



# NATIONAL BOARD FOR TECHNICAL EDUCATION

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

## **NATIONAL DIPLOMA & HIGHER NATIONAL DIPLOMA**

### **AGRIC COMMON COURSES**

## **CURRICULUM AND COURSE SPECIFICATION**

**JUNE, 2026**

## PREFACE

The transformation of Nigeria's agricultural sector remains central to the nation's aspirations for sustainable economic growth, food security, job creation, industrial development, and poverty reduction. As agriculture continues to evolve in response to technological advancements, climate change, emerging global market demands, and the need for increased productivity across agricultural value chains, it has become imperative to ensure that curricula in Nigerian tertiary institutions remain relevant, responsive, and aligned with contemporary industry requirements. It is against this backdrop that we embarked on the comprehensive review and modernization of Agricultural curricula for Nigerian tertiary institutions. The review process was designed to address identified skills gaps, integrate emerging technologies and innovations, strengthen entrepreneurship and employability competencies, promote climate-smart agriculture, and align training programmes with the industry expectations and global best practices.

The successful execution of this important project was made possible through the invaluable support and commitment of key stakeholders. I wish to express profound appreciation to the Honourable Minister of Education for providing the policy direction and leadership that facilitated this initiative. I also extend sincere gratitude to the Honourable Minister of Agriculture and Food Security and the Honourable Minister of Livestock Development for their unwavering support, technical contributions, and commitment to strengthening agricultural education and workforce development in Nigeria. Special appreciation goes to the Tertiary Education Trust Fund (TETFund) for providing the special intervention grant that enabled the conduct of nationwide skills gap analyses and supported the series of national curriculum review and development workshops. The findings from the skills gap studies provided critical evidence and industry insights that guided the review process and ensured that the curricula reflect current and future workforce requirements within the agricultural sector. I also acknowledge with gratitude the immense contributions of the Sector Skills Council for Agriculture, whose expertise and industry perspectives greatly enriched the curriculum development process. Equally commendable are the efforts of members of the Implementation Committee, resource persons, industry experts, professional bodies, French Embassy in Nigeria, regulatory agencies, academic institutions, employers, development partners, and other stakeholders who devoted their time, knowledge, and experience to the various workshops and technical sessions.

The revised curricula represent a collective national effort to produce graduates equipped with relevant knowledge, practical skills, digital competencies, entrepreneurial capabilities, and professional attitudes required to drive innovation and productivity across Nigeria's agronomy, forestry, fisheries and livestock sectors. It is my expectation that Institutions offering these programmes will faithfully implement the curricula and continue to collaborate with industry to ensure sustained relevance and quality.

I commend all stakeholders for their dedication and contributions to this landmark achievement and look forward to the successful implementation of these curricula for the benefit of our dear nation.

Professor Idris M. Bugaje, FNSE  
Chairman, Implementation Committee

**EXECUTIVE SECRETARY**

National Board for Technical Education (NBTE), Kaduna

## ACKNOWLEDGEMENT

The National Board for Technical Education (NBTE) expresses its profound appreciation to all individuals and organizations whose invaluable support, expertise, and commitment made the successful review and modernization of the Agricultural Education curricula for Nigerian tertiary institutions possible.

Our sincere gratitude goes to the Honourable Minister of Education for providing the policy direction and leadership that made this national initiative possible. We also appreciate the Honourable Minister of Agriculture and Food Security and the Honourable Minister of Livestock Development for their technical guidance, collaboration, and unwavering commitment to strengthening agricultural education and workforce development in Nigeria.

The Board is particularly grateful to the Tertiary Education Trust Fund (TETFund) for providing the special intervention grant that funded the nationwide skills gap analyses, stakeholder engagements, curriculum review exercises, validation meetings, and development workshops. The evidence generated through these studies provided a solid foundation for developing curricula that are relevant, industry-driven, and responsive to national and global agricultural priorities.

Special appreciation is extended to the members of the agriculture, 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.

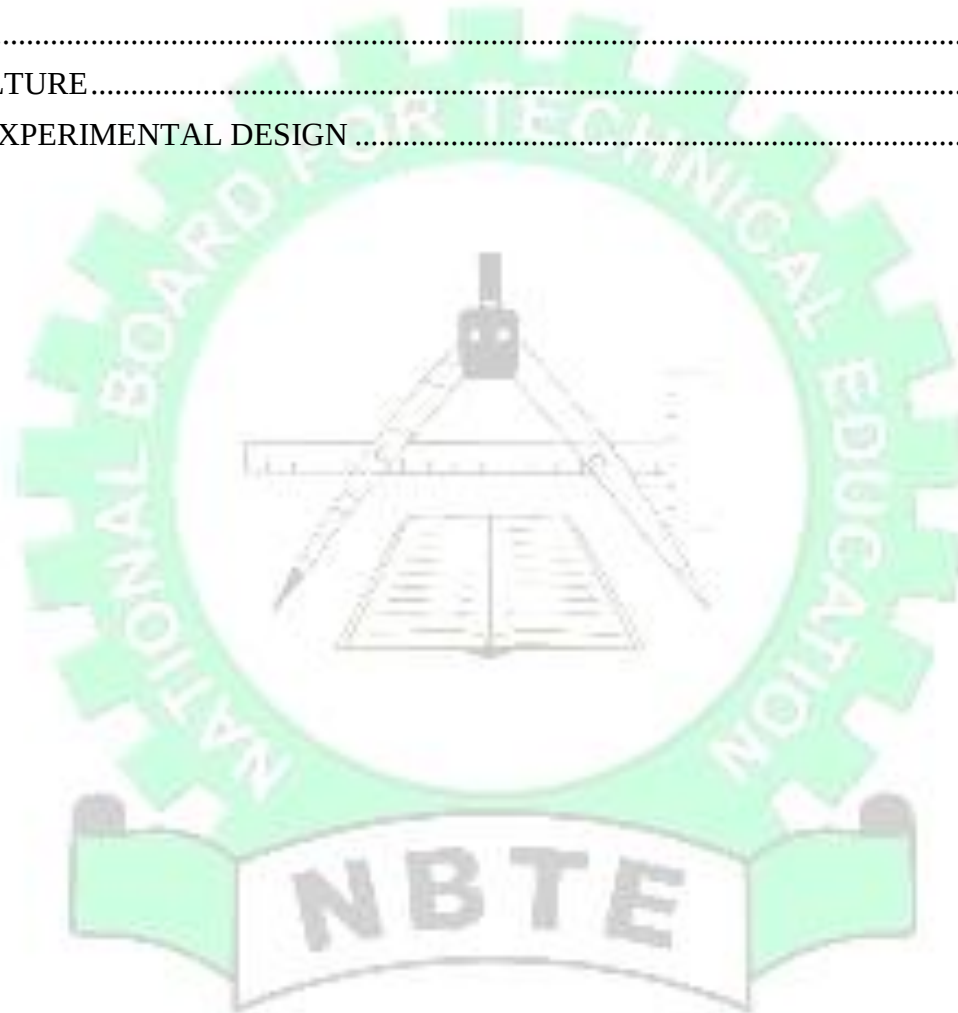
Finally, NBTE expresses its gratitude to all tertiary institutions, researchers, facilitators, rapporteurs, technical staff, and administrative personnel whose commitment and hard work contributed to the successful completion of this important national assignment.

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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**CURRICULUM TABLE  
ND/HND AGRIC COMMON COURSES**

| S/N                        | COURSE CODE | COURSE TITLE                                | L | T | P | CU | C/H |
|----------------------------|-------------|---------------------------------------------|---|---|---|----|-----|
| <b>ND I — Semester I</b>   |             |                                             |   |   |   |    |     |
| 1.                         | AGR 101     | Introduction to Agriculture                 | 1 | 0 | 2 | 3  | 3   |
| <b>ND II — Semester I</b>  |             |                                             |   |   |   |    |     |
| 2.                         | AGR 201     | Research Methods and Experimental Design    | 1 | 0 | 1 | 2  | 2   |
| <b>HND I — Semester I</b>  |             |                                             |   |   |   |    |     |
| 3.                         | AGR 301     | Farm Management                             | 1 | 0 | 1 | 2  | 2   |
| 4.                         | AGR 302     | Annual Crops                                | 1 | 0 | 2 | 3  | 3   |
| <b>HND I — Semester II</b> |             |                                             |   |   |   |    |     |
| 5.                         | AGR 303     | Field Experimentation and Data Analysis     | 1 | 0 | 1 | 2  | 2   |
| <b>HND II — Semester I</b> |             |                                             |   |   |   |    |     |
| 6.                         | AGR 401     | Research Methodology and Scientific Writing | 1 | 0 | 1 | 2  | 2   |

**KEY:**

L= Lectures (hours/week)

T= Tutorial (hours/week)

P= Practical (hours/week)

CU=Credit Unit

CH=Contact Hours (hours/week)

**INTRODUCTION TO AGRICULTURE****PROGRAMME: AGRICULTURE COMMON COURSES — NATIONAL DIPLOMA (ND)**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------|
| <b>Course Title: Introduction to Agriculture</b>                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Course Code: AGR 101</b> | <b>Contact Hours: 3 Hours/Week</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Credit Unit: 3</b>       | <b>Theoretical: 1 Hour/Week</b>    |
| <b>Year: I      Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Pre-Requisite:</b>       | <b>Practical: 2 Hours/Week</b>     |
| <b>GOAL: This course is designed to equip students with the scope of agriculture, its sub-sectors, and current developments, and to develop an appreciation of agriculture as a science, business, and tool for national development.</b>                                                                                                                                                                                                                                |                             |                                    |
| <b>GENERAL OBJECTIVES: On completion of this course, the students should be able to:</b> <ul style="list-style-type: none"> <li>1.0 Understand the basic principles of crop science;</li> <li>2.0 Understand the basic principles of animal science;</li> <li>3.0 Know the scope of forestry;</li> <li>4.0 Appreciate the historical development of fisheries in Nigeria;</li> <li>5.0 Know current developments and emerging trends in Nigerian agriculture.</li> </ul> |                             |                                    |

| PROGRAMME: AGRICULTURE COMMON COURSES — NATIONAL DIPLOMA (ND)                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Title: Introduction to Agriculture                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                   | Course Code: AGR 101                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                      | 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 equip students with the scope of agriculture, its sub-sectors, and current developments, and to develop an appreciation of agriculture as a science, business, and tool for national development. |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                             |
| General Objective 1.0: Understand the basic principles of crop science                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                             |
| THEORETICAL CONTENT                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                       | PRACTICAL CONTENT                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                             |
| Week                                                                                                                                                                                                                               | Specific Learning Outcome                                                                                                                                                                                                                                                                                                   | Teacher's Activities                                                                                                                                                                                                                                                                              | Resources                                                                                                                                                                             | Specific Learning Outcome                                                                                                                                                                                                                                                                                                                            | Teacher's Activities                                                                                                                                                                                                                                                                                                                                                      | Resources                                                                                                                                                   |
| 1 – 5                                                                                                                                                                                                                              | 1.1 Outline the history of agricultural development and administration in Nigeria<br><br>1.2 List types of farming systems: monocropping, mixed cropping, relay cropping, continuous cropping, shifting cultivation, plantation farming etc.<br><br>1.3 Explain the influence of each farming system on crop yield and soil | <ul style="list-style-type: none"><li>▪ Give a brief history of agriculture in Nigeria using charts and local examples</li><li>▪ Describe each farming system with diagrams and discuss land use and soil implications</li><li>▪ Use a Nigeria agro-ecological zone map to explain zone</li></ul> | Textbooks, charts, agro-ecological zone map of Nigeria, FMAFS/IITA reports, projector<br>Textbooks, NIMET rainfall data, storage facility charts, erosion control diagrams, projector | <ul style="list-style-type: none"><li>• Write technical report on a visit to farm practicing at least two farming systems and compare management practices</li><li>• Identify crops suited to each agro-ecological zone on a Nigeria map</li><li>• Write a short report on observations from the farm visit</li><li>• Inspect grain stored</li></ul> | Guide student to: <ul style="list-style-type: none"><li>• Arrange farm visit and guide observation of farming systems</li><li>• Guide map exercise and zone-crop matching activity</li><li>• Review farm visit reports and give feedback</li><li>• Guide storage inspection and moisture measurement exercise</li><li>• Brief students on interview conduct and</li></ul> | Nearby farm, observation guide, Nigeria agro-zone map, field notebooks, transport Grain samples, hermetic bags, moisture meter, metal bin, farmer interview |

|                                                                                                                         |                                                                                          |                                                                                      |                                                                                                               |                                                                           |                                                                                    |
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| management                                                                                                              | characteristics and crops                                                                | Tillage implement diagrams, NASC seed certification guide, textbooks, projector etc. | in a sack, hermetic bag, and metal bin; measure moisture content and compare keeping quality                  | debrief findings with class                                               | guide, field notebooks                                                             |
| 1.4 Describe the major agro-ecological zones of Nigeria and their characteristic crops                                  | ▪ Engage students through questioning and short discussions                              |                                                                                      |                                                                                                               | • Lead erosion observation on campus farm and facilitate class discussion | Dibble sticks, hoes, seeds, measuring tape, germination record sheet, seed packets |
| 1.5 Explain the effect of social factors such as customs, taboos, and land tenure on crop production in Nigeria         | ▪ Discuss social factors affecting farming using local Nigerian examples                 |                                                                                      | • Interview a local farmer on how customs or land tenure affects their farming decisions and present findings | • Demonstrate zero-till and conventional seeding methods side by side     | Practical manual etc.                                                              |
| 1.2 Explain how climatic factors affect crop production: rainfall onset, dry spells, drought, sunshine, day length etc. | ▪ Explain climatic factors and their effects on crop growth, pest incidence, and storage |                                                                                      | • Identify signs of erosion on the campus farm and suggest control measures                                   | • Guide germination recording and comparison between both plots           |                                                                                    |
| 1.3 Describe types of crop storage and explain the keeping quality of silos, hermetic bags, rhombus stores, and barns   | ▪ Describe storage systems and compare storage quality using moisture and pest data      |                                                                                      | • Demonstrate zero-till seeding using a dibble stick and compare with a hoe-tilled plot                       | • Supervise seed label reading and handling exercise                      |                                                                                    |
| 1.4 Explain different types and methods of erosion control including contouring and terracing                           | ▪ Describe erosion control methods with diagrams and field examples                      |                                                                                      | • Record germination percentage from both plots after 7 days                                                  |                                                                           |                                                                                    |
| 1.5 Describe methods of land preparation: manual and mechanised; explain                                                | ▪ Describe land preparation methods using diagrams of implements used                    |                                                                                      | • Identify farm seeds and check labels for purity and viability data                                          |                                                                           |                                                                                    |

