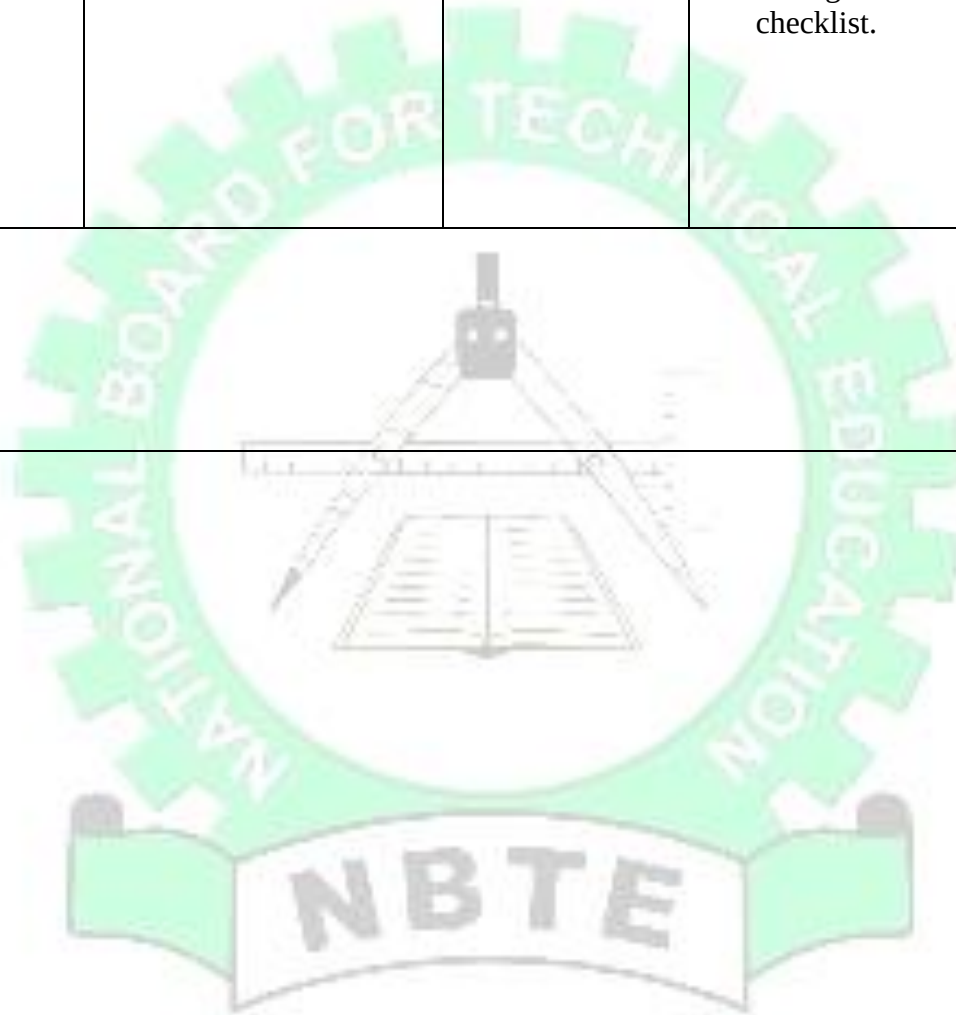
PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: WOOD WASTE UTILIZATION AND BIOENERGY SYSTEMS			COURSE CODE: WPT 223		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOURS/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge and skills in bio-energy production and wood biomass utilisation for value addition and environmental sustainability						
GENERAL OBJECTIVE 1.0: Understand wood biomass generation and biomass resources.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 3	1.1 Explain biomass generation in wood industries 1.2 State importance of biomass utilization 1.3 List types of biomass materials 1.4 Distinguish between bioenergy resources and wood biomass 1.5 State safety precautions during biomass handling.	• Discuss biomass generation in wood industries • Explain the importance of biomass utilization • Explain types of biomass materials • Discuss the differences between bioenergy resources and wood biomass • Explain safety precautions during biomass handling.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify types of biomass materials such as; - Sawdust, - Wood Shavings, - Bark - Wood chips. • Identify reusable and non-reusable biomass. • Demonstrate safe handling of wood biomass materials. • Arrange wood biomass according to type.	Guide students to: • Identify types of biomass materials such as; - sawdust, - wood shavings, - bark - wood chips. • Identify reusable and non-reusable biomass. • Demonstrate safe handling of wood	Sawdust, wood Shavings, bark, offcuts, PPEs.

					biomass materials. • Arrange wood biomass according to type.	
General Objective: 2.0 Understand wood biomass collection, sorting, and utilization techniques.						
4 – 6	2.1 Outline wood biomass sorting procedures 2.2 Explain collection and storage methods for wood biomass 2.3 Explain uses of different wood residues 2.4 Explain waste minimization practices in workshop 2.5 State precautions during waste management.	• State wood biomass sorting procedures • Describe the collection and storage methods for wood biomass • Explain uses of different wood residues • Explain waste minimization practices in workshop • Explain precautions during waste management.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Collect wood biomass from workshop. • Sort wood biomass according to type and reuse. • Store reusable wood residues appropriately • Separate sawdust, chips and timber offcuts. • Prepare simple wood biomass inventory record. • Carry out workshop cleaning after sorting.	Guide students to: • Collect wood biomass from workshop. • Sort wood biomass according to type and reuse. • Store reusable wood residues appropriately • Separate sawdust, chips and timber offcuts. • Prepare simple wood biomass inventory record. • Carry out workshop cleaning after sorting.	Collection bins, Sacks, Storage rack, Wood residues
General Objective 3.0: Apply simple biomass conversion techniques and bio-energy production.						
7 – 9	3.1 Describe biomass	• Explain the various	Charts, posters,	• Prepare sawdust	Guide students	Sawdust,

	conversion and bioenergy technology. 3.2 Explain briquette, wood gas, charcoal and biogas production procedures 3.3 Explain composting of biodegradable wood residues 3.4 State safety precautions during biomass conversion.	biomass conversion. • Explain briquette, wood gas, charcoal and biogas production procedures • Explain composting of biodegradable wood residues • State safety precautions during biomass conversion.	photographs, multimedia, timber samples, paper samples.	for briquette production. • Demonstrate simple briquette moulding • Dry prepared briquette samples. • Prepare compost mixture using biodegradable biomass material. • Identify additional materials suitable for bioenergy production. • Observe safety during waste conversion process.	to: • Prepare sawdust for briquette production. • Demonstrate simple briquette moulding • Dry prepared briquette samples. • Prepare compost mixture using biodegradable biomass material. • Identify additional materials suitable for bioenergy production. • Observe safety during waste conversion process	Mould, binder, Drying tray, Oven, Compost materials.
General Objective 4.0: Know wood biomass recycling and value addition practices.						
10-12	4.1 Describe the reuse of wood biomass 4.2 Explain wood biomass recycling methods 4.3 Explain simple product development from	• Explain the reuse of wood biomass • Discuss wood biomass recycling methods • Discuss simple	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Produce simple item from wood biomass. • Reuse wood residues for workshop	Guide students to: • Produce simple item from wood biomass.	Wood biomass, hand tools, reusable residues.