|                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                           |                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                          |
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|                                                                                  | <p>merits and demerits of each</p> <p>1.6 Explain minimum, zero, and conventional tillage and current trends in Nigeria</p> <p>1.7 List common planting methods practised in Nigeria and explain seed quality in terms of purity, viability etc.</p>                                                                                                                                         | <ul style="list-style-type: none"> <li>▪ Explain tillage systems and discuss current trends with Nigerian farm examples</li> <li>▪ Explain planting methods and seed quality requirements using NASC guidelines</li> </ul>                                                                                                                |                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                          |
| <b>General Objective 2.0: Understand the basic principles of animal science.</b> |                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                           |                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                          |
| 6 – 8                                                                            | <p>2.1 Explain the interrelationship between crop production and animal production: manure, forage, fodder, and hay</p> <p>2.2 List important farm animals in Nigeria and their major products: cattle, sheep, goats, poultry, and pigs</p> <p>2.3 Identify common wild animals in Nigeria and explain their effects on crops and vegetation</p> <p>2.4 Match common wild animals to the</p> | <ul style="list-style-type: none"> <li>• Explain crop-livestock integration using Nigerian farm examples</li> <li>• List major livestock species and products using charts and photographs</li> <li>• Discuss wild animal distribution across Nigerian vegetation zones using wildlife maps</li> <li>• Engage students through</li> </ul> | <p>Farm animal charts, livestock production statistics, wildlife zone maps, photographs, projector, etc.</p> | <ul style="list-style-type: none"> <li>• Write technical report on a visit to mixed crop-livestock farm and observe how animal manure is used on crop plots</li> <li>• Identify 10 farm animals and 5 wild animals from photographs; record products and zone of occurrence</li> <li>• Interview the farmer on crop-livestock integration benefits and write a short report</li> </ul> | <p>Guide students:</p> <ul style="list-style-type: none"> <li>• Arrange farm visit and guide observation of crop-livestock integration</li> <li>• Facilitate photo identification exercise and guide zone mapping on Nigeria map</li> <li>• Review farm visit reports and give feedback</li> </ul> | <p>Mixed crop-livestock farm, animal photograph cards, Nigeria wildlife zone map, interview guide, field notebooks, transport, Practical manual etc.</p> |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                             |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | vegetation zones they inhabit in Nigeria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | questioning and discussion throughout                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                             |
| <b>General Objective 3.0: Know the scope of forestry.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                             |
| 9 – 11                                                    | <p>3.1 Define forestry and distinguish production forestry, social forestry, and agroforestry</p> <p>3.2 Describe the direct and indirect benefits of forests: timber, fuelwood, wildlife, watershed management, and erosion control</p> <p>3.3 Explain forest regeneration and establishment: seed procurement, nursery technology, plantation establishment, and silvicultural systems used in Nigeria</p> <p>3.4 Identify major indigenous and exotic timber species in Nigeria and state their uses: Iroko, Obeche, Opepe, Mahogany,</p> | <ul style="list-style-type: none"> <li>• Define forestry and explain the three types with Nigerian examples</li> <li>• Describe direct and indirect forest benefits using economic data</li> <li>• Explain plantation establishment steps and silvicultural systems used in Nigeria</li> <li>• Display photographs and wood samples of major timber species and explain uses</li> <li>• Explain forest services structure from federal to state level</li> </ul> | <p>Nigeria Forestry Commission reports, timber species photographs, wood samples, tree identification manual, FDF organisational chart, projector, etc.</p> | <ul style="list-style-type: none"> <li>• Write technical report on a visit to forest nursery or plantation and identify 5 major timber species; record nursery operations observed</li> <li>• Measure the girth and estimate the height of 3 trees on campus using measuring tape and clinometer</li> <li>• Identify 10 timber species from leaf, bark, and wood samples and match botanical and local names</li> </ul> | <ul style="list-style-type: none"> <li>• Arrange forest nursery or plantation visit and guide species identification</li> <li>• Demonstrate clinometer use and girth measurement and supervise students</li> <li>• Facilitate species identification exercise using specimens and photographs</li> </ul> | <p>Forest nursery or plantation, clinometer, measuring tape, tree volume tables, wood samples, identification manual, field notebooks, transport, Practical manual etc.</p> |

|                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                              |                                                                                                                            |
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|                                                                                              | Teak, Gmelina, Shea butter, Pine etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                              |                                                                                                                            |
|                                                                                              | 3.5 Outline the structure and organisation of forest services in Nigeria                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                              |                                                                                                                            |
| <b>General Objective 4.0: Comprehend the historical development of fisheries in Nigeria.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                              |                                                                                                                            |
| 12 – 13                                                                                      | <p>4.1 Describe the status of fisheries resources and production in Nigeria: artisanal, aquaculture, and industrial fisheries</p> <p>4.2 Explain the importance of fish in human nutrition: protein, omega-3, vitamins, and role in food security</p> <p>4.3 Define rivers, flood plains, lake basins, lagoons, and estuaries and describe their fisheries potential</p> <p>4.4 Describe the physical, chemical, and biological properties of the aquatic environment: temperature, pH, dissolved oxygen, turbidity, plankton etc.</p> | <ul style="list-style-type: none"> <li>• Present Nigeria fish production statistics and explain the supply gap</li> <li>• Explain nutritional value of fish and its role in Nigerian food security</li> <li>• Define each water body type and describe its fisheries characteristics</li> <li>• Explain measurement of water quality parameters and their role in fish health</li> <li>• Engage students through questioning and short discussions</li> </ul> | FAOSTAT fisheries data, Nigeria fisheries reports, water body diagrams, aquatic ecology charts, water quality test kits, projector, etc. | <ul style="list-style-type: none"> <li>• Test water samples from a nearby stream or pond: measure temperature, pH, and dissolved oxygen and record results</li> <li>• Identify common fish species in Nigeria and state their water body habitat</li> <li>• Write a short report comparing water quality findings with standard values for fish production</li> </ul> | <ul style="list-style-type: none"> <li>• Guide water quality testing at a pond or stream and demonstrate use of test kits</li> <li>• Facilitate fish identification exercise using photographs and identification guide</li> <li>• Review water quality reports and give feedback</li> </ul> | Portable water quality test kit, sample containers, fish identification cards, notebooks, transport, Practical manual etc. |

**General Objective 5.0: Know current developments and emerging trends in Nigerian agriculture.**

|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                  |
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| 14 – 15 | <p>5.1 Explain digital and precision agriculture and give examples of ICT tools used in Nigerian farming: mobile apps, drones, sensors, GPS etc.</p> <p>5.2 Describe climate-smart agriculture and explain how Nigerian farmers are adapting to climate change</p> <p>5.3 Explain the One Health concept and its relevance to agriculture: the link between animal health, human health, plant health, and the environment</p> <p>5.4 Describe the importance of agribusiness and value chain development in modern Nigerian agriculture</p> <p>5.5 Explain the role of gender, youth, and social inclusion in agricultural</p> | <ul style="list-style-type: none"> <li>• Introduce digital agriculture tools with local Nigerian examples and video demonstrations</li> <li>• Explain climate-smart agriculture and discuss adaptation strategies used by Nigerian farmers</li> <li>• Explain the One Health concept using real disease outbreak examples from Nigeria</li> <li>• Discuss value chain development and agribusiness opportunities</li> <li>• Facilitate discussion on gender and youth in agriculture using current data</li> <li>• Present aquaculture growth data and discuss fish farming enterprise opportunities</li> </ul> | <p>Smartphones, agricultural apps, climate change charts, One Health materials, value chain diagrams, aquaculture data, projector, videos etc.</p> | <ul style="list-style-type: none"> <li>• Use a mobile phone app to record farm data for a campus plot: planting date, inputs used, and estimated yield</li> <li>• Write technical report on a visit to fish farm or aquaculture unit and observe and record production practices</li> <li>• Research one current agricultural development programme in Nigeria and present findings to the class</li> <li>• Conduct a simple One Health risk assessment on the campus farm and identify one animal-human-environment health linkage</li> </ul> | <ul style="list-style-type: none"> <li>• Guide students through mobile app data entry exercise on the campus farm</li> <li>• Arrange fish farm visit and guide observation of production practices</li> <li>• Assign development programme research and supervise class presentations</li> <li>• Guide One Health risk assessment exercise and facilitate class discussion on findings</li> </ul> | <p>Smartphones, farm management app, campus farm plot, fish farm or aquaculture unit, One Health risk assessment guide, presentation guide, field notebooks, transport, etc.</p> |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|  |                                                                                                                                             |                                                                       |  |  |  |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--|--|--|--|
|  | development in Nigeria<br>5.6 Describe the growth of aquaculture in Nigeria and its importance for food security and enterprise development | • Engage students through questioning and group discussion throughout |  |  |  |  |
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**COURSE ASSESSMENT:**

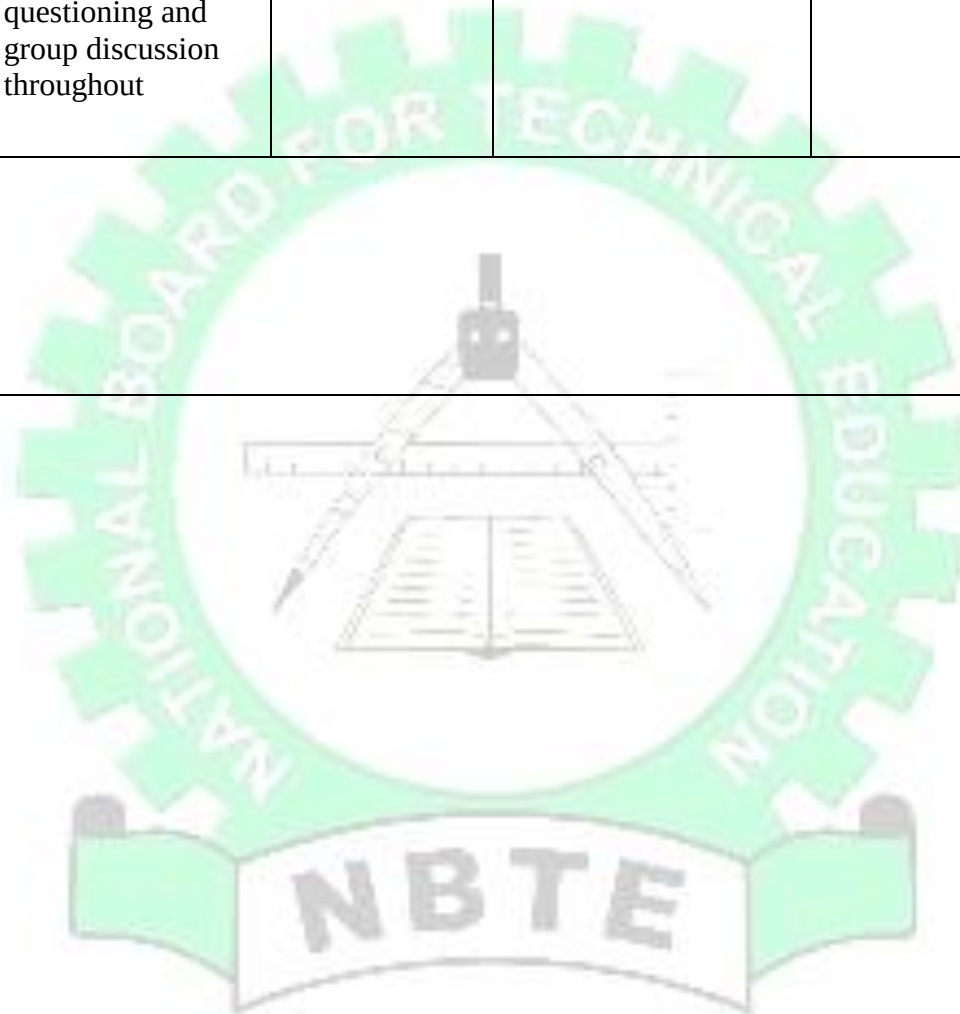
Course work: 10%

Test/Assignments: 10%

Practical: 40%

Examination: 40%

**Total: 100%**



## RESEARCH METHODS AND EXPERIMENTAL DESIGN

| PROGRAMME: AGRICULTURE COMMON COURSES — NATIONAL DIPLOMA (ND)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                    |
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| <b>Course Title: Research Methods and Experimental Design</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Course Code: AGR 201</b> | <b>Contact Hours: 2 Hours/Week</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Credit Unit: 2</b>       | <b>Theoretical: 1 Hour/Week</b>    |
| <b>Year: II      Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Pre-Requisite:</b>       | <b>Practical: 1 Hour/Week</b>      |
| <b>GOAL: This course is designed to provide students with the knowledge and skills required to design, conduct, and analyse agricultural research, enabling them to solve field problems and contribute to agricultural development.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                    |
| <b>GENERAL OBJECTIVES: On completion of this course, the students should be able to:</b> <ol style="list-style-type: none"> <li>1.0 Understand the basic concepts and importance of research in agriculture;</li> <li>2.0 Know how to identify and formulate research problems and hypotheses;</li> <li>3.0 Understand the different types of research designs and sampling techniques;</li> <li>4.0 Comprehend the methods of data collection in agricultural research;</li> <li>5.0 Understand the basic principles of experimental design (CRD, RCBD, etc);</li> <li>6.0 Understand the methods of data processing and analysis using descriptive and inferential statistics.;</li> <li>7.0 Know how to use modern digital tools and software for data analysis;</li> <li>8.0 Understand the principles of research reporting and technical writing.</li> </ol> |                             |                                    |

| PROGRAMME: NATIONAL DIPLOMA IN AGRICULTURAL TECHNOLOGY                                                                                                                                            |                                                                                                                                                         |                                                                                                                                                                   |                                                                                                                     |                                                                                                                                                                     |                                                                                                                                                                                            |                                                                                                                                                         |
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| Course Title: Research Methods and Experimental Design                                                                                                                                            |                                                                                                                                                         |                                                                                                                                                                   | Course Code: AGR 201                                                                                                |                                                                                                                                                                     | Contact Hours: 2 Hours/Week                                                                                                                                                                |                                                                                                                                                         |
|                                                                                                                                                                                                   |                                                                                                                                                         |                                                                                                                                                                   | Credit Unit: 2                                                                                                      |                                                                                                                                                                     | Theoretical: 1 Hour/Week                                                                                                                                                                   |                                                                                                                                                         |
| Year: II Semester: I                                                                                                                                                                              |                                                                                                                                                         |                                                                                                                                                                   | Pre-Requisite:                                                                                                      |                                                                                                                                                                     | Practical: 1 Hour/Week                                                                                                                                                                     |                                                                                                                                                         |
| Course Specification: Theoretical And Practical                                                                                                                                                   |                                                                                                                                                         |                                                                                                                                                                   |                                                                                                                     |                                                                                                                                                                     |                                                                                                                                                                                            |                                                                                                                                                         |
| GOAL: This course is designed to equip students with the knowledge and skills required to design, conduct, and analyse agricultural research, and to present research outcome in a logical order. |                                                                                                                                                         |                                                                                                                                                                   |                                                                                                                     |                                                                                                                                                                     |                                                                                                                                                                                            |                                                                                                                                                         |
| GENERAL OBJECTIVE 1.0: Understand the basic concepts and importance of research in agriculture                                                                                                    |                                                                                                                                                         |                                                                                                                                                                   |                                                                                                                     |                                                                                                                                                                     |                                                                                                                                                                                            |                                                                                                                                                         |
| THEORETICAL CONTENT                                                                                                                                                                               |                                                                                                                                                         |                                                                                                                                                                   |                                                                                                                     | PRACTICAL CONTENT                                                                                                                                                   |                                                                                                                                                                                            |                                                                                                                                                         |
| Week                                                                                                                                                                                              | Specific Learning Outcome                                                                                                                               | Teacher’s Activities                                                                                                                                              | Resources                                                                                                           | Specific Learning Outcome                                                                                                                                           | Teacher’s Activities                                                                                                                                                                       | Resources                                                                                                                                               |
| 1- 3                                                                                                                                                                                              | 1.1 Define research and its roles in agriculture.<br>1.2 Distinguish between basic, applied, and adaptive research.<br>1.3 Explain the aims of research | • Explain research and list the types of research<br>• Explain the impact of research on productivity of crop/livestock/fish etc<br>• Discuss ethics in research. | Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc. | • Conduct a simple search for agricultural research papers in the library or online.<br>• Identify the type of research (basic vs. applied) from provided abstracts | Guide students to:<br>• Conduct a simple search for agricultural research papers in the library or online.<br>• Identify the type of research (basic vs. applied) from provided abstracts. | Projector<br>Video/Audio devices<br>Models<br>Internet<br>Lecture notes<br>Charts<br>Pictures<br>Whiteboard<br>Marker<br>Computer, practical manual etc |
| General Objective 2.0: Know how to identify and formulate research problems and hypotheses.                                                                                                       |                                                                                                                                                         |                                                                                                                                                                   |                                                                                                                     |                                                                                                                                                                     |                                                                                                                                                                                            |                                                                                                                                                         |
| 4 – 6                                                                                                                                                                                             | 2.1 Discuss sources of research problems.<br>2.2 Formulate clear research objectives.<br>2.3 Explain the development of null                            | • Explain how to narrow down a broad topic into a specific problem statement                                                                                      | Textbooks, Journals, Internet, Articles, Projector, Computer,                                                       | • Formulate a research topic and state clear objectives<br>• Formulate hypotheses for the                                                                           | Guide students to<br>• Select a relevant agricultural problem (e.g., effect of fertilizer on maize).<br>Write clear                                                                        | Whiteboard, markers, worksheets, journals<br>Students’ projects                                                                                         |

|                                                                                                           |                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                           |                                                                                                                     |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                               |                                                                                                                                                               |
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|                                                                                                           | and alternative hypotheses.<br>1.4 Explain experimental error                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                           | Diagrams/charts, Marker board, Marker, Pictures, etc.                                                               | selected topic                                                                                                                                                                                                  | objectives and hypotheses for the selected topics.                                                                                                                                                                                            | Internet Magazines Newspapers, practical manual, etc.                                                                                                         |
| <b>General Objective 3.0: Understand the different types of research designs and sampling techniques.</b> |                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                           |                                                                                                                     |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                               |                                                                                                                                                               |
| 7 – 9                                                                                                     | 3.1 Explain research design<br>3.2 Give examples of research design<br>3.3 Explain the merits and demerits of various research design<br>3.4 Define population, sample, and sampling<br>3.5 Explain sampling techniques (Random, Stratified, Systematic, etc)<br>3.6 Explain the advantages and disadvantages of each type of sampling | <ul style="list-style-type: none"> <li>Explain research design and the different types of design used in Agricultural research e.g. experimental vs. non-experimental designs, studies, questionnaire, interview, home visits, observation etc</li> <li>Explain sampling and its relevance to research process</li> </ul> | Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc. | <ul style="list-style-type: none"> <li>Carry out research and select appropriate design for the study.</li> <li>Take representative sample of the study population and use it to generalize findings</li> </ul> | <ul style="list-style-type: none"> <li>Guide students to:</li> <li>Carry out a research and select appropriate design for the study.</li> <li>Take representative sample of the study population and use it to generalize findings</li> </ul> | Projector Text book Internet Lecture notes Charts Pictures Whiteboard Marker, seeds of different colors, sampling frames, calculators, practical manual, etc. |
| <b>General Objective 4.0: Comprehend the methods of data collection in agricultural research</b>          |                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                           |                                                                                                                     |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                               |                                                                                                                                                               |
| 10 – 12                                                                                                   | 4.1 Explain types of data                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Explain the different types of data source.</li> </ul>                                                                                                                                                                                                                             | Lecture notes Internets                                                                                             | <ul style="list-style-type: none"> <li>Demonstrate how to design a simple</li> </ul>                                                                                                                            | <ul style="list-style-type: none"> <li>Guide student to design a simple</li> </ul>                                                                                                                                                            | Sample questionnaires,                                                                                                                                        |

|                                                                                                                                   |                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                     |                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                 |
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|                                                                                                                                   | <p>4.2 Explain methods of data (Primary vs. Secondary, Qualitative vs. Quantitative).</p> <p>4.3 Explain tools used for data collection (Questionnaires, Interviews, Observations, Field measurements etc)</p> | <ul style="list-style-type: none"> <li>• Demonstrate how to design a simple questionnaire.</li> <li>• Explain the use of field notebooks.</li> </ul> | Whiteboards<br>Marker Charts                                                                                        | <p>questionnaire.</p> <ul style="list-style-type: none"> <li>• Record data of selected parameters</li> </ul>                                                                                                                                                                                                               | <p>questionnaire.</p> <ul style="list-style-type: none"> <li>• Record data of selected parameters</li> </ul>                                                                                                                                                                                                                                          | measuring tapes, field notebooks. Scales Vernier calipers                                                       |
| <b>General Objective 5.0: Understand the basic principles of experimental design</b>                                              |                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                     |                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                 |
| 13 – 15                                                                                                                           | <p>5.1 Explain the principles of Replication, Randomization, and Local Control.</p> <p>5.2 Describe Completely Randomized Design (CRD).</p> <p>5.3 Describe Randomized Complete Block Design (RCBD)</p>        | <ul style="list-style-type: none"> <li>• Explain using field layouts to show how plots are randomized and blocked</li> </ul>                         | Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc. | <ul style="list-style-type: none"> <li>• Mark out the field, the plan and the pegging</li> <li>• Layout a simple RCBD experiment in the field</li> <li>• Layout out a simple CRD experiment in the greenhouse or laboratory</li> <li>• Use a random number table or drawing lots to assign treatments to plots.</li> </ul> | <p>Guide students to:</p> <ul style="list-style-type: none"> <li>• Mark out the field, the plan and the pegging</li> <li>• Lay out a simple RCBD experiment in the field</li> <li>• Layout out a simple CRD experiment in the greenhouse or laboratory</li> <li>• Use a random number table or drawing lots to assign treatments to plots.</li> </ul> | <p>Pegs, ropes, measuring tapes, polybags, Petri dishes, random number tables. Tags, practical manual, etc.</p> |
| <b>General objective: 6.0 Understand the methods of data processing and analysis using descriptive and inferential statistics</b> |                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                     |                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                 |
|                                                                                                                                   | 6.1 Discuss Descriptive Statistics (Mean, Median, Mode,                                                                                                                                                        | <ul style="list-style-type: none"> <li>• Solve simple statistical problems on board.</li> <li>• Explain the use of specific</li> </ul>               | Textbooks, Journals, Internet,                                                                                      | <ul style="list-style-type: none"> <li>• Collect data for the experiment</li> <li>• Perform a manual t-</li> </ul>                                                                                                                                                                                                         | <p>Guide students to:</p> <ul style="list-style-type: none"> <li>• Calculate mean and standard deviation</li> </ul>                                                                                                                                                                                                                                   | Scientific calculators, statistical                                                                             |

|                                                                                                         |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                 |                                                                                                                                                                   |                                                                                                                                                  |                                                                                                                                                                                                                                                                               |                                                                        |
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|                                                                                                         | Standard Deviation).<br>6.2 Explain Inferential Statistics (t-test, ANOVA, chi-square).<br>6.3 Explain levels of significance (P-values).                                                  | tests.                                                                                                                                                                                                                                                          | Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, etc.                                                                              | test to compare two treatment means.                                                                                                             | for a set of crop yield data.<br>• Calculate t-test and ANOVA                                                                                                                                                                                                                 | tables.<br>Computer, practical manual, etc.                            |
| <b>General Objective: 7.0 Understand how to use modern digital tools and software for data analysis</b> |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                 |                                                                                                                                                                   |                                                                                                                                                  |                                                                                                                                                                                                                                                                               |                                                                        |
|                                                                                                         | 7.1 Explain spreadsheets (Excel/Google Sheets) for data entry<br>7.2 Explain the use of basic functions and formulas.<br>7.2 7.3 Explain how to Create charts and graphs (Bar, Line, Pie). | <ul style="list-style-type: none"> <li>• Explain the use of MS Excel and other software in data analysis.</li> <li>• Explain the use of basic functions and formulas in spreadsheet</li> <li>• Explain the use of charts and graphs (Bar, Line, Pie)</li> </ul> | Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts, Marker board, Marker, Pictures, Computer with necessary software application, etc. | <ul style="list-style-type: none"> <li>• Demonstrate data entry and chart creation using a projector.</li> </ul>                                 | <ul style="list-style-type: none"> <li>• Guide students to: Enter field data into a spreadsheet.</li> <li>• Create a bar chart comparing yields and a line graph showing growth over time.</li> <li>• Use Excel functions (AVERAGE, STDEV, ANOVA) to analyze data.</li> </ul> | Computers, spreadsheet software, LCD projector, practical manual, etc. |
| <b>General objective: 8.0 Know the principles of research reporting and technical writing</b>           |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                 |                                                                                                                                                                   |                                                                                                                                                  |                                                                                                                                                                                                                                                                               |                                                                        |
|                                                                                                         | 8.1 Explain the structure of a research report using the following format: Project Title, Acknowledgement, Abstract, Table of contents, List of                                            | <ul style="list-style-type: none"> <li>• Explain the procedure in reporting research outcomes based on some agreeable headlines.</li> </ul>                                                                                                                     | Textbooks, Journals, Internet, Articles, Projector, Computer, Diagrams/charts,                                                                                    | <ul style="list-style-type: none"> <li>• Report the outcome of research based on the agreeable headings</li> <li>• Interpret results.</li> </ul> | <ul style="list-style-type: none"> <li>• Guide students to: Report the outcome of research based on the agreeable headings</li> <li>• Interpret results.</li> <li>• Practice citing</li> </ul>                                                                                | Sample research reports, Published Journal articles, APA style guides. |