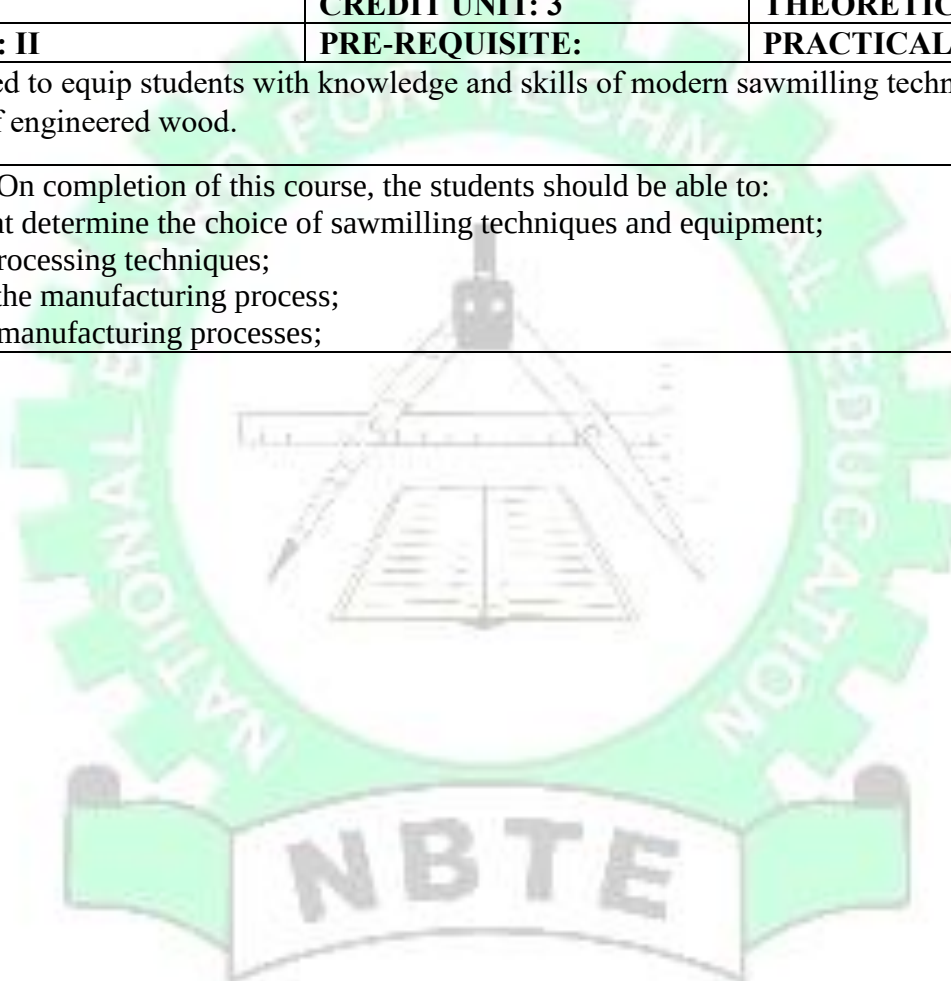
	wood biomass. 4.4 Explain value addition opportunities available for wood biomass. 4.5 Outline the environmental benefits of recycling.	product development from wood biomass. • Discuss value addition opportunities available for wood biomass. • Explain the environmental benefits of recycling.		exercise. • Prepare simple wood biomass product. • Sort recyclable and non-recyclable residues. • Inspect reusable wood biomass for suitability.	• Reuse wood residues for workshop exercise. • Prepare simple wood biomass product. • Sort recyclable and non-recyclable residues. • Inspect reusable wood biomass for suitability.	
General Objective 5.0: Understand sustainable waste management and safety practices.						
13-15	5.1.Outline workshop sanitation practices 5.2.Explain safe disposal of unusable waste 5.3.Explain environmental protection practices 5.4.Explain safety precautions in waste handling 5.5.Explain importance of clean workshop environment.	• Explain workshop sanitation procedures • Demonstrate safe waste disposal • Explain environmental protection practices • Explain workshop safety measures. • State importance of clean workshop environment.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Clean workshop after activities. • Collect unusable wood waste safely. • Arrange reusable waste materials properly. • Demonstrate use of PPE during waste handling. • Carry out workshop sanitation	Guide students to: • Sweep and clean workshop after activities. • Collect unusable wood waste safely. • Arrange reusable waste materials properly. • Demonstrate use of PPE	Collection bins, broom, PPE, sanitation materials.

				exercise. • Prepare simple waste management checklist.	during waste handling. • Carry out workshop sanitation exercise. • Prepare simple waste management checklist.	
COURSE ASSESSMENT Course Work: 10% Tests: 10% Practical 40% Examination: 40% Total: 100%						



TECHNOLOGY OF WOOD PRODUCTS

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: TECHNOLOGY OF WOOD PRODUCTS	COURSE CODE: WPT 224	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 of modern sawmilling techniques and the basic processes involved in the manufacture of engineered wood.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the factors that determine the choice of sawmilling techniques and equipment; 2.0 Know modern plywood processing techniques; 3.0 Know particle board and the manufacturing process; 4.0 Know fibre board and its manufacturing processes;		



PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: TECHNOLOGY OF WOOD PRODUCTS			COURSE CODE: WPT 224		CONTACT HOURS: 3 HOURS/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOURS/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills of modern sawmilling techniques and the basic processes involved in the manufacture of engineered wood						
GENERAL OBJECTIVE 1.0: Understand the factors that determine the choice of sawmilling techniques and equipment.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 4	1.1 List the various types of sawmilling equipment used in Nigeria e.g. axe pit saw, band saw, power chain saw etc 1.2 Describe the various types of sawmilling equipment used in Nigeria e.g., axe pit saw, band saw, power chain saw etc 1.3 List the major primary conversion equipment in use 1.4 Explain the working principles and limitations of conversion equipment;	- State different types of sawmilling equipment. - Explain the various types of sawmilling equipment used in Nigeria - Explain the various types of sawmilling equipment used in Nigeria - State the major primary conversion equipment in use - Explain the working principles and limitations of conversion equipment - Explain the major primary conversion	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify types of sawmill equipment. - Identify primary and secondary conversion equipment. - Apply different modern sawmilling techniques e.g., through and through, plain sawing, quarter sawing. - Identify the various materials in handling and transfer equipment used in sawmills.	Guide students to: - Identify types of sawmill equipment. - Identify primary and secondary conversion equipment. - Apply different modern sawmilling techniques e.g., through and through, plain sawing, quarter sawing. - Identify the	Wood samples. axe pit saw, band saw, power chain saw Band racks, frame saw, Headings and circular saw