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|                                                                                                                                    | tables,<br>charts/figures, etc.                                                                                                                                                                           |  | Marker board,<br>Marker,<br>Pictures,<br>Published Journal<br>articles, samples<br>of past students'<br>projects, APA<br>style guides, etc. |  | sources using the<br>APA format |  |
|                                                                                                                                    | 8.2 List of<br>abbreviations,<br>Introduction,<br>Literature review-<br>Material and<br>method/<br>Methodology,<br>Results, Discussion,<br>Conclusion and<br>Recommendation,<br>References<br>Appendixes. |  |                                                                                                                                             |  |                                 |  |
|                                                                                                                                    | 8.3 Explain referencing<br>styles (APA,<br>Chicago, etc).                                                                                                                                                 |  |                                                                                                                                             |  |                                 |  |
| <b>COURSE ASSESSMENT:</b><br>Course work: 10%<br>Test/Assignments: 10%<br>Practical: 40%<br>Examination: 40%<br><b>Total: 100%</b> |                                                                                                                                                                                                           |  |                                                                                                                                             |  |                                 |  |

**FARM MANAGEMENT**

| <b>PROGRAMME: AGRICULTURE COMMON COURSES — HIGHER NATIONAL DIPLOMA (HND)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |                                    |
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| <b>Course Title: Farm Management</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Course Code: AGR 301</b> | <b>Contact Hours: 2 Hours/week</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Credit Unit: 2</b>       | <b>Theoretical: 1 Hour/week</b>    |
| <b>Year: I      Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Pre-requisite:</b>       | <b>Practical: 1 Hour/week</b>      |
| <b>GOAL:</b> This course is designed to provide students with knowledge and skills on farm management, enterprise planning, budgeting and farm record keeping for efficient and profitable agricultural operations.                                                                                                                                                                                                                                                                                                     |                             |                                    |
| <b>GENERAL OBJECTIVES:</b> On completion of this course, the students should be able to: <ol style="list-style-type: none"> <li>1.0 Understand the meaning and scope of farm management.</li> <li>2.0 Know the principles of farm planning and budgeting.</li> <li>3.0 Understand farm records and their importance.</li> <li>4.0 Understand enterprise analysis and partial budgeting.</li> <li>5.0 Know agricultural credit and finance.</li> <li>6.0 Understand farm business organization and management</li> </ol> |                             |                                    |

| PROGRAMME: AGRICULTURE COMMON COURSES — HIGHER NATIONAL DIPLOMA (HND)                                                                                                                                        |                                                                                                                                                                             |                                                                                                    |                                                                                               |                                                                                   |                                                                                                      |                                                                              |
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| Course Title: Farm Management                                                                                                                                                                                |                                                                                                                                                                             | COURSE CODE: AGR 301                                                                               |                                                                                               |                                                                                   | Contact Hours: 2 Hours/week                                                                          |                                                                              |
|                                                                                                                                                                                                              |                                                                                                                                                                             | Credit Unit: 2                                                                                     |                                                                                               |                                                                                   | Theoretical: 1 Hours/week                                                                            |                                                                              |
| Year: I                                                                                                                                                                                                      | Semester: I                                                                                                                                                                 | Pre-requisite:                                                                                     |                                                                                               |                                                                                   | Practical: 1 Hour/week                                                                               |                                                                              |
| COURSE SPECIFICATION: THEORETICAL AND PRACTICAL                                                                                                                                                              |                                                                                                                                                                             |                                                                                                    |                                                                                               |                                                                                   |                                                                                                      |                                                                              |
| GOAL: This course is designed to provide students with knowledge and skills on farm management, enterprise planning, budgeting and farm record keeping for efficient and profitable agricultural operations. |                                                                                                                                                                             |                                                                                                    |                                                                                               |                                                                                   |                                                                                                      |                                                                              |
| GENERAL OBJECTIVE 1.0: Understand the meaning and scope of farm management.                                                                                                                                  |                                                                                                                                                                             |                                                                                                    |                                                                                               |                                                                                   |                                                                                                      |                                                                              |
| THEORETICAL CONTENT                                                                                                                                                                                          |                                                                                                                                                                             |                                                                                                    |                                                                                               | PRACTICAL CONTENT                                                                 |                                                                                                      |                                                                              |
| Week                                                                                                                                                                                                         | Specific Learning Outcome                                                                                                                                                   | Teacher’s Activities                                                                               | Resources                                                                                     | Specific Learning Outcome                                                         | Teacher’s Activities                                                                                 | Resources                                                                    |
|                                                                                                                                                                                                              | 1.1 Define farm management                                                                                                                                                  | Explain the concept of farm management                                                             | Textbooks, white/smart board, projector, farm management case studies from ADPs, videos, etc. | Identify management problems from a given a case study of a small-scale crop farm | Guide students to: Identify management problems from a given a case study of a small-scale crop farm | Farm management case study handout, calculator, notebooks, smartphones, etc. |
|                                                                                                                                                                                                              | 1.2 Explain the scope of farm management                                                                                                                                    | Discuss the scope and goals of farm management:                                                    |                                                                                               | Identify how each management principle applies to improve profitability           |                                                                                                      |                                                                              |
|                                                                                                                                                                                                              | 1.3 Explain the goals of farm management                                                                                                                                    | Distinguishing it from agricultural economics;                                                     |                                                                                               |                                                                                   |                                                                                                      |                                                                              |
|                                                                                                                                                                                                              | 1.4 Describe the role of a farm manager:                                                                                                                                    | Discuss the goals of farm management: profit maximization, risk minimization, sustainability, etc. |                                                                                               | Visit to a model farm to understudy the management operations of the farm         |                                                                                                      |                                                                              |
|                                                                                                                                                                                                              | 1.5 Explain the principles of farm management:<br>- Law of diminishing returns<br>- Principle of substitution<br>- Principle of opportunity cost<br>- Equi-marginal returns | Describe the role farm manager with agricultural examples;                                         |                                                                                               |                                                                                   |                                                                                                      |                                                                              |

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|                                                                                   |                                                                                                              | planning, organizing, directing, controlling, etc                                                                                                                                                  |                                                                                                                            |                                                                                                                                                          |                                                                                                                                                      |                                                                                                      |
|                                                                                   |                                                                                                              | Explain the principles of farm management with numerical farm examples showing graphically how diminishing returns operates                                                                        |                                                                                                                            |                                                                                                                                                          |                                                                                                                                                      |                                                                                                      |
| <b>General Objective 2.0: Know the principles of farm planning and budgeting.</b> |                                                                                                              |                                                                                                                                                                                                    |                                                                                                                            |                                                                                                                                                          |                                                                                                                                                      |                                                                                                      |
|                                                                                   | 2.1 Describe the farm planning process: objectives, resource inventory, enterprise selection, implementation | Explain farm planning steps: define objectives, inventory land/labour/capital, select enterprises, fixed vs variable costs; define gross margin = gross income – variable costs; guide calculation | Farm plan templates, budget worksheets, calculator, market price data, textbooks, white/smart board, markers, videos, etc. | Prepare a complete enterprise budget for one (1) ha crop production enterprise using provided input costs and market price                               | Guide students to:<br><br>Prepare a complete enterprise budget for one (1) ha crop production enterprise using provided input costs and market price | Enterprise budget template, market price data, calculator, spreadsheet, smartphones, computers, etc. |
|                                                                                   | 2.2 Define enterprise budget: fixed costs, variable costs, gross income, gross margin                        | Explain whole-farm budget: sum of enterprise budgets minus overhead costs                                                                                                                          |                                                                                                                            | Prepare a one (1) ha farm plan: enterprise mix, input requirements, labour, calendar                                                                     | Prepare a one (1) ha farm plan: enterprise mix, input requirements, labour, calendar                                                                 |                                                                                                      |
|                                                                                   | 2.3 Explain break-even analysis and payback period                                                           | Explain break-even price, break-even yield and payback period; show formula and example                                                                                                            |                                                                                                                            | Calculate gross margin and Return on Investment (ROI) of a given farm enterprise<br><br>Calculate break-even yield and break-even price for a given crop | Calculate gross margin and Return on Investment                                                                                                      |                                                                                                      |

|                                                                             |                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                      |
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|                                                                             |                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                        | enterprise                                                                                                                                                                                                                                                                                                                                                                                           | (ROI) of a given farm enterprise<br><br>Calculate break-even yield and break-even price for the tomato enterprise                                                                                                                                                                                                          |                                                                                                                                                      |
| <b>General Objective 3.0: Understand farm records and their importance.</b> |                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                      |
|                                                                             | <p>3.1 Explain the importance of farm records for management, credit access and tax</p> <p>3.2 Describe types of farm records:</p> <p>3.3 Explain farm statement of financial position and statement of profit or loss</p> | <p>Explain how records support decision-making, loan applications and tax compliance</p> <p>Describe each record type with examples:</p> <ul style="list-style-type: none"> <li>- Physical records (production, stock, labour, timesheet, stock register, etc.)</li> <li>- Financial records (cash book, inventory, income and expenditure, depreciation, harvest record, etc.)</li> <li>- Biological/performance records</li> </ul> <p>Discuss farm statement of financial position and statement of profit or</p> | <p>Farm record templates (cash book, stock register, labour timesheet), calculator, accounting textbooks, videos, white/smart board, markers, etc.</p> | <p>Prepare a record of 10 hypothetical farm transactions in a cash book</p> <p>Calculate closing balance of a given case study</p> <p>Use a case study to demonstrate double-entry cash book: debit (income), credit (expenditure), balance</p> <p>Prepare a simple statement of financial position for a farm with given assets (land, equipment, stocks) and liabilities (loans, trade credit)</p> | <p>Guide cash book exercise</p> <p>Demonstrate correct debit/credit entries</p> <p>Demonstrate double-entry cash book: debit (income), credit (expenditure), balance</p> <p>Guide preparation of statement of financial position (assets vs liabilities) and statement of profit or loss (revenue – expenses = profit)</p> | <p>Cash book template, statement of financial position template, calculator, transaction list, computer, financial soft wares, smartphones, etc.</p> |

|                                                                                     |                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                       |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |                                                                                                                                        |
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|                                                                                     |                                                                                                                                                                                                                                                                                                                         | loss                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                       |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |                                                                                                                                        |
| <b>General Objective 4.0: Understand enterprise analysis and partial budgeting.</b> |                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                       |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |                                                                                                                                        |
|                                                                                     | <p>4.1 Define enterprise analysis</p> <p>4.2 Explain the preparation and interpretation of an enterprise gross margin analysis</p> <p>4.3 Define partial budgeting</p> <p>4.4 Explain the use of partial budgeting in farm management</p> <p>4.5 Explain sensitivity analysis and its application to farm decisions</p> | <p>Explain enterprise analysis in farm management</p> <p>Explain identification of the most profitable enterprise: calculate gross margin (GM) for multiple enterprises; rank by GM/ha and GM/unit of scarce resource</p> <p>Explain partial budget and its uses in farm management; 4 quadrants: added returns, added costs, reduced returns, reduced costs</p> <p>Explain sensitivity analysis: vary one input (e.g. price, yield) and recalculate GM; identify risk threshold</p> | <p>Enterprise budget worksheets, partial budget template, calculator, market price data, videos, white/smart board, markers, etc.</p> | <p>Calculate and compare gross margins for any three enterprises using provided data</p> <p>Identify the most profitable enterprise for a smallholder</p> <p>Prepare a partial budget for introducing drip irrigation on a vegetable farm</p> <p>Interpret net change in income</p> | <p>Guide gross margin comparison; facilitate enterprise ranking discussion</p> <p>Guide partial budget preparation; discuss net income change interpretation</p> | <p>Enterprise budget worksheets, partial budget template, calculator, market data, computer, financial softwares, smartphones, etc</p> |
| <b>General Objective 5.0: Know agricultural credit and finance.</b>                 |                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                       |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |                                                                                                                                        |

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|                                                                                    | <p>5.1 Explain credit and its importance in agriculture</p> <p>5.2 Explain the classification of agricultural credit.</p> <p>5.3 Describe the sources of agricultural credit in Nigeria</p> <p>5.4 Explain the conditions for accessing agricultural credit: collateral, business plan, FIRS tax clearance</p> <p>5.5 Explain simple and compound interest on agricultural loans</p> | <ul style="list-style-type: none"> <li>• Explain credit and its importance in agriculture</li> <li>• Explain the classification of agricultural credit by: time (short, medium, long-term), source (formal, informal, etc), purpose</li> <li>• Describe sources of agricultural credit in Nigeria:- CBN AGSMEIS, BOA, NIRSAL, microfinance banks, cooperative societies, aggregators, input dealers, etc</li> <li>• Explain conditions for accessing agricultural credit: collateral, business plan, FIRS tax clearance</li> <li>• Calculate simple and compound interest on agricultural loans</li> </ul> | <p>CBN AGSMEIS guidelines, BOA loan application form, cooperative credit guide, interest calculation worksheets, white/smart board, markers, videos, etc.</p> | <p>Calculate simple and compound interest on a loan at a given interest rate per annum for 3 years; compare total interest paid</p> <p>Carry out complete a simulated AGSMEIS loan application form for a farm enterprise</p> | <p>Guide interest calculations; review and compare results</p> <p>Facilitate loan application exercise; review completeness and accuracy</p> | <p>Interest calculation worksheet, calculator; AGSMEIS application form, business plan template, computer, smartphones, etc.</p> |
| <b>General Objective 6.0: Understand farm business organization and management</b> |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                               |                                                                                                                                                                                                                               |                                                                                                                                              |                                                                                                                                  |

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|                                                                                                             | <p>6.1 Describe forms of farm business organisation:<br/>- Sole proprietorship, partnership, cooperative, limited liability company</p> <p>6.2 Explain advantages and disadvantages of each business form</p> <p>6.3 Explain cooperative societies: types, principles, registration, governance</p> <p>6.4 Describe risk in agriculture and methods of risk management:<br/>- farm insurance, diversification, contract farming, hedging</p> <p>6.5 Explain labour management in agriculture: hiring, supervision, motivation, piece-rate vs daily wage</p> | <p>Explain forms of farm business organisation:<br/>- Sole proprietorship, partnership, cooperative, limited liability company</p> <p>Discuss advantages and disadvantages of each business form</p> <p>Discuss cooperative societies: types, principles, registration, governance</p> <p>Define risk; categorise: price risk, production risk, human/institutional risk; describe each management strategy</p> <p>Explain farm labour planning: labour calendar, gantt chart; discuss wage determination; explain piece-rate advantages for harvesting</p> | <p>Business registration guide, cooperative bye-law sample, crop insurance brochures, labour calendar template, textbooks, videos, white/smart board, marker, etc,</p> | <p>Design a model cooperative bye-law for a 20-member vegetable growers' cooperative; include objectives, membership criteria, share structure and governance</p> <p>Prepare a labour calendar for a 2 ha farm showing peak labour periods and estimated labour days</p> | <p>Facilitate cooperative bye-law design exercise; review for completeness</p> <p>Guide labour calendar preparation; discuss seasonal labour peaks and solutions</p> | <p>Cooperative bye-law template, CAC registration guide; labour calendar template, financial app, calendar, computer, smartphones, etc.</p> |
| <p><b>COURSE ASSESSMENT:</b></p> <p>Course work: 10%</p> <p>Test/Assignments: 10%</p> <p>Practical: 40%</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                        |                                                                                                                                                                                                                                                                          |                                                                                                                                                                      |                                                                                                                                             |

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| Examination:  | 40%         |
| <b>Total:</b> | <b>100%</b> |



**ANNUAL CROPS**

| <b>PROGRAMME: AGRICULTURE COMMON COURSES — HIGHER NATIONAL DIPLOMA (HND)</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |                                    |
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| <b>Course Title: Annual Crops</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Course Code: AGR 302</b> | <b>Contact Hours: 3 Hours/week</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Credit Unit: 3</b>       | <b>Theoretical: 1 Hour/week</b>    |
| <b>Year: I      Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Pre-requisite:</b>       | <b>Practical: 2 Hours/week</b>     |
| <b>GOAL:</b> This course is designed to equip students with in-depth knowledge and practical skills in the production, management and post-harvest handling of the major annual food crops of economic importance in Nigeria.                                                                                                                                                                                                                                                                            |                             |                                    |
| <b>GENERAL OBJECTIVES:</b> On completion of this course, the students should be able to: <ol style="list-style-type: none"> <li>1.0 Know the classification and importance of annual crops.</li> <li>2.0 Understand the agronomy of major cereal crops.</li> <li>3.0 Understand the agronomy of major legume and oilseed crops.</li> <li>4.0 Know the production of major root and tuber crops.</li> <li>5.0 Understand integrated crop management and post-harvest handling of annual crops.</li> </ol> |                             |                                    |

| PROGRAMME: AGRICULTURE COMMON COURSES — HIGHER NATIONAL DIPLOMA (HND)                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |                                                                                                                                                |                                                                                                             |                                                                                                                                                 |
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| Course Title: Annual Crops                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | COURSE CODE: AGR 302                                                                                                                                                                                                                                                                                                          |                                                                                                                                       |                                                                                                                                                | 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 equip students with in-depth knowledge and practical skills in the production, management and post-harvest handling of the major annual food crops of economic importance in Nigeria. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |                                                                                                                                                |                                                                                                             |                                                                                                                                                 |
| GENERAL OBJECTIVE 1.0: Know the classification and importance of annual crops.                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |                                                                                                                                                |                                                                                                             |                                                                                                                                                 |
| THEORETICAL CONTENT                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                       | PRACTICAL CONTENT                                                                                                                              |                                                                                                             |                                                                                                                                                 |
| Week                                                                                                                                                                                                                   | Specific Learning Outcome                                                                                                                                                                                                                                                                                                                                                                                                                                        | Teacher’s Activities                                                                                                                                                                                                                                                                                                          | Resources                                                                                                                             | Specific Learning Outcome                                                                                                                      | Teacher’s Activities                                                                                        | Resources                                                                                                                                       |
| 1 - 2                                                                                                                                                                                                                  | 1.1 Define annual crops<br>1.2 Describe annual, biennial and perennial crops<br>1.3 Explain the classification of annual crops by:<br>- Botanical family<br>- Economic use (cereals, legumes, oilseeds, roots and tubers, vegetables, fibre)<br>- Cropping season (long season, short season)<br>1.4 Explain the economic and food security importance of annual crops in Nigeria<br>1.5 List major annual crops grown in Nigeria with local and botanical names | • Explain annual crops and distinguish biennial and perennial crops<br><br>• Explain the classification of annual crops using botanical names: Poaceae (cereals), Fabaceae (legumes), Euphorbiaceae (cassava); explain each economic use group<br><br>• Discuss Nigeria's food production statistics; explain contribution of | Textbooks, FAOSTAT Nigeria crop production data, classification charts, projector, white/smart board, markers, internet, videos, etc. | Identify 15 annual crop specimens (seeds or fresh plant) by local and botanical name; classify each by economic use group and botanical family | Provide 15 labelled specimens; guide identification exercise; facilitate class discussion on classification | Annual crop specimens (seeds, dried plants), identification charts, classification table template, annual crops samples, smartphones, PPE, etc. |

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|                                                                              |                                                                                                                                                                                                                                                                                                                                    | annual crops to GDP, employment and export<br>• Explain major annual crops grown in Nigeria with local and botanical names:<br><i>Zea mays</i> (maize), <i>Sorghum bicolor</i> (sorghum), <i>Pennisetum glaucum</i> (millet), <i>Oryza sativa</i> (rice), <i>Vigna unguiculata</i> (cowpea), <i>Glycine max</i> (soybean), <i>Manihot esculenta</i> (cassava), <i>Ipomea batatas</i> (sweet potato) |                                                                                                                                          |                                                                                                                                                                                                                                                                              |                                                                                                                                                                                        |                                                                                                                 |
| <b>General Objective 2.0: Understand the agronomy of major cereal crops.</b> |                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                          |                                                                                                                                                                                                                                                                              |                                                                                                                                                                                        |                                                                                                                 |
| 3 - 5                                                                        | 2.1 Describe the botany, ecology and varieties of maize ( <i>Zea mays</i> ):<br>- Growth stages (V1–VT–R1–R6)<br>- Improved varieties: SAMMAZ, OBA series, Tela Maize (a GMO seed), etc.<br>2.2 Explain agronomic practices for maize:<br>- Land preparation, planting (75×25 cm), fertilization (N-P-K), weed control, irrigation | Describe maize morphology, growth stages, photoperiod sensitivity, ecological zones; present SAMMAZ, OBA varieties<br>Explain land preparation (0–30 cm depth); planting: 75×25 cm, 1 seed/hole; fertilizer: 2 bags NPK 15:15:15 + 2 bags urea/ha; weed                                                                                                                                             | Maize, rice, sorghum and millet plots on school farm, fertilizer labels, herbicide labels, pheromone traps, Plantix app, IITA production | Establish maize and cowpea plots at recommended spacing; apply basal fertilizer; carry out weed control; scout for FAW using Plantix app; record infestation; apply appropriate control<br>Harvest maize at physiological maturity; thresh manually; measure grain moisture; | Guide plot establishment, fertilizer calculation and application; supervise weed control operations<br>Demonstrate FAW scouting; supervise harvesting, threshing and yield calculation | School farm plots, NPK fertilizer, urea, herbicide (atrazine), measuring tape, knapsack sprayer, PPE; smartphon |

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|                                                                                          | <p>2.3 Describe production of rice (upland, lowland, irrigated systems)</p> <p>2.4 Describe production of sorghum and pearl millet: varieties, management, bird control</p> <p>2.5 Explain fall armyworm (FAW) management in cereals using IPM</p>                                                 | <p>control: atrazine pre-emergence</p> <p>Describe upland, lowland and irrigated rice systems; explain NERICA varieties, puddling, transplanting</p> <p>Explain sorghum and millet varieties, planting season, spacing, fertilizer, bird damage and bird-scaring</p> <p>Explain FAW biology; describe scouting, economic threshold, pheromone traps, Bt and chemical control</p> | guides                                                                                                                                      | calculate yield per hectare                                                                                                                                                                                                                                                                    |                                                                                                                                                                                     | <p>es (Plantix), pheromone traps; harvesting tools, moisture meter, weighing scale</p>                                |
| <b>General Objective 3.0: Understand the agronomy of major legume and oilseed crops.</b> |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                             |                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                     |                                                                                                                       |
| 6 - 8                                                                                    | <p>3.1 Explain the botany, ecology and varieties of cowpea (<i>Vigna unguiculata</i>):</p> <p>3.2 Explain agronomic practices for cowpea: spacing, fertilization (P only), IPM</p> <p>3.3 Describe production of soybean (<i>Glycine max</i>): varieties, rhizobium inoculation, herbicide use</p> | <ul style="list-style-type: none"> <li>Describe cowpea morphology, nodulation, ecological requirements, varieties, etc.</li> <li>Explain cowpea spacing (75×20 cm); phosphate fertilizer only (no N needed); major pests: pod-borer, bruchid; IPM strategies</li> </ul>                                                                                                          | <p>Cowpea, soybean, groundnut, sesame plots; rhizobium inoculant, phosphate fertilizer, aflatoxin test strips, weighing scale, IITA/IAR</p> | <p>Inoculate soybean seeds with Rhizobium culture; plant at 60×5 cm; count and weigh nodules at 6 WAP; compare nodulation with uninoculated control</p> <p>Carry out earthing-up operation on groundnut plots at 3 WAP; harvest at physiological maturity; calculate pod yield per hectare</p> | <p>Demonstrate Rhizobium inoculation; guide planting; supervise nodule counting and comparison</p> <p>Demonstrate earthing-up technique; guide harvesting and yield calculation</p> | <p>Soybean seeds, Rhizobium culture, cowpea plots, measuring tape; groundnut plots, earthing-up tools, harvesting</p> |

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|                                                                                  | <p>3.4 Explain groundnut (<i>Arachis hypogaea</i>) production: varieties, earthing-up, aflatoxin management</p> <p>3.5 Describe sesame (<i>Sesamum indicum</i>) production and export potential</p>          | <ul style="list-style-type: none"> <li>• Explain soybean varieties; Rhizobium inoculation method; herbicide: bentazon; harvest at 90% pod yellowing</li> <li>• Describe groundnut varieties; explain earthing-up to aid peg penetration; aflatoxin control: timely harvest, proper drying</li> <li>• Describe sesame varieties, single-stem vs branching types, dehiscence management for seed harvesting; export market</li> </ul> | variety catalogues                                                       |                                                                                                                                                                                     |                                                                                                                                                                     | tools, weighing scale                                                                        |
| <b>General Objective 4.0: Know the production of major root and tuber crops.</b> |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                          |                                                                                                                                                                                     |                                                                                                                                                                     |                                                                                              |
| 9 - 11                                                                           | <p>4.1 Describe the botany, ecology and varieties of cassava</p> <p>4.2 Explain cassava agronomy: land preparation, planting, fertilization, weed control, harvesting, pest and disease management, etc.</p> | <ul style="list-style-type: none"> <li>• Describe the botany, ecology and varieties of cassava (<i>Manihot esculenta</i>):</li> <li>- Improved varieties: TMS 30572, IITA TMEB varieties, Pro-vitamin A cassava</li> </ul>                                                                                                                                                                                                          | Textbooks, Projector, white/smart board, markers, internet, videos, etc. | <p>Establish a 5x10 m cassava farm carrying out all production and management practices. Record growth parameters at regular interval</p> <p>Prepare yam mounds and plant setts</p> | <p>Guide students to:</p> <p>Establish a 5x10 m cassava farm carrying out all production and management practices. Record growth parameters at regular interval</p> | <p>Cassava stems, NPK fertilizer, herbicides, measuring tape, ruler; yam mounds, ridger,</p> |