	primary conversion equipment - Band racks frame saw, Headings and circular saw. 1.5 Describe the major primary conversion equipment in use as in 1.3 1.6 Explain factors that determine the choice of types of sawmill; for location e.g. forest species available e.g. tropical hardwood mill, softwood mill estate sawmill, hardwood/softwood mill. 1.7 Describe the relationship between the characteristics of converted timber and the conversion methods applied-figure strength, dimension of stability etc) 1.8 Describe different modern sawmilling techniques e.g., through and through, plain sawing, quarter sawing.	equipment in use as above • Explain factors that determine the choice of types of sawmill location • Explain the relationship between the characteristics of converted timber and the conversion methods applied • Explain different modern sawmilling techniques • Explain the cutting action of the teeth, and the importance of selecting the appropriate cutting speeds, feed speeds, tooth design etc of saws. • Explain the various material handling and transfer equipment used in sawmills • Explain various secondary sawmilling equipment and their uses • Explain a typical sawmill layout and organisation		• Identify various secondary sawmilling equipment and their uses. • Carry out visit to a typical sawmill	various materials in handling and transfer equipment used in sawmills. • Identify various secondary sawmilling equipment and their uses. • Carry out visit to a typical sawmill	
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	1.9 Explain the cutting action of the teeth, and the importance of selecting the appropriate cutting speeds, feed speeds, tooth design etc of saws. 1.10 Describe the various material handling and transfer equipment used in sawmills e.g., log pushers and kickers, winches, carriers 1.11 Describe various secondary sawmilling equipment and their uses e.g. planners, edger, cutting angle and their importance etc 1.12 Describe a typical sawmill layout and organisation					
General Objective 2.0: Know modern plywood processing techniques						
5 – 8	2.1 Outline the history of plywood processing in Nigeria 2.2 Explain the various terminologies	- State history of plywood processing in Nigeria - Explain the various terminologies	Charts, posters, photographs, multimedia, timber	- Carry out field trip to plywood factories - Apply the various plywood	- Carry out field trip to plywood factories - Apply the various	Lathe machines. Slicers Pit for steaming.

	associated with plywood processing 2.3 Describe the various plywood manufacturing processes 2.4 List the properties of plywood e.g., Isotropic behavior nailing near edges, acoustic properties etc. 2.5 Describe the properties of plywood 2.6 Compare the utilization potential of plywood with that of other competing materials.	associated with plywood processing • Explain the various plywood manufacturing processes • State the properties of plywood • Explain the properties of plywood • Discuss the utilization potential of plywood with that of other competing materials.	samples, paper samples.	manufacturing processes	plywood manufacturing processes	Billets Veneers Samples of plywood.
General Objective 3.0: Know particle board and the manufacturing process.						
9 -12	3.1 Define particleboard in accordance with the relevant standard e.g. F.A.O (1958) BS 1811, ASTM, NCP-2 of 1973 3.2 Describe the various categories of particle board e.g. Homogeneous/grade d density/ multilayer board, High/medium/low density	• Explain particleboard in accordance with the relevant standard • Explain the various categories of particle board • Explain the following terminologies associated with particle board • Explain a flow chart of particleboard manufacture. • Explain the	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify the various categories of particleboard. • Make particle board following the processing stages. • Determine particleboard properties through physical tests e.g., dimensional stability, moisture absorption, static bending strength	Guide students to: • Identify the various categories of particleboard. • Make particle board following the processing stages. • Determine particleboard properties through • Physical tests	Wood materials, binders, press, laboratory

	particleboard: according to source of raw material: coconut shives; Baggase board etc, according to particle geometry;- water board, flake board: chipboard: according to utilization potential: structural 3.3 Explain the following terminologies associated with particle board: see through, pot lite, storage lite, press closingspeed; slenderness ratio adhesives efficiency. 3.4 Explain a flow chart of particleboard manufacture. 3.5 Describe the processing stages of particleboard 3.6 Describe the process of making particleboard following the processing stages. 3.7 Explain the basic effects of the processing variable	processing stages of particleboard • Explain the process of making particleboard following the processing stages. • Explain the basic effects of the processing variable • Explain particleboard properties through Physical tests • Outline the advantages of particleboard over similar materials in construction		checks etc • Carry out field trip to: - Particle board factory - Draw a flow chart of particleboard manufacture.	e.g., dimensional stability, moisture absorption, static bending strength checks etc • Carry out field trip to • Particle board factory • Draw a flow chart of particleboard manufacture.	
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	e.g., wood specific gravity: physical tests e.g., wood specific gravity: PH particle geometry: type and level of compaction properties of finished 3.8 Explain particleboard properties through 3.9 Physical tests e.g., dimensional stability, moisture absorption, static bending strength checks, etc. 3.10 Describe the advantages of particleboard over similar materials in construction					
General Objective 4.0: Know fibre board and its manufacturing processes						
13-15	4.1 Define fibreboard as in FAO 1958 and relevant BS, ASTM, Dintand NCP- 2 (1973) according to specific gravity-Insulation board, hardboard medium/High/Low density fibreboard, additive etc Heat/oil tempered	• Explain fibreboard as in the relevant standard • State the raw materials for the manufacture of fibreboard • Explain the basic modes of fibre generation • Explain the processing stages of	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Manufacture fibreboard following the flowchart in 4.4 • Identify raw materials for the manufacture of fibreboard	• Manufacture fibreboard following the flowchart in 4.4 • Identify raw materials for the manufacture of fibreboard	Wood samples, debarker, digester, reagents.

	4.2 Describe the raw materials for the manufacture of fibreboard 4.3 Describe the basic modes of fibre generation e.g. mechanical pulping explosion process etc 4.4 Describe the processing stages of fibreboard manufacture using a flowchart 4.5 Describe the manufacture of fibreboard following the flowchart in 4.4 above 4.6 Explain the advantage of fibreboard over similar materials	fibreboard manufacture using a flowchart • Explain the manufacture of fibreboard following the flowchart in 4.4 • State the advantage of fibreboard over similar materials.				
Course Assessment: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						

WOOD TESTING, UTILIZATION AND PRODUCT STANDARD

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: WOOD TESTING, UTILIZATION AND PRODUCT STANDARD	COURSE CODE: WPT 225	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 in wood testing, utilization, grading, standardization, and quality assurance in wood industries.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the principles and importance of wood testing; 2.0 Know physical and mechanical testing procedures on wood; 3. Understand methods of wood utilization and processing; 4.0 Understand wood product standards, quality control and product evaluation; 5.0 Know laboratory testing and results interpretation.		