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|                                                                                                                | <p>4.3 Describe yam (<i>Dioscorea spp.</i>) production</p> <p>4.4 Explain sweet potato (<i>Ipomoea batatas</i>) production</p>                | <ul style="list-style-type: none"> <li>• Explain cassava agronomy: land preparation, planting (stem cuttings), fertilization, weed control, harvesting, disease (CMD, CBSD) and pest management (cassava mealybug, green mite)</li> <li>• Describe yam (<i>Dioscorea spp.</i>) production: varieties, sett preparation, staking, earthing-up, harvest</li> <li>• Explain sweet potato (<i>Ipomoea batatas</i>) production: varieties, vine cutting propagation, management</li> </ul> |                                                          | <p>Carry out staking and earth-up at 6 WA</p> <p>Prepare field production records</p> | <p>Prepare yam mounds and plant setts</p> <p>Carry out staking and earth-up at 6 WA</p> <p>Prepare field production records</p> | <p>tractors, planters, sweet potato vines, cassava disease guide, Plantix app, yam setts, stakes, hoes, weighing scale, PPE, smartphones, etc.</p> |
| <b>General Objective 5.0: Understand integrated crop management and post-harvest handling of annual crops.</b> |                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                                                                       |                                                                                                                                 |                                                                                                                                                    |
| 12 - 15                                                                                                        | <p>5.1 Explain Integrated Crop Management (ICM): agronomic practices, variety selection, fertilization and IPM interact to optimise yield</p> | <ul style="list-style-type: none"> <li>• Explain ICM and how agronomic practices, variety selection, fertilization and IPM</li> </ul>                                                                                                                                                                                                                                                                                                                                                 | <p>Textbooks, Projector, white/smart board, markers,</p> | <p>Prepare an integrated crop management (ICM) plan for a major annual crop</p>       | <p>Guide students to: Prepare an integrated crop management (ICM) plan for a major</p>                                          | <p>Manuals, Thresher, moisture meter, hermetic</p>                                                                                                 |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                 |
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|  | <p>5.2 Identify major post-harvest losses in annual crops and describe their causes</p> <p>5.3 Describe post-harvest handling for cereals: threshing, drying, cleaning, storage in hermetic bags/silos</p> <p>5.4 Describe post-harvest handling for legumes: shelling, cleaning, treatment with Actellic dust, hermetic storage</p> <p>5.5 Explain value addition for annual crops: maize flour, garri, soy milk, groundnut oil extraction</p> <p>5.6 Explain equipment and quality control measures during value addition of annual crops</p> | <p>interact to optimise yield</p> <ul style="list-style-type: none"> <li>• Identify major post-harvest losses in annual crops and describe their causes</li> <li>• Describe post-harvest handling for cereals: threshing, drying, cleaning, storage in hermetic bags/silos</li> <li>• Describe post-harvest handling for legumes: shelling, cleaning, treatment with Actellic dust, hermetic storage</li> <li>• Explain value addition for annual crops: maize flour, garri, soy milk, groundnut oil extraction</li> <li>• Explain equipment and quality control measures during value addition of annual crops</li> </ul> | <p>internet, videos, etc.</p> | <p>Carry out cowpea shelling; cleaning; treating with Actellic 2% dust at 1 g/kg; hermetic storage; fumigation with Phostoxin</p> <p>Determine the measure moisture content before and after drying</p> <p>Carry out storage in hermetic bag</p> <p>Carry out processing of 2 kg soybeans into soy milk: soak, blend, filter, boil, add flavour; assess quality</p> <p>Determine percentage post-harvest loss from a stored maize sample compared with initial weight</p> <p>Prepare record of processing activities</p> | <p>annual crop</p> <p>Carry out cowpea shelling; cleaning; treating with Actellic 2% dust at 1 g/kg; hermetic storage; fumigation with Phostoxin</p> <p>Determine the measure moisture content before and after drying</p> <p>Carry out storage in hermetic bag</p> <p>Carry out processing of 2 kg soybeans into soy milk: soak, blend, filter, boil, add flavour; assess quality</p> <p>Determine percentage post-harvest loss from a stored maize sample compared with initial weight</p> | <p>bags; soybeans, blender, filter cloth, cooker, threshers, flavour; weighing scale, PHL calculation sheet, Actellic dust, silo, processing equipment (grater, press, mill), quality testing tools, PPE, smartphones, etc.</p> |
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|                                                                                                                                    |  |  |  |  | Prepare record of processing activities |  |
| <b>COURSE ASSESSMENT:</b><br>Course work: 10%<br>Test/Assignments: 10%<br>Practical: 40%<br>Examination: 40%<br><b>Total: 100%</b> |  |  |  |  |                                         |  |



**FIELD EXPERIMENTATION AND DATA ANALYSIS**

| <b>PROGRAMME: AGRICULTURE COMMON COURSES — HIGHER NATIONAL DIPLOMA (HND)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |                                    |
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| <b>Course Title: Field Experimentation and Data Analysis</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Course Code: AGR 303</b> | <b>Contact Hours: 2 Hours/week</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Credit Unit: 2</b>       | <b>Theoretical: 1 Hour/week</b>    |
| <b>Year: I      Semester: II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Pre-requisite:</b>       | <b>Practical: 1 Hour/week</b>      |
| <b>GOAL:</b> This course is designed to equip students with the principles of field experimentation, statistical data collection, analysis and interpretation for applied agricultural research.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                                    |
| <b>GENERAL OBJECTIVES:</b> On completion of this course, the students should be able to: <ol style="list-style-type: none"> <li>1.0 Understand the principles and importance of agricultural experimentation.</li> <li>2.0 Know the basic experimental designs used in agricultural research.</li> <li>3.0 Understand data collection methods and measurement in field experiments.</li> <li>4.0 Know the application of basic descriptive and inferential statistical methods to agricultural data.</li> <li>5.0 Understand analysis of variance (ANOVA) and mean separation techniques.</li> <li>6.0 Know correlation, regression and non-parametric methods.</li> <li>7.0 Understand the preparation and presentation of research reports.</li> </ol> |                             |                                    |

| PROGRAMME: AGRICULTURE COMMON COURSES — HIGHER NATIONAL DIPLOMA (HND)                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                          |                                                                                                                                                                                                              |                                                                                                                                                                                                                                    |                                                     |
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| Course Title: Field Experimentation and Data Analysis                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                | Course Code: AGR 303                                                                                                                                                                                                                                                                                                                  |                                                                                                                          |                                                                                                                                                                                                              | Contact Hours: 2 Hours/week                                                                                                                                                                                                        |                                                     |
|                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                | Credit Unit: 2                                                                                                                                                                                                                                                                                                                        |                                                                                                                          |                                                                                                                                                                                                              | Theoretical: 1 Hour/week                                                                                                                                                                                                           |                                                     |
| Year: I                                                                                                                                                                                   | Semester: II                                                                                                                                                                                                                                                                                                                                                                                   | Pre-requisite:                                                                                                                                                                                                                                                                                                                        |                                                                                                                          |                                                                                                                                                                                                              | Practical: 1 Hour/week                                                                                                                                                                                                             |                                                     |
| COURSE SPECIFICATION: THEORETICAL AND PRACTICAL                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                          |                                                                                                                                                                                                              |                                                                                                                                                                                                                                    |                                                     |
| GOAL: This course is designed to equip students with the principles of field experimentation, statistical data collection, analysis and interpretation for applied agricultural research. |                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                          |                                                                                                                                                                                                              |                                                                                                                                                                                                                                    |                                                     |
| GENERAL OBJECTIVE 1.0: Understand the principles and importance of agricultural experimentation.                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                          |                                                                                                                                                                                                              |                                                                                                                                                                                                                                    |                                                     |
| THEORETICAL CONTENT                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                          | PRACTICAL CONTENT                                                                                                                                                                                            |                                                                                                                                                                                                                                    |                                                     |
| Week                                                                                                                                                                                      | Specific Learning Outcome                                                                                                                                                                                                                                                                                                                                                                      | Teacher’s Activities                                                                                                                                                                                                                                                                                                                  | Resources                                                                                                                | Specific Learning Outcome                                                                                                                                                                                    | Teacher’s Activities                                                                                                                                                                                                               | Resources                                           |
| 1-2                                                                                                                                                                                       | 1.1 Define field experimentation and explain its importance in agricultural research<br>1.2 Explain the three basic principles of experimental design:<br>- Replication<br>- Randomization<br>- Local control (blocking)<br>1.3 Explain the following terms: treatments, experimental units, plots and blocks<br>1.4 Explain the sources of experimental error and methods of minimising error | • Explain field experimentation; and how it provides evidence for causal relationships between treatments and outcomes<br>• Explain each principle: replication estimates error, randomization eliminates bias, local control reduces environmental variation<br>• Describe treatment, experimental unit, plot, block, replicate with | Textbooks, field layout diagrams, projector, white/smart board, marker, case studies from IITA/IAR research, videos, etc | • Identify two or three directional slopes<br>• Propose the direction of blocks for a particular slope to improve precision.<br>• Take right-angles with ropes, tapes and ranging poles<br>• Prepare reports | Guide students to:<br>• Identify two or three directional slopes<br>• Propose the direction of blocks for a particular slope to improve precision.<br>• Take right-angles with ropes, tapes and ranging poles<br>• Prepare reports | Farmland , Tapes, Poles, Ropes, Pegs, Cutlass, GPS, |

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|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>examples from crop, soil and livestock experiments</p> <ul style="list-style-type: none"> <li>• Explain biological, mechanical and human sources of error; describe border rows, discards, guard rows, buffers, uniformity trials and plot size optimization</li> </ul>                                                                                              |                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                             |
| <b>General Objective 2.0: Know the basic experimental designs used in agricultural research.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                             |
| 2-4                                                                                              | <p>2.1 Describe and layout a Completely Randomised Design (CRD):</p> <ul style="list-style-type: none"> <li>- When to use, advantages, disadvantages</li> </ul> <p>2.2 Describe and layout a Randomised Complete Block Design (RCBD):</p> <ul style="list-style-type: none"> <li>- When to use, blocking criteria, number of replications</li> </ul> <p>2.3 Describe and layout a Latin Square Design (LSD)</p> <p>2.4 Describe Factorial Experiments:</p> <ul style="list-style-type: none"> <li>- Main effects, interaction effects, notation (e.g. <math>2^3</math>)</li> </ul> | <ul style="list-style-type: none"> <li>• Explain CRD: homogeneous experimental material; layout with example; describe analysis</li> <li>• Explain RCBD: heterogeneous field; describe blocking direction relative to gradient; layout and randomisation</li> <li>• Explain LSD: two-way blocking; show <math>5 \times 5</math> example; discuss limitations</li> </ul> | <p>Graph paper, measuring tape, pegs, random number table, field layout guide, white/smart board, markers, GenStat/R output examples, textbooks, videos, etc.</p> | <ul style="list-style-type: none"> <li>• Carry out the layout of a simple 5-treatment by 3 replicates CRD experiment in the laboratory, screen/greenhouse, poultry pen, etc.</li> <li>• Randomly assign treatments to experimental units (plots) in the CRD layout using random number table or balloting; label each plot</li> </ul> | <p>Guide students to:</p> <ul style="list-style-type: none"> <li>• Carry out the layout of a simple 5-treatment by 3 replicates CRD experiment in the laboratory, screen/greenhouse, poultry pen, etc.</li> <li>• Randomly assign treatments to experimental units (plots) in the CRD layout using random number</li> </ul> | <p>School farm, measuring tape, pegs, string, plot labelling cards, graph paper, pencils, random number table, field layout guide, statistical software</p> |

|  |                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                          |
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|  | <p>factorial)<br/>2.5 Describe Split Plot and Strip Plot designs and their applications<br/>2.6 Explain layout in relation to field contour to achieve effective blocking</p> | <ul style="list-style-type: none"> <li>• Explain factorial notation; describe main effects and interactions; show a 2×3 factorial example</li> <li>• Explain split-plot assignment of main and sub-plot factors; describe strip plot; give agronomic examples</li> <li>• Explain layout in relation to field contour to achieve effective blocking</li> </ul> |  | <ul style="list-style-type: none"> <li>• Identify potential sources of error in the layout plan; propose corrective measures</li> <li>• Design and layout an RCBD with 5 treatments and 3 replications on the school farm; draw the field plan to scale on graph paper</li> <li>• Randomly assign treatments to experimental units (plots) in the RCBD layout using random number table or balloting; label each plot</li> <li>• Design a 2×3 factorial experiment (2 varieties × 3 fertilizer levels); list all treatment combinations and randomise in RCBD</li> <li>• Carry out layout for</li> </ul> | <p>table or balloting; label each plot</p> <ul style="list-style-type: none"> <li>• Identify potential sources of error in the layout plan; propose corrective measures</li> <li>• Design and layout an RCBD with 5 treatments and 3 replications on the school farm; draw the field plan to scale on graph paper</li> <li>• Randomly assign treatments to experimental units (plots) in the RCBD layout using random number table or balloting; label each plot</li> <li>• Design a 2×3 factorial experiment (2</li> </ul> | <p>(Excel, SPSS, GenStat, SAS, R, etc) outputs, smartphone, PPE, etc</p> |
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|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                             | <p>Split Plot and Strip Plot designs on paper to learn the technique.</p> <ul style="list-style-type: none"> <li>• Prepare all reports</li> </ul>                                                                                                                                                                             | <p>varieties <math>\times</math> 3 fertilizer levels); list all treatment combinations and randomise in RCBD</p> <ul style="list-style-type: none"> <li>• Carry out layout for Split Plot and Strip Plot designs on paper to learn the technique.</li> <li>• Prepare all reports</li> </ul> |                                                                                                             |
| <b>General Objective 3.0: Understand data collection methods and measurement in field experiments.</b> |                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                             |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                             |                                                                                                             |
|                                                                                                        | <p>3.1 Identify types of data: quantitative (continuous, discrete) and qualitative (nominal, ordinal)</p> <p>3.2 Describe methods of measurement: direct measurement, scoring, rating scales</p> <p>3.3 Explain sampling methods: simple random, stratified, systematic, cluster sampling, etc</p> <p>3.4 Explain time sensitive nature of all operations</p> <p>3.5 Design a data collection</p> | <ul style="list-style-type: none"> <li>• Classify data types with agricultural examples: grain yield (continuous), plant count (discrete), disease severity score (ordinal)</li> <li>• Describe ruler, balance, moisture meter, spectrophotometer measurement; explain rating scales for disease, weed cover</li> <li>• Explain each sampling method with</li> </ul> | <p>Measuring tape, ruler, balance, moisture meter, disease rating guide, data collection templates, laptop/spread sheet</p> | <ul style="list-style-type: none"> <li>• Design a complete data collection sheet for the established CRD and RCBD trials; include all relevant parameters</li> <li>• Carry out data collection of all relevant parameters using both direct measurement and rated score; compare consistency between two observers</li> </ul> | <p>Guide data collection using measuring tape and ruler; demonstrate inter-observer calibration</p> <p>Facilitate data sheet design exercise; review and provide feedback</p>                                                                                                               | <p>Measuring tape, ruler; weighing scale, data sheet template, laptop/spreadsheet, smartphone, PPE, etc</p> |

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|                                                                                                                 | <p>sheet for a field experiment</p> <p>3.6 Explain concepts of accuracy, precision, bias, validity, reliability, missing plots and mistakes in data collection</p>                                                                                                                                                           | <p>agricultural application; calculate sample size using standard formulae</p> <ul style="list-style-type: none"> <li>• Explain time sensitive nature of all operations</li> </ul> <p>Guide design of a data sheet: treatment, replication, plot number, parameters, units, date columns</p> <ul style="list-style-type: none"> <li>• Explain accuracy (closeness to true value) vs precision (repeatability); describe systematic bias and its sources</li> </ul> |                                                                                                                   |                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                       |                                                                                                            |
| <b>General Objective 4.0: Apply basic descriptive and inferential statistical methods to agricultural data.</b> |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                   |                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                       |                                                                                                            |
|                                                                                                                 | <p>4.1 Define measures of central tendencies,</p> <p>4.2 Calculate measures of central tendency: mean, median, mode</p> <p>4.3 Define measures of dispersion</p> <p>4.4 Calculate measures of variability (dispersion): range, variance, standard deviation, coefficient of variation (CV%)</p> <p>4.5 Explain frequency</p> | <ul style="list-style-type: none"> <li>• Explain mean, median and mode from sample crop data; explain when each is appropriate</li> <li>• Calculate range, variance, SD and CV% from crop yield data; explain CV% as a measure of experimental precision</li> <li>• Construct frequency</li> </ul>                                                                                                                                                                 | <p>Crop yield data sets, calculator, laptop with Excel or R, textbooks, graph paper, videos, whiteboard, etc,</p> | <ul style="list-style-type: none"> <li>• Calculate mean, median, mode, SD and CV% for a provided maize yield dataset of 20 plots using manual methods (calculator) and softwares such as Excel, SPSS, Gen Start,</li> <li>• Construct a histogram and interpret the</li> </ul> | <p>Guide statistical calculations using manual method (calculator) and softwares such as Excel, SPSS, Gen Start; supervise histogram construction</p> <p>Demonstrate t-test using manual methods (calculator) and</p> | <p>Printed dataset, calculator, laptops with softwares (Excel, SPSS, Gen Start, etc), graph paper, etc</p> |

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|                                                                                                       | <p>distributions and construct frequency tables and histograms</p> <p>4.6 Explain the normal distribution and its properties</p> <p>4.7 Explain hypothesis testing: null hypothesis, alternative hypothesis, Type I and Type II errors, p-value, significance level</p> <p>4.8 Explain t-test</p> <p>4.9 Carry out a two-sample t-test</p> | <p>table and histogram from a data set; explain class intervals and frequency density</p> <ul style="list-style-type: none"> <li>Describe properties of normal distribution: symmetry, 68-95-99.7 rule; explain how many agricultural variables approximate normality</li> <li>Explain hypothesis testing framework; define <math>H_0</math> and <math>H_1</math>; explain Type I (reject true <math>H_0</math>) and Type II errors; describe p-value interpretation</li> <li>Explain t-test and carry out a two-sample t-test</li> </ul> |                                                                                                | <p>distribution.</p> <ul style="list-style-type: none"> <li>Given a data set with two treatments to carry out a two-sample t-test using manual methods (calculator) and softwares such as Excel, SPSS, Gen Start; state <math>H_0</math>, <math>H_1</math>, interpret p-value and make conclusion</li> </ul> | <p>softwares such as Excel, SPSS, Gen Start; guide interpretation of p-value and conclusion writing</p>                                                     |                                                                                    |
| <b>General Objective 5.0: Understand analysis of variance (ANOVA) and mean separation techniques.</b> |                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                |                                                                                                                                                                                                                                                                                                              |                                                                                                                                                             |                                                                                    |
|                                                                                                       | <p>5.1 Explain the purpose and assumptions of ANOVA</p> <p>5.2 Explain how to carry out one-way ANOVA for CRD data</p> <p>5.3 Explain how to carry out two-way ANOVA for RCBD data</p>                                                                                                                                                     | <ul style="list-style-type: none"> <li>Explain partitioning of total sum of squares; state ANOVA assumptions: normality, homogeneity of variance, independence</li> <li>Guide calculation of</li> </ul>                                                                                                                                                                                                                                                                                                                                   | <p>Printed ANOVA worksheets, F-distribution tables, calculators, laptops with GenStat/Exce</p> | <ul style="list-style-type: none"> <li>Carry out complete ANOVA for the dataset obtained from the established CRD and RCBD trials by hand calculation</li> <li>Present ANOVA</li> </ul>                                                                                                                      | <ul style="list-style-type: none"> <li>Guide step-by-step ANOVA calculation using manual methods (calculator) and softwares such as Excel, SPSS,</li> </ul> | <p>Printed ANOVA worksheet, F-table, calculator; laptop with softwares (Excel,</p> |

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|                                                                                        | <p>5.4 Interpret F-ratio and determine statistical significance</p> <p>5.5 Explain how to apply mean separation tests: LSD, Duncan's Multiple Range Test (DMRT), Tukey's HSD</p> <p>5.6 Present ANOVA results in standard scientific table format</p> | <p>ANOVA table for CRD: SS_treatment, SS_error, df, MS, F-ratio</p> <ul style="list-style-type: none"> <li>• Guide two-way ANOVA for RCBD adding SS_blocks to the partitioning</li> <li>• Explain F-table; interpret F-ratio vs F-critical; explain <math>p &lt; 0.05</math> significance criterion</li> <li>• Calculate LSD at 5%; explain DMRT grouping letters; explain when each test is appropriate</li> <li>• Show standard ANOVA table format with footnotes; explain mean <math>\pm</math> SE presentation</li> </ul> | I/R, textbooks | <p>results in a correctly formatted table; write the interpretation of the result.</p> <ul style="list-style-type: none"> <li>• Carry out post ANOVA test to the same CRD and RCBD data             <ul style="list-style-type: none"> <li>(a) LSD at 5% and present the result in a table.</li> <li>(b) DMRT at 5%, assign letter groupings to treatment means and present the result in a table.</li> </ul> </li> <li>• Carry out the ANOVA, LSD and DMRT of the same data set above using softwares such as Excel, SPSS, Gen Start, etc. and print out the output</li> <li>• Prepare the reports</li> </ul> | <p>Gen Start; demonstrate LSD and DMRT Test</p> <ul style="list-style-type: none"> <li>• Facilitate table formatting exercise; provide feedback on the interpretation</li> </ul> | <p>SPSS, Gen Start, etc) ANOVA table template, etc</p> |
| <b>General Objective 6.0: Know correlation, regression and non-parametric methods.</b> |                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                  |                                                        |

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|  | <p>6.1 Explain correlation: Pearson's r, interpretation, assumptions</p> <p>6.2 Explain how to carry out simple linear regression: <math>y = a + bx</math>; interpret slope and intercept</p> <p>6.3 Calculate coefficient of determination (<math>R^2</math>) and explain its meaning</p> <p>6.4 Explain non-parametric tests: Chi-square test, Mann-Whitney U test, Kruskal-Wallis test</p> <p>6.5 Explain when to use parametric vs non-parametric tests</p> | <ul style="list-style-type: none"> <li>• Define correlation; calculate Pearson's r; explain positive, negative and zero correlation with agricultural examples</li> <li>• Explain least squares method; demonstrate regression calculation; interpret slope (rate of change) and intercept</li> <li>• Calculate <math>R^2</math>; explain proportion of variance explained; discuss limitations of regression extrapolation</li> <li>• Describe Chi-square test for goodness of fit and independence; explain Mann-Whitney U and Kruskal-Wallis as rank-based alternatives to t-test and ANOVA.</li> <li>• Explain normality assumption; describe when data are ordinal, non-normal or small samples warrant non-parametric tests</li> </ul> | <p>Printed datasets, calculator, laptops with Excel/R/SPSS, scatter plot paper, textbooks</p> | <ul style="list-style-type: none"> <li>• Calculate Pearson's r for a provided dataset of 10 paired values (e.g. rainfall vs. yield); plot scatter diagram; add regression line; calculate <math>R^2</math> and interpret</li> <li>• Apply Chi-square test to a <math>2 \times 3</math> contingency table of pest incidence data; state <math>H_0</math> and interpret result</li> <li>• Carry out the above Pearson's r and Chi-square test using softwares such as Excel, SPSS, Gen Start, etc. and print out the output</li> <li>• Prepare all reports</li> </ul> | <ul style="list-style-type: none"> <li>• Guide correlation and regression calculation; demonstrate scatter plot; supervise <math>R^2</math> interpretation</li> <li>• Demonstrate Chi-square calculation; guide interpretation and conclusion</li> </ul> | <p>Printed paired dataset, graph paper, calculator; Chi-square contingency table worksheet, Chi-square table, laptops with softwares (Excel, SPSS, Gen Start, etc), etc</p> |
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| <b>General Objective 7.0: Understand the preparation and presentation of research reports.</b>                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                              |                                                                                                                                             |
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|                                                                                                                                    | <p>7.1 Describe the standard structure of an agricultural research report: Title, Abstract, Introduction, Literature Review, Materials &amp; Methods, Results, Discussion, Conclusion, Recommendations, References</p> <p>7.2 Describe the procedure for research report writing</p> <p>7.3 Explain the different referencing styles: APA, Chicago, IAEJ, etc</p> <p>7.4 Explain ethical considerations in agricultural research</p> | <ul style="list-style-type: none"> <li>• Describe each section's purpose, typical length and common mistakes</li> <li>• Guide drafting of Materials &amp; Methods and Results sections from class experimental data</li> <li>• Demonstrate APA in-text citation and reference list format; compare with IAEJ journal style</li> <li>• Explain seminar structure: title, background, methods, results, discussion; guide poster layout design</li> <li>• Discuss plagiarism, data fabrication, authorship, informed consent in on-farm research</li> </ul> | <p>Published agricultural journal articles, APA style guide, IAEJ author guidelines, laptop with Word, projector, smartphone, etc</p> | <ul style="list-style-type: none"> <li>• Prepare a complete Materials &amp; Methods section for the CRD and RCBD experiments conducted earlier in the semester; include site, design, treatments, data collected and statistical analysis, etc used</li> <li>• Prepare a 10-slide</li> <li>• Prepare a PowerPoint presentation of field results</li> </ul> | <ul style="list-style-type: none"> <li>• Guide M&amp;M writing; provide feedback using a marking rubric</li> <li>• Facilitate PowerPoint preparation; organise class presentations; guide Q&amp;A</li> </ul> | <p>Laptop with MS Word and PowerPoint, projector, journal article examples, APA guide, IAEJ guidelines, marking rubric, smartphone, etc</p> |
| <b>COURSE ASSESSMENT:</b><br>Course work: 10%<br>Test/Assignments: 10%<br>Practical: 40%<br>Examination: 40%<br><b>Total: 100%</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                              |                                                                                                                                             |



**RESEARCH METHODOLOGY AND SCIENTIFIC WRITING**

| <b>PROGRAMME: AGRICULTURE COMMON COURSES — HIGHER NATIONAL DIPLOMA (HND)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             |                                    |
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| <b>Course Title: Research Methodology and Scientific Writing</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Course Code: AGR 401</b> | <b>Contact Hours: 2 Hours/week</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Credit Unit: 2</b>       | <b>Theoretical: 1 Hour/week</b>    |
| <b>Year: II      Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Pre-requisite:</b>       | <b>Practical: 1 Hour/week</b>      |
| <b>GOAL:</b> This course is designed to equip students with the basic knowledge of Research Methodology to enable them to plan, execute and report applied agricultural research.                                                                                                                                                                                                                                                                                                                                                   |                             |                                    |
| <b>GENERAL OBJECTIVES:</b> On completion of this course, the students should be able to: <ol style="list-style-type: none"> <li>1.0 Understand the meaning of research.</li> <li>2.0 Understand the meaning of research methodology.</li> <li>3.0 Know the approaches to research.</li> <li>4.0 Understand research design and the methods.</li> <li>5.0 Understand sampling techniques.</li> <li>6.0 Understand the use of basic statistics in research.</li> <li>7.0 Understand the conduct and reporting of research.</li> </ol> |                             |                                    |

| PROGRAMME: AGRICULTURE COMMON COURSES — HIGHER NATIONAL DIPLOMA (HND)                                                                                                      |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |                                                                                                                                                                       |                                                                                                |                                                                                               |
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| Course Title: Research Methodology and Scientific Writing                                                                                                                  |                                                                                                                                                                                                                                                    | Course Code: AGR 401                                                                                                                                                                                                                                                                        |                                                                                                                                                                          |                                                                                                                                                                       | Contact Hours: 2 Hours/week                                                                    |                                                                                               |
|                                                                                                                                                                            |                                                                                                                                                                                                                                                    | Credit Unit: 2                                                                                                                                                                                                                                                                              |                                                                                                                                                                          |                                                                                                                                                                       | Theoretical: 1 Hour/week                                                                       |                                                                                               |
| Year: II Semester: I                                                                                                                                                       |                                                                                                                                                                                                                                                    | Pre-requisite:                                                                                                                                                                                                                                                                              |                                                                                                                                                                          |                                                                                                                                                                       | Practical: 1 Hour/week                                                                         |                                                                                               |
| COURSE SPECIFICATION: THEORETICAL AND PRACTICAL                                                                                                                            |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |                                                                                                                                                                       |                                                                                                |                                                                                               |
| GOAL: This course is designed to equip students with the basic knowledge of Research Methodology to enable them to plan, execute and report applied agricultural research. |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |                                                                                                                                                                       |                                                                                                |                                                                                               |
| GENERAL OBJECTIVE 1.0: Understand the meaning of research.                                                                                                                 |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |                                                                                                                                                                       |                                                                                                |                                                                                               |
| THEORETICAL CONTENT                                                                                                                                                        |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          | PRACTICAL CONTENT                                                                                                                                                     |                                                                                                |                                                                                               |
| Week                                                                                                                                                                       | Specific Learning Outcome                                                                                                                                                                                                                          | Teacher’s Activities                                                                                                                                                                                                                                                                        | Resources                                                                                                                                                                | Specific Learning Outcome                                                                                                                                             | Teacher’s Activities                                                                           | Resources                                                                                     |
|                                                                                                                                                                            | 1.1 Explain research and its importance in agriculture<br>1.2 Describe types of research:<br>- Historical, descriptive, experimental, action research<br>1.3 Explain the aims of research: generate new knowledge, solve problems, verify theories | • Explain research and its importance<br>• Describe each research type with agricultural examples: historical (origin of crops), descriptive (farm survey), experimental (fertilizer trial)<br>• Explain research as answering specific questions and contributing to agricultural practice | Textbooks on research methods, agricultural research reports from research institutes, universities, colleges, whiteboard, marker, projector, smartphone, e-library, etc | Read at least two published agricultural research abstracts; Identify which type of research each represents; Describe the research aim and present findings to class | Provide research abstract handouts; guide identification exercise; facilitate class discussion | Printed research abstracts (two examples), textbooks, notebooks, computers, smartphones, etc. |
| General Objective 2.0: Understand the meaning of research methodology                                                                                                      |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                          |                                                                                                                                                                       |                                                                                                |                                                                                               |