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: WOOD TESTING, UTILIZATION AND PRODUCT STANDARD			COURSE CODE: WPT 225		CONTACT HOURS: 3 HOUR/WEEK	
			CREDIT UNIT: 3		THEORETICAL: 1 HOUR/WEEK	
YEAR: II SEMESTER: II			PRE-REQUISITE:		PRACTICAL: 2 HOUR/WEEK	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with knowledge and skills in wood testing, utilization, grading, standardization, and quality assurance in wood industries.						
GENERAL OBJECTIVE 1.0: Know the principles and importance of wood testing.						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities.	Resources	Specific Learning Outcome	Teacher’s Activities.	Resources
1 – 3	1.1 Define wood testing. 1.2 Explain the importance of wood testing in industries. 1.3 Describe the physical properties of wood. 1.4 Explain the mechanical properties of wood. 1.5 Explain factors affecting wood quality. 1.6 Differentiate destructive and non-destructive tests. 1.7 Explain laboratory safety procedures.	• Explain the concept of wood testing. • Discuss the importance of testing in wood industries. • Explain the physical properties of wood • Explain mechanical properties of wood with illustrations. • Discuss factors affecting wood quality. • Explain destructive and non-destructive tests. • Explain laboratory safety precautions.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Conduct wood testing • Determine the properties of wood through testing.	Guide students to: • Conduct wood testing • Determine the properties of wood through testing.	Wood specimens Hand lens. Laboratory benches. Measuring tools. Timber grading Charts. Testing standards manuals Moisture meter. PPEs
General Objective 2.0: Know physical and mechanical testing procedures on wood.						

4 – 7	2.1 Explain moisture content of wood. 2.2 Explain wood density and specific gravity. 2.3 Explain shrinkage and swelling tests. 2.4 Explain compression testing procedures. 2.5 Explain bending tests on wood. 2.6 Explain tension and shear testing methods. 2.7 Explain how to interpret testing results.	• Discuss moisture content of wood. • Describe wood density and specific gravity. • Discuss shrinkage and swelling tests. • Describe compression testing procedures. • Discuss bending tests on wood. • Discuss tension and shear testing methods. • Describe how to interpret testing results.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Measure moisture content accurately. • Determine wood density. • Conduct dimensional measurements. • Perform compression tests. • Carry out bending tests. • Record laboratory data.	Guide students to: • Measure moisture content accurately. • Determine wood density. • Conduct dimensional measurements. • Perform compression tests. • Carry out bending tests. • Record laboratory data.	Universal testing machine Wood samples Laboratory manuals Moisture meter Weighing balance Vernier caliper Data recording sheets Drying oven
General Objective 3.0: Understand methods of wood utilization and processing.						
8-10	3.1 Explain timber conversion methods. 3.2 Explain wood processing techniques. 3.3 Describe wood utilization practices. 3.4 Explain value-added wood products. 3.5 Explain wood waste materials. 3.6 Explain wood recycling methods. 3.7 Explain sustainable wood utilization.	• Explain timber conversion processes. • Explain wood processing techniques. • Discuss efficient wood utilization practices. • Explain value-added products. • Explain waste management methods. • Discuss recycling	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify wood waste materials • Convert timber into usable products. • Identify different wood products. • Produce simple wood products. • Demonstrate recycling techniques.	Guide students to: • Identify wood waste materials • Convert timber into usable products. • Identify different wood products. • Produce simple wood products. • Demonstrate	Workshop machines. Hand tools. Timber Adhesives and fasteners Recycling materials. Hand tools Waste Collection bins. Workshop manuals

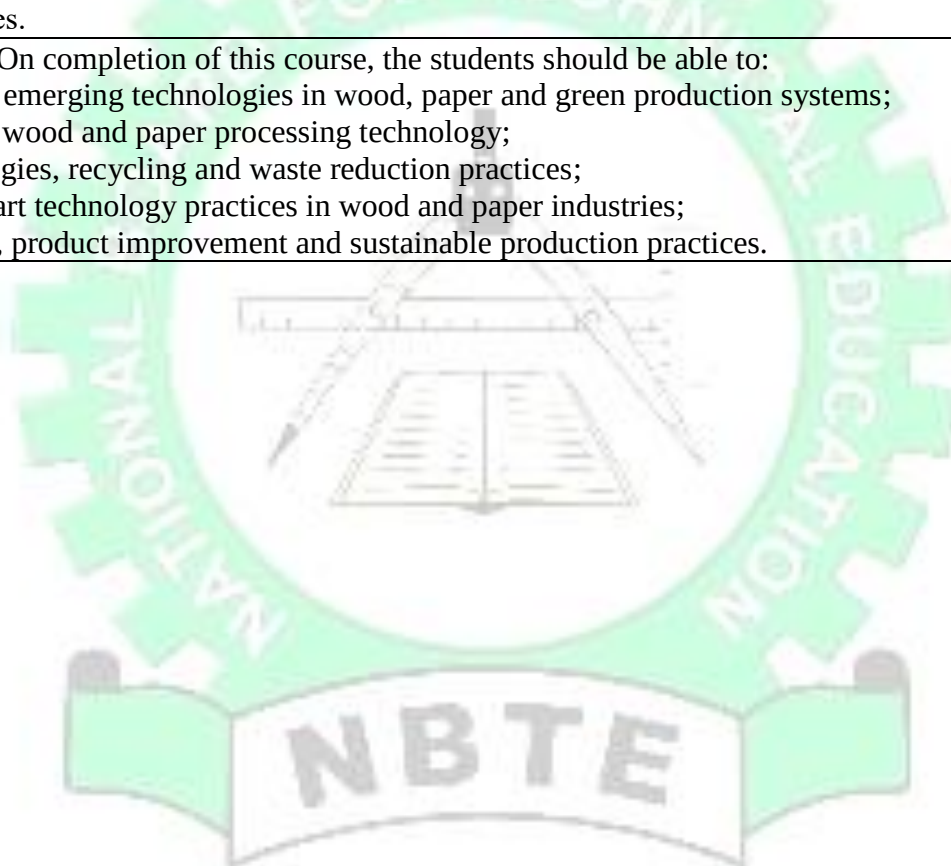
		procedures. • Discuss sustainability principles.			recycling techniques.	
General Objective 4.0: Understand wood product standards, quality control and product evaluation.						
11 – 12	4.1 Explain wood product standards. 4.2 Explain grading rules for timber. 4.3 Explain quality control procedures. 4.4 Explain how to evaluate wood product quality. 4.5 Explain timber inspection procedures 4.6 Explain standard and substandard products. 4.7 Explain certification systems. 4.8 Describe steps to prepare quality assurance reports.	• Describe timber grading standards. • Explain quality control systems. • Explain inspection procedures. • Explain how to evaluate wood product quality. • Describe how to carry out inspection exercises. • Explain standard and substandard products • Explain certification systems. • Explain steps to prepare quality assurance reports.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Grade timber using standard rules. • Inspect wood products for defects. • Conduct quality checks. • Use inspection tools correctly. • Carry out timber inspection. • Identify standard and substandard products. • Prepare inspection reports.	Guide students to: • Grade timber using standard rules. • Inspect wood products for defects. • Conduct quality checks. • Use inspection tools correctly. • Carry out timber inspection. • Identify standard and substandard products. • Prepare inspection reports.	Timber grading charts. Inspection tools. Defective wood samples. Quality control forms. Measuring tools. Product samples Workshop facilities
General Objective 5.0: Know laboratory testing and results interpretation.						
13 – 15	5.1.Explain the analysis of testing data. 5.2.Explain the interpretation of laboratory results. 5.3.Explain the preparation of technical reports.	• Discuss the analysis of testing data. • Describe the interpretation of laboratory results. • Describe the	Charts, posters, photographs, multimedia, timber samples, paper	• Conduct complete laboratory testing exercises. • Record data. • Organize data. • Analyze laboratory results.	Guide students to: • Conduct complete laboratory testing exercises. • Record data. • Organize data.	Laboratory equipment omputers Report templates Data sheets PPEs