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|                                                               | <p>2.1 Define research methodology</p> <p>2.2 Explain the methods of conducting research:</p> <ul style="list-style-type: none"> <li>- Authoritarian method, mystical approach, rational/logical approach, scientific method</li> </ul> <p>2.3 Explain the merits and demerits of each method of conducting research</p> | <ul style="list-style-type: none"> <li>• Explain research methodology as the systematic framework guiding how research is conducted</li> <li>• Explain the methods of conducting research: authoritarian (acceptance of authority), mystical (intuition), logical (deduction/induction) and scientific (empirical, testable, repeatable) approaches</li> <li>• Explain merits/demerits: authoritarian fast but uncritical; scientific rigorous but time-consuming and costly</li> </ul> | Textbooks on research methods, agricultural research reports from research institutes, universities, colleges, white/smart board, marker, projector, e-library, etc | Read two published agricultural research abstracts; identify which type of method each was used; state the merits and demerits of each method; present findings to the class | Provide research abstract handouts; guide identification exercise; facilitate class discussion                                                | Printed research abstracts (two examples), textbooks, notebooks, computer, smartphones, etc. |
| <b>General Objective 3.0: Know the approaches to research</b> |                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                     |                                                                                                                                                                              |                                                                                                                                               |                                                                                              |
|                                                               | <p>3.1 Define research approaches</p> <p>3.2 Describe the scientific approaches to research and their characteristics.</p> <p>3.3 Explain how to formulate</p>                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Explain research approaches</li> <li>• Discuss the scientific approaches to research and their characteristics.</li> </ul>                                                                                                                                                                                                                                                                                                                     | Google Scholar access, printed journal articles, index card template,                                                                                               | <ul style="list-style-type: none"> <li>• Identify a researchable problem based on observation, literature gaps, stakeholder needs</li> <li>• Formulate 3 research</li> </ul> | Guide students to: <ul style="list-style-type: none"> <li>• Identify a researchable problem based on observation, literature gaps,</li> </ul> | Laptops with internet, Google Scholar, printed index card                                    |

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|                                                                          | <p>a research title</p> <p>3.4: Explain useful sources of information for literature review</p> <p>3.5 Explain index card format</p> <p>3.6 Explain how to synthesise literature into a review</p> <p>3.7 Explain how to develop a research conceptual framework</p> | <ul style="list-style-type: none"> <li>• Explain SMART criteria for title formulation; show examples of poor vs good research titles</li> <li>• Explain useful sources of information for literature review; primary and secondary sources; (use of Google Scholar, AGRIS, CAB Abstracts, etc)</li> <li>• Explain index card format: author, title, journal, year, volume, pages, key findings; relevance to paper</li> <li>• Explain how to synthesis literature into a review: thematic organisation, chronological flow, critical analysis</li> <li>• Explain conceptual framework</li> </ul> | <p>conceptual framework examples, textbooks, internet, projector, white/smart board, marker, etc</p> | <p>titles on a topic of their choice; evaluate each against SMART criteria; select the best one</p> <ul style="list-style-type: none"> <li>• Search Google Scholar for 5 recent publications on their chosen topic; complete index cards for each and write summary report</li> <li>• Develop a research conceptual framework; identify variables, show relationships with a diagram</li> </ul> | <p>stakeholder needs</p> <ul style="list-style-type: none"> <li>• Formulate 3 research titles on a topic of their choice; evaluate each against SMART criteria; select the best one</li> <li>• Search Google Scholar for 5 recent publications on their chosen topic; complete index cards for each and write summary report</li> <li>• Develop a research conceptual framework; identify variables, show relationships with a diagram</li> </ul> | <p>template, journal articles, etc</p> |
| <b>General Objective 4.0: Understand research design and the methods</b> |                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                        |
|                                                                          | <p>4.1 Explain research design and give examples</p> <p>4.2 Explain the methods</p>                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• Describe research design; experimental vs non-experimental</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>Research proposal template,</p>                                                                   | <ul style="list-style-type: none"> <li>• Design a simple questionnaire to assess farmers' fertilizer use</li> </ul>                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Guide students to: Design a simple questionnaire to</li> </ul>                                                                                                                                                                                                                                                                                                                                           | <p>Questionnaire design guide,</p>     |

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|  | <p>applied in research design</p> <p>4.3 Explain merits and demerits of each method</p> <p>4.4 Explain how to write a research proposal covering:</p> <ul style="list-style-type: none"> <li>- Background, statement of problem, objectives, literature review, methodology, budget, timeline</li> </ul> | <p>designs.</p> <ul style="list-style-type: none"> <li>• Discuss the methods applied in research design:             <ul style="list-style-type: none"> <li>- Interventional (randomised controlled trial (RCT), field trial, factorial experiment)</li> <li>- Non-interventional (survey, observation)</li> <li>- Questionnaire, interview, home visit, observation</li> </ul> </li> <li>• Discuss the merits and demerits of each method; RCT (high internal validity, costly), survey (wide coverage, potential bias), observation (natural setting, time-consuming)</li> <li>• Explain proposal writing (to include section's purpose, typical length; demonstrate how objectives drive</li> </ul> | <p>sample proposals from research institutes, universities, colleges, white/smart board, marker, projector, e-library, etc</p> | <p>practices in the local area; pre-test on at least 5 classmates and revise.</p> <ul style="list-style-type: none"> <li>• Prepare a 3-page research proposal on a topic of their choice, following the standard format</li> </ul> | <p>assess farmers' fertilizer use practices in the local area; pre-test on at least 5 classmates and revise.</p> <ul style="list-style-type: none"> <li>• Prepare a 3-page research proposal on a topic of their choice, following the standard format</li> </ul> | <p>sample questionnaire; research proposal template, sample proposal, marking rubric, laptop, etc</p> |
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|                                                               |                                                                                                                                                                                                                                                                                                                               | methodology)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                            |                                                                                                  |
| <b>General Objective 5.0: Understand sampling techniques.</b> |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                            |                                                                                                  |
|                                                               | 5.1 Define population, sample and sampling frame<br>5.2 Explain probability sampling methods<br>5.3 Explain non-probability sampling methods<br>5.4 Describe how to calculate sample size using known formula: {e.g Yamane $n = \frac{N}{1+N_e^2}$ , Krejcie formula, etc.}<br>5.5 Explain sources of sampling error and bias | <ul style="list-style-type: none"> <li>• Explain population, sample and sampling frame</li> <li>• Describe probability sampling methods (Simple random, systematic, stratified, cluster sampling); explain random number table use for simple random sampling; explain stratification by agro-zone, farm size, etc</li> <li>• Describe non-probability sampling methods (purposive, convenience, snowball); explain when purposive sampling is used in qualitative agricultural research.</li> <li>• Discuss how to calculate sample size using known formula:</li> </ul> | Textbooks on research methods, agricultural research reports from research institutes, universities, colleges, Printed random number table, calculator, white/smart board, marker, projector, e-library, etc | <ul style="list-style-type: none"> <li>• Select a simple random sample of 30 from a list of 200 farmers using a random number table; record selected farmer numbers</li> <li>• Calculate the required sample size for a farm survey of N=1000 farmers at 5% error margin using a known formula</li> <li>• Prepare a report</li> </ul> | <ul style="list-style-type: none"> <li>• Guide random number table use</li> <li>• Supervise sample selection exercise</li> <li>• Demonstrate Yamane, krejcie, etc formula; guide calculation and interpretation</li> </ul> | Printed random number table, farmer list (200 names), calculator; Yamane formula worksheet, etc. |

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|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | {e.g Yamane $n = \frac{N}{1+Ne^2}$ , krejcie formula, etc.}<br>• Explain sampling error (due to chance), non-sampling error (bias in measurement or non-response)                                                                                                                                                                                                                                                        |                                                                                                                                                            |                                                                                                                                                                                                                                                |                                                                                                                                             |                                                                          |
| <b>General Objective 6.0: Understand the use of basic statistics in research.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                            |                                                                                                                                                                                                                                                |                                                                                                                                             |                                                                          |
|                                                                                   | 6.1 Describe the role of statistics in agricultural research<br>6.2 Explain descriptive vs inferential statistics<br>6.3 Explain parametric vs non-parametric tests<br>6.4 Explain how to calculate mean, standard deviation and coefficient of variation from research data<br>6.5 Explain the t-test and its application in comparing two treatment means<br>6.6 Explain Chi-square test for independence and goodness of fit<br>6.7 Interpret computer-generated statistical output for t-test and ANOVA | • Discuss the role of statistics in agricultural research<br>• Explain descriptive vs inferential statistics<br>• Explain parametric vs non-parametric tests<br>• Explain how to calculate mean, SD and CV% from crop yield data; explain CV% as indicator of data precision<br>• Explain paired and independent samples t-test; demonstrate calculation; interpret p-value<br>• Explain Chi-square formula; demonstrate | Printed datasets, calculator, laptops with Excel or SPSS, t-distribution table, Chi-square table, textbooks, whiteboard, marker, projector, e-library, etc | • Calculate mean, SD and CV% from a 10-observation yield dataset; interpret CV% in terms of data precision<br>• Carry out an independent samples t-test (using Excel, SPSS, R, etc) for two treatment means; state conclusion based on p-value | Guide statistical calculations; supervise interpretation of CV%<br>Demonstrate t-test in Excel; guide interpretation and conclusion writing | Printed dataset, calculator; laptops with Excel, SPSS or R, t-table, etc |

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|                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>calculation for a 2×2 contingency table; interpret degrees of freedom</p> <ul style="list-style-type: none"> <li>• Explain statistical software package (Excel, SPSS, R, etc) generated output for t-test and ANOVA including the reading of F-statistic, p-value, means table, etc</li> </ul>                                                                                                 |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                           |                                                                                              |
| <b>General Objective 7.0: Understand the conduct and reporting of research.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                           |                                                                                              |
|                                                                                 | <p>7.1 Describe steps in conducting field research: permit, ethical approval, data collection, storage</p> <p>7.2 Explain how to write a standard research report:<br/>- Title, Abstract, Introduction, Literature Review, Methodology, Results, Discussion, Conclusion, References</p> <p>7.3 Explain citation and referencing styles</p> <p>7.4 Describe the contents of seminar presentation</p> <p>7.5 Explain intellectual property, plagiarism and</p> | <ul style="list-style-type: none"> <li>• Explain field research steps: site access, ethical clearance, data collection protocol, data storage and backup</li> <li>• Discuss how to write a standard research report including word limits, passive vs active voice, past tense in methodology,</li> <li>• Explain citation and referencing styles with examples (APA in-text citation:</li> </ul> | <p>Laptop with Word and PowerPoint, APA reference guide, Turnitin access or Grammarly, published research, textbooks, white/smart board, marker, projector, e-library,</p> | <ul style="list-style-type: none"> <li>• Prepare a 2-page structured abstract for a hypothetical fertilizer trial/field survey; include background, objective, hypothesis, methods, key results and conclusion</li> <li>• Prepare a 12-slide PowerPoint for a class seminar on a topic studied during the semester; present in 10 minutes; respond to questions</li> </ul> | <p>Guide abstract writing; provide marked feedback using a rubric</p> <p>Organise class seminar; guide slide preparation; facilitate Q&amp;A; assess presentation</p> <p>Carry out plagiarism test using relevant tools e.g. Turnitin</p> | <p>Abstract writing template, marking rubric; PowerPoint template, projector, timer, etc</p> |

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|                                                                                                                                    | research ethics in agriculture<br>7.6 Explain the use of plagiarism test tools e.g. Turnitin | (Adeyemi, 2021);<br>reference list: Author, year, title, journal, volume(issue), pages)<br>• Explain seminar structure: 10–15 slides; introduce background, methods, results, conclusion; time management<br>• Explain plagiarism, authorship, data sharing ethics, conflicts of interest, etc<br>• Explain the use of plagiarism test tools e.g. Turnitin | papers, projector, etc, | <ul style="list-style-type: none"> <li>• Carry out plagiarism test using relevant tools e.g. Turnitin</li> <li>• Present a research seminar on a selected topic</li> </ul> |  |  |
| <b>COURSE ASSESSMENT:</b><br>Course work: 10%<br>Test/Assignments: 10%<br>Practical: 40%<br>Examination: 40%<br><b>Total: 100%</b> |                                                                                              |                                                                                                                                                                                                                                                                                                                                                            |                         |                                                                                                                                                                            |  |  |