	5.4.Explain the presentation of laboratory findings. 5.5.Explain the industrial applications of test results.	preparation of technical reports. • Describe the presentation of laboratory findings. • Discuss the industrial applications of test results.	samples.	• Apply laboratory safety procedures. • Organize laboratory practical sessions.	• Analyze laboratory results. • Apply laboratory safety procedures. • Organize laboratory practical sessions.	Projector
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total: 100%						



EMERGING TRENDS IN WOOD, PAPER AND GREEN TECHNOLOGIES

PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: EMERGING TRENDS IN WOOD, PAPER AND GREEN TECHNOLOGIES	COURSE CODE: WPT 226	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 provide students with knowledge and skills in emerging wood, paper and green technologies for sustainable production practices.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Appreciate information on emerging technologies in wood, paper and green production systems; 2.0 Know modern practices in wood and paper processing technology; 3.0 Understand green technologies, recycling and waste reduction practices; 4.0 Understand digital and smart technology practices in wood and paper industries; 5.0 Understand the innovation, product improvement and sustainable production practices.		



PROGRAMME: NATIONAL DIPLOMA (ND) WOOD AND PAPER TECHNOLOGY.						
COURSE TITLE: EMERGING TRENDS IN WOOD, PAPER AND GREEN TECHNOLOGIES			COURSE CODE: WPT 226		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 provide students with knowledge and skills in emerging wood, paper and green technologies for sustainable production practices.						
GENERAL OBJECTIVE 1.0: Appreciate information on emerging technologies in wood, paper and green production systems.						
THEORETICAL CONTENT.				PRACTICAL CONTENT.		
Week.	Specific Learning Outcome.	Teacher’s Activities.	Resources.	Specific Learning Outcome.	Teacher’s Activities.	Resources.
1 – 2	1.1 Explain emerging technologies in wood and paper industries e.g. Internet of Things (IoT), Mobile apps AI tools etc. 1.2 Explain green technology concepts 1.3 Explain eco-friendly wood and paper production 1.4 Explain automation in wood industries 1.5 Explain sustainability in modern industries.	- Describe modern wood and paper technologies. - Discuss green technology concepts. - Describe eco-friendly wood and paper production - Describe automation in wood industries - Discuss sustainability in modern industries.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify eco-friendly wood and paper products. - Compare conventional with other eco-friendly products. - Observe modern processing equipment through video or demonstration. - Prepare simple observation note on emerging technologies.	Guide students to: - Identify eco-friendly wood and paper products. - Compare conventional with other eco-friendly products. - Observe modern processing equipment through video or demonstration. - Prepare simple observation note on emerging technologies.	Multimedia Product samples Videos Mobile apps AI tools Computer.

General Objective 2.0: Know modern practices in wood and paper processing technology.

3 – 5	2.1 Explain modern wood processing systems 2.2 Explain modern paper production systems 2.3 Explain engineered wood technologies 2.4 Explain machine-assisted production systems 2.5 Explain workplace safety in modern systems.	- Describe wood processing systems. - Describe modern paper production. - Describe engineered wood technologies. - Describe machine-assisted production systems. - Describe workplace safety in modern systems.	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Identify trends in engineered wood products. - Identify automated equipment used in wood and paper industries. - Observe digital or machine-assisted processing systems. - Carry out safe handling of workshop equipment.	Guide students to: - Identify trends in engineered wood products. - Identify automated equipment used in wood and paper industries. - Observe digital or machine-assisted processing systems. - Carry out safe handling of workshop equipment.	Product samples multimedia Workshop equipment.
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General Objective 3.0: Understand green technologies, recycling and waste reduction practices.

6 – 9	3.1 Describe green technologies in wood and paper industries eg. Solar power, wind power, electric vehicle etc. 3.2 Describe waste reduction practices 3.3 Describe eco-friendly product	- Discuss green technologies. - Explain waste reduction techniques. - Discuss eco-friendly product development. - Describe recycling innovations - Explain environmental	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Sort recyclable and non-recyclable wood waste. - Produce simple recycled paper product. - Prepare simple value-added product from wood offcuts. - Carry out workshop waste minimization practice. - Participate in environmental sanitation exercise.	Guide students to: - Sort recyclable and non-recyclable wood waste. - Produce simple recycled paper product. - Prepare simple value-added product from wood offcuts. - Carry out	Waste paper, wood residues, recycling tools.
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	development. 3.4 Explain recycling innovations. 3.5 Describe environmental sustainability practices.	sustainability practices.			workshop waste minimization practice. • Participate in environmental sanitation exercise	
General Objective 4.0: Understand digital and smart technology practices in wood and paper industries.						
10 – 12	4.1 Explain digital technologies in wood industries. 4.2 Describe smart technologies in production. 4.3 Explain digital inventory and monitoring systems 4.4 Explain modern product design systems. 4.5 Describe workplace digital safety practices.	• Describe digital applications in industry. • Discuss smart production practices. • Describe digital inventory and monitoring systems • Discuss modern product design systems. • Explain workplace digital safety practices.	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Observe digital inventory system demonstration. • Observe digital wood or paper product design software demonstration. • Record simple product inventory using digital device. • Demonstrate use of mobile technology for product documentation. • Prepare simple digital observation record.	Guide students to: • Observe digital inventory system demonstration. • Observe digital wood or paper product design software demonstration. • Record simple product inventory using digital device. • Demonstrate use of mobile technology for product documentation. • Prepare simple digital observation record.	Computer, Mobile devices, Inventory sheet,
General Objective 5.0: Understand the innovation, product improvement and sustainable production practices.						
13-15	5.1.Explain product innovation in wood and paper	• Describe innovation practices	Charts, posters, photographs,	• Carry out improvement for simple wood or paper product.	• Carry out improvement for simple wood or	Product samples, Notebook,

	industries. 5.2.Explain product improvement techniques 5.3.Describe sustainable 5.4.production practices 5.5.Explain workplace innovation culture. 5.6.Describe the importance of continuous improvement.	• Discuss product improvement techniques. • Discuss sustainable production practices. • Explain workplace innovation culture. • Describe the importance of continuous improvement.	multimedia, timber samples, paper samples.	• Carry out the modification of simple product design. • Compare improved and unimproved product features. • Prepare simple innovation idea sheet. • Present simple sustainable product idea.	paper product. • Carry out the modification of simple product design. • Compare improved and unimproved product features. • Prepare simple innovation idea sheet. • Present simple sustainable product idea.	Presentation materials
COURSE ASSESSMENT: Course work: 10% Test/Assignments: 10% Practical: 40% Examination: 40% Total 100%						

SMART WOOD MANUFACTURING AND INDUSTRY

PROGRAMME: NATIONAL DIPLOMA(ND) IN WOOD AND PAPER TECHNOLOGY		
COURSE TITLE: SMART WOOD MANUFACTURING AND INDUSTRY	COURSE CODE: WPT 227	CONTACT HOURS: 3 HOURS/WEEK
	CREDIT UNIT: 3	THEORETICAL: 1 HOUR
YEAR: II SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2 HOURS/WEEK
GOAL: This course is designed to equip the student with the knowledge and skills in basic smart wood manufacturing and industry as applied to forestry and wood industries		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand smart wood manufacturing and industry; 2.0 Understand the application of smart wood manufacturing to wood species, structure and properties; 3.0 Understand Computer-Aided Design (CAD) for Wood Products; 4.0 Know the application of smart manufacturing technology in wood manufacturing; 5.0 Know the application of smart manufacturing technology in wood manufacturing processes and production management; 6.0 Understand the application of smart manufacturing technology to wood finishing technologies; 7.0 Understand the application of smart manufacturing technology to Sustainable Wood Sourcing and Environmental Management.		

PROGRAMME: NATIONAL DIPLOMA IN WOOD AND PAPER TECHNOLOGY						
COURSE TITLE: SMART WOOD MANUFACTURING AND INDUSTRY			COURSE CODE: WPT 227		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 the student with the knowledge and skills in basic smart wood manufacturing and industry as applied to forestry and wood industries.						
GENERAL OBJECTIVE 1.0: Understand smart wood manufacturing and industry						
THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teacher’s Activities	Resources	Specific Learning Outcome	Teacher’s Activities	Resources
1-2	1.1 Define smart manufacturing 1.2 Describe the historical evolution of smart manufacturing 1.3 Describe roles of smart manufacturing in the industry 1.4 Explain the application of PPE in smart manufacturing 1.5 Explain hazards in workshops 1.6 Describe the importance of compliance with environmental regulations in smart manufacturing	• Explain smart manufacturing • Explain the historical evolution of smart manufacturing • Discuss roles of smart manufacturing in the industry • Describe the application of PPE in smart manufacturing • Explain hazards in workshops • State the importance of compliance with environmental regulations in smart manufacturing	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Identify roles of smart wood manufacturing in the industry • Apply PPE correctly • Identify hazards in workshops	Guide students to: • Identify roles of smart wood manufacturing in the industry • Apply PPE correctly • Identify hazards in workshops	PPE
General Objective 2.0: Understand the application of smart wood manufacturing to wood species, structure and properties						

3-4	2.1 Explain classification of local and exotic wood species 2.2 Distinguish hardwood from softwood 2.3 Explain analysis of wood grain and moisture content 2.4 Differentiate engineered wood products 2.5 Explain bonding and lamination processes 2.6 Explain evaluation of product suitability for applications	• Explain classification of local and exotic wood species • Differentiate hardwood from softwood • Explain analysis of wood grain and moisture content • Explain differences of engineered wood products • Explain bonding and lamination processes • Explain evaluation of product suitability for applications	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Classify local and exotic wood species • Analyse wood grain and moisture content • Evaluate product suitability for applications	Guide students to: • Classify local and exotic wood species • Analyse wood grain and moisture content • Evaluate product suitability for applications	Moisture meter Arborretum Digital tools, Mobile devices,
General Objective 3.0: Understand Computer-Aided Design (CAD) for Wood Products						
5-6	3.1 Explain operation of CAD software for furniture design Describe production of 2D and 3D technical drawings 3.2 Explain generation of cut lists and Bill of Quantity BOMs 3.3 Explain translation of CAD files to CNC toolpaths 3.4 Describe operation of CNC router safely 3.5 Describe basic CNC	• Explain operation of CAD software for furniture design • Explain production of 2D and 3D technical • Explain generation of cut lists and Bill of Quantity BOMs • Explain translation of CAD files to CNC toolpaths • Explain operation of CNC router safely • Explain basic CNC	Charts, posters, photographs, multimedia, timber samples, paper samples.	• Operate CAD software for furniture design • Produce 2D and 3D technical drawings • Generate cut lists and • Translate CAD files to CNC toolpaths • Operate CNC router safely • Perform basic CNC maintenance	Guide students to: • Operate CAD software for furniture design • Produce 2D and 3D technical drawings • Generate cut lists and • Translate CAD files to CNC toolpaths • Operate CNC router safely • Perform basic	CNC CAD files

	maintenance	maintenance			CNC maintenance	
General Objective 4.0: Know the application of smart manufacturing technology in wood manufacturing						
7-8	4.1 Explain Industry 4.0 concepts 4.2 Explain integration of Inter net of Things IoT devices into production 4.3 Explain analysis real-time production data 4.4 Explain types of industrial robots 4.5 Explain programming of basic robotic tasks 4.6 Explain integration of robots into wood production lines	- Describe Industry 4.0 concepts - Describe integration of Inter net of Things IoT devices into production - Discuss analysis real-time production data - Discuss types of industrial robots - Describe programming of basic robotic tasks - Discuss integration of robots into wood production lines	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Integrate Inter net of Things IoT devices into production - Identify types of industrial robots - Programme basic robotic tasks - Integrate robots into wood production lines	Guide students to: - Integrate Inter net of Things IoT devices into production - Identify types of industrial robots - Programme basic robotic tasks - Integrate robots into wood production lines	IoT devices Digital tools, Mobile devices, industrial robots, practical manual etc.
General Objective 5.0: Know the application of smart manufacturing technology in wood manufacturing processes and production management						
9-10	5.1.Explain operation of primary and secondary machines 5.2.Explain planning of machining sequences 5.3.Explain dimensional accuracy 5.4.Explain application of lean principles to wood production production schedules 5.5.Explain identification and elimination of waste	- Describe operation of primary and secondary machines - Discuss planning of machining sequences - Discuss dimensional accuracy - Describe application of lean principles to wood production - Discuss production schedules - Discuss identification	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Operate primary and secondary machines - Plan machining sequences - Apply lean principles to wood production - Create production schedules - Identify waste (Muda) - Eliminate waste (Muda)	Guide students - Operate primary and secondary machines - Plan machining sequences - Apply lean principles to wood production - Create production	Band saw Planing, moulding and routing sanding, staining, varnishing machines Digital tools, Mobile devices,

	(Muda)	and elimination of waste (Muda)			- schedules - Identify waste (Muda) - Eliminate waste (Muda)	
General Objective 6.0: Understand the application of smart manufacturing technology to wood finishing technologies						
11-13	6.1 Explain appropriate finishes for products 6.2 Describe application of finishes using hand and spray methods 6.3 Explain troubleshooting of finishing defects 6.4 Explain application of design thinking to wood products 6.5 Explain development of a product from concept to prototype 6.6 Explain evaluation of market viability	- Explain appropriate finishes for products - Describe application of finishes using hand and spray methods - Explain troubleshooting of finishing defects - Explain application of design thinking to wood products - Explain development of a product from concept to prototype - Explain evaluation of market viability	Charts, posters, photographs, multimedia, timber samples, paper samples.	- Select appropriate finishes for products - Apply finishes using hand and spray methods - Troubleshoot finishing defects - Apply design thinking to wood products - Develop a product from concept to prototype - Evaluate market viability	Guide students to: - Select appropriate finishes for products - Apply finishes using hand and spray methods - Troubleshoot finishing defects - Apply design thinking to wood products - Develop a product from concept to prototype - Evaluate market viability	oil, wax, lacquer, polyurethane
General Objective 7.0: Understand the application of smart manufacturing technology to sustainable wood sourcing and environmental management						
14-15	7.1 Explain sustainable forestry practices 7.2 Explain certified wood sources 7.3 Explain calculation of	- Explain sustainable forestry practices - Explain certified wood sources - Explain calculation	Charts, posters, photographs, multimedia, timber	- Identify certified wood source - Calculate carbon footprint of production	Guide students to: - Identify certified wood source - Calculate	Computer, Videos, Digital tools, Mobile

	carbon footprint of production 7.4 Explain development of business plan for a wood enterprise 7.5 Explain funding sources 7.6 Explain application of marketing strategies	of carbon footprint of production • Explain development of business plan for a wood enterprise • Explain funding sources • Explain application of marketing strategies	samples, paper samples.	• Develop a business plan for a wood enterprise • Identify funding sources • Apply marketing strategies	carbon footprint of production • Develop a business plan for a wood enterprise • Identify funding sources • Apply marketing strategies	devices, Log books
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COURSE ASSESSMENT:

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

LIST OF MINIMUM RESOURCES/PHYSICAL FACILITIES

Laboratory Equipment, Workshop Tools and Machinery Required for Effective Training in Wood and Paper Technology (ND)

A. SURVEY EQUIPMENT AND TOOLS			
	S/N	DISCRIPTION OF ITEMS	QUANTITY REQUIRED
	1	Drawing Boards / Stools	30
	2	Drafting set	30
	3	T-Square	30
	4	Set square	30
	5	Protractors	30
	6	Lettering set	30
	7	Stereoscope	5
	8	Prismatic compass	5
	9	Ranging Poles	15
	10	Chain	5
	11	Metric Tape	5
	12	Planimeters	5
	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 EQUIPMENT/ITEMS			
	S/N	Equipment	Quantity
	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	2
	8	Evaporimeter	2
	9	Hygrometer	2
	10	Barometer	2
C. AUDIO VISUAL ROOM / ICT TEACHING FACILITIES			
	S/N	Equipment	Quantity
	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	Multimedia projector	1
	13	Smart board	1
	14	Desktop computers	30
	15	Internet facilities	1 unit
	16	CAD/CAM software	1 license
	17	Furniture design software	1 license
	18	Printer and scanner	1 each
	19	Technical drawing tables	5
	20	Library resources	1 set

	21	Instructional charts and models	Various
	22	Computer system with wood identification software	1
D. PEST CONTROL EQUIPMENT			
	S/N	Equipment	Quantity
	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			
	S/N	Equipment	Quantity
	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			
	S/N	Equipment	Quantity
	1	Watering system (spraying)	3
	2	Seed sowers	3
	3	Root prunners	3
	4	Plant lifters	3
	5	Flame weeders and hedgers	3
	6	G H P Pump	3
	7	Secateurs	3
	8	Planting hoes	30
	9	Spade	30
	10	Pick axe	30
	11	Hand trowel	30
	12	Wheelbarrows	30
	13	Watering cans	30
	14	Head pans	30
	15	Machetes	30
	16	Cutting knives	30
G. WOOD ANATOMY AND IDENTIFICATION LABORATORY			
	S/N	Equipment	Quantity
	1	Compound light microscope	2+
	2	Stereo microscope	2+
	3	Microtome machine	1
	4	Hand lens	10+
	5	Wood specimen cabinet	1

	6	Digital moisture meter	2
	7	Vernier caliper	5+
	8	Measuring tape	5+
	9	Digital weighing balance	2+
	10	Drying oven	1
	11	Sample preparation knives	Set
	12	Slides and cover slips	Assorted
	13	Laboratory glassware	Assorted sizes
	14	Hot plate	2
	15	pH meter	2
	16	Desiccator	1
	17	Timber sample racks	Assorted sizes

H. WOOD SEASONING & PRESERVATION LABORATORY

	S/N	Equipment	Quantity
	1	Laboratory kiln dryer	1
	2	Moisture meters	2
	3	Hygrometer	2
	4	Thermometer	5
	5	Vacuum-pressure treatment cylinder	1
	6	Preservation chemical tanks	2
	7	Spray equipment	2
	8	Drying racks	Assorted sizes
	9	Timber stacking stickers	Set
	10	Water absorption test apparatus	1
	11	Treatment brushes	5
	12	Wood defect inspection tools	Set
	13	Chemical storage cabinet	1

I. TIMBER MECHANICS AND STRENGTH TESTING LABORATORY

	S/N	Equipment	Quantity
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	1	Universal testing machine (UTM)	1
	2	Compression testing machine	1
	3	Impact testing machine	1
	4	Hardness testing machine	1
	5	Bending test apparatus	1
	6	Torsion testing machine	1
	7	Deflection measuring gauges	Set
	8	Load cells	Set
	9	Dial gauges	5
	10	Micrometer screw gauge	5
	11	Timber sample cutting machine	1
	12	Conditioning chamber	1

J. WOOD WORKING MACHINES (Major)

	S/N	Equipment	Quantity
	1	Circular saw machine	1
	2	Band saw machine	2
	3	Surface planer	2
	4	Thickness planer	2
	5	Spindle moulder	1
	6	Wood lathe	1
	7	Mortising machine	1
	8	Tenoning machine	1
	9	Drilling machine	2
	10	CNC router	1
	11	Edge banding machine	1
	12	Belt sanding machine	1
	13	Cross-cut saw	1
	14	Rip saw	1
	15	Panel saw	1

	16	Hydraulic press	1
	17	Veneer peeling machine	1
	18	Wood crusher/chipper	1
	19	Working benches with vice	10
K. FURNITURE AND WOOD PROCESSING HAND TOOLS			
	S/N	Equipment	Quantity
	1	Hammers	Assorted sizes
	2	Mallets	2 sets
	3	Hand saws	Assorted sizes
	4	Chisels	Set
	5	Screwdrivers	Set
	6	Spanners	Set
	7	Hand planes	Set
	8	Try square	Assorted sizes
	9	Marking gauge	Assorted sizes
	10	Clamps	Assorted sizes
	11	Wood files	Assorted sizes
	12	Rasps	Assorted sizes
	13	Spirit level	Assorted sizes
	14	Pliers	Assorted sizes
	15	Nail punches	Various sizes
	16	Sharpening stones	Assorted grades
L. PORTABLE POWER TOOLS			
	S/N	Equipment	Quantity
	1	Portable circular saw	1
	2	Electric drill	2
	3	Orbital sander	1
	4	Jig saw	1
	5	Angle grinder	1

	6	Portable router	1
	7	Nail gun	1
	8	Heat gun	1
M. PULP AND PAPER TECHNOLOGY LABORATORY			
	S/N	Equipment	Quantity
	1	Laboratory pulper	1
	2	Beater/refiner	1
	3	Sheet forming machine	1
	4	Paper press machine	1
	5	Drying plates	Set
	6	Fiber disintegrator	1
	7	Water bath	1
	8	Laboratory blender	1
	9	Brightness tester	1
	10	Paper thickness gauge	1
	11	Tensile strength tester	1
	12	Bursting strength tester	1
	13	Tear resistance tester	1
	14	Cobb sizing tester	1
	15	GSM balance	1
	16	Chemical storage containers	Several
N. FINISHING AND SURFACE COATING EQUIPMENT			
	S/N	Equipment	Quantity
	1	Spray booth	1
	2	Air compressor	1
	3	Spray guns	2
	4	Paint brushes	Set
	5	Sanding machines	2
	6	Polishing machine	1

	7	Drying racks	Several
	8	Finishing tables	2
	9	Mixing containers	Set
	10	Measuring cups	Set
	11	Paint viscosity cup	1
	12	Wood staining equipment	Set
O. BIOENERGY AND WOOD CHEMISTRY LABORATORY			
	S/N	Equipment	Quantity
	1	Bomb calorimeter	1
	2	Muffle furnace	1
	3	Retort kiln	1
	4	Distillation apparatus	1
	5	Soxhlet extractor	1
	6	Analytical balance	1
	7	Fume hood	1
	8	Biomass briquetting machine	1
	9	Charcoal testing equipment	Set
	10	Chemical reagent shelves	Several
P. METAL WORKSHOP AND MAINTENANCE EQUIPMENT			
	S/N	Equipment	Quantity
	1	Lathe	1
	2	Pipe benders	3
	3	Anvils	1
	4	Micrometers (inside, outside)	5
	5	Stock and dice set	5
	6	Drill sets	5
	7	Electrical hand drills	2
	8	Tool boxes	5
	9	Hydraulic jack (12 and 15 tons)	1 each

	10	Box of drill	4
	11	Battery charger	1
	12	Grease guns	1
	13	Pipe cutter	1
	14	Scribers	1
	15	Steel ruler	5
	16	Pipe screwing threading	2
	17	Arc welding equipment + working benches	8 tables
	18	Arc welder	30
	19	Electric grinder	2
	20	Welding gloves	15
	21	Welding helmet	15
	22	Wire brush	5
	23	Welding boots and screen	15
	24	Soldering equipment	4
	25	Blowtorch	4
	26	Tin snips	4
	27	Soldering flux	4
	28	Sheet metal sheer	4
	29	Mallet hammer	4
	30	Hack saw	4
	31	Oxygen and acetylene bottles	3
	32	Oxygen and acetylene regulators	2
	33	Cylinders wrenches	3
	34	Spark lighter	5
	35	Service pit	1
	36	Teaching models (tractor engines, ploughs, etc.)	Various
Q. LOGGING & MENSURATION EQUIPMENT			
	S/N	Equipment	Quantity

	1	Power saw	2
	2	Bow saw	4
	3	Axe	10
	4	Sledgehammer	1
	5	Wedge	2
	6	File (flat type)	3
	7	Round file	3
	8	Circular saw blades	5
	9	Grinding stone	4
	10	Bench vice	4
	11	Girthing tapes	5
	12	Abney level	1
	13	Improvised measuring poles	10
	14	Haga altimeter	5
	15	Improvised christens Hypsometer	5
	16	Back gauge	5
	17	Calipers	5
	18	Increment borers	5
	19	Relascope	4
R. IRRIGATION EQUIPMENT			
	S/N	Equipment	Quantity
	1	Rotating sprinkler for 5 acres	100
	2	Hoses (Various sizes)	2 sets
	3	Irrigation water tester	2
	4	Current meter	2
	5	Electric motor pump	1
S.FIELD AND WORKSHOP SAFETY EQUIPMENT AND ITEMS			
	S/N	Equipment	Quantity

	1	Fire extinguishers	Several
	2	First aid box / kit	2
	3	Eye wash station	1
	4	Fire alarm system	1
	5	PPE kits (full)	Several
	6	Safety boots	30 pairs
	7	Nose masks	Several
	8	Hand gloves	15 pairs +
	9	Ear protectors	Several
	10	Safety goggles	Several
	11	Workshop ventilation system	1
	12	Dust extraction system	1
	13	Emergency exits	As required
	14	Safety sign boards	Several
	15	Safety helmet	15
	16	Rain boots	30 pairs
	17	Rain coats	30 pairs

T. OUTDOOR FACILITIES AND OTHERS

	S/N	Equipment / Facility	Quantity
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	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

	10	Display Cabinets / Boards	Various
	11	Drawing pencils, pens, water colour	Various



LIST OF WORKSHOP PARTICIPANTS

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