

## **B. Agriculture**

### **Overview**

This B. Agriculture programme curriculum is an improvement over the BMAS curriculum. Though the B. Agriculture programme of the BMAS has been unbundled in this CCMAS document, it is the opinion of experts that the B. Agriculture curriculum should not go extinct but be revised to enable students and Universities who may still be interested in this programme to offer it. This new curriculum has been designed to offer better delivery of knowledge and skills in such a way that will help to produce graduates who are a perfect fit for the market. The curriculum is core containing seventy percent (70%) of mandatory courses to be taken by students in all universities. It is believed that university Senates will complement this with the remaining thirty percent (30%) to further enrich the curriculum.

### **Philosophy**

The philosophy of the B. Agriculture programme is to achieve the goals and objectives of the National Policy on Agriculture in Nigeria, which are aimed at restructuring the sector, thus enhancing its capacity in terms of: the production of food for the rapidly increasing population; the supply of raw materials to a growing industrial sector; increasing the Gross Domestic Product (GDP), thus making it the mainstay of the economy as it were before the advent of oil and gas; the provision of employment to the teeming and jobless Nigerian youths and providing a major/sustainable source of foreign exchange in Nigeria. This will be achieved through the training of skilled manpower, equipped with broad-based knowledge and skills in the different areas of agriculture contributing to knowledge production and dissemination, research, and economic activities in all areas of agriculture.

### **Objectives**

The objectives of the B. Agriculture programme is to:

1. produce skilled manpower adequately equipped with the comprehensive technology required in profitable agricultural production in an environment characterized by rural settings and adequate land endowment;
2. assist the nation in its efforts to achieve self-sufficiency in the production of basic food and agricultural raw materials needed to support the growth of industries in the country;
3. modernize agricultural production, processing, storage, preservation and distribution;
4. enhance employment opportunities and attendant improvement in the quality of rural life;
5. adapt and adopt exogenous technology to solve local agricultural management problems;
6. be able to exercise original thought, have good professional judgment and be able to take responsibility for farming as a profitable business.
7. produce adequate manpower that will engage in direct production and conduct research in all facets of agricultural production, extension and rural development along with judicious management of human resources, funds, natural resources and equipment; and
8. improve on indigenous agricultural technology and policies which confirm agriculture as an important part of the national economy.

## Unique Features of the Programme

Though the B. Agriculture still largely retains the philosophy and objectives of the BMAS, its unique features lie in the following:

1. It has been reinvigorated with new courses introduced into the unbundled former B. Agriculture programme in this CCMAS that have been designed to deliver higher-order learning outcomes;
2. It will enable a better delivery of entrepreneurship in line with the needs of the economy;
3. The objectives provide a specific and clear pathway to achieve the programme philosophy. The objectives are SMART; Specific, Measurable, Achievable, Realistic and Time-bound; and
4. It will help produce graduates with a broad knowledge base in the major subject areas of agriculture.

## Employability Skills

Graduates of the B. Agriculture programme will have the following skills that will enable them to be meaningfully engaged:

1. **Independence**—the ability to perform research with minimum supervision, developing their own research methods and forming their own conclusions.
2. **Verbal and written communication skills**—the ability to communicate research findings in reports, publications, and courses.
3. **Active listening and interpersonal skills**—the ability to collaborate and communicate with other team members, as well as those in academia.
4. **Time management**—the ability to adhere to schedules, sometimes under stringent deadlines.
5. **Problem-solving skills** – the ability to understand a problem by breaking it down into smaller parts, and identifying the key issues, implications and identifying solutions.
6. **Organisational skills** - being organised and methodical. The ability to plan work to meet deadlines and targets.
7. **Ability to learn and adapt** - to be enthusiastic about work, and to identify ways to learn from mistakes for the benefit of both employee and employer.
8. **Self-motivation** – take pride in personal achievements and ability to bounce back from failures.

## 21st Century Skills

1. The programme will lead to the development and acquisition of the following 21st-century skills: Critical thinking, problem solving, reasoning, analysis, synthesizing information and interpretation skills.
2. Research skills and practices, interrogative questioning, Leadership, teamwork and collaboration skills.
3. Presentation skills.
4. Oral and written communication and public speaking skills.
5. Perseverance, self-direction, planning, self-discipline, adaptability and ability to take initiative.
6. ICT literacy, media and internet literacy and computer programming skills.

## **Admission and Graduation Requirements**

### **Admission Requirements**

Candidates are admitted into the B. Agriculture degree programme in any of the following two ways:

1. The Unified Tertiary Matriculation Examination (UTME)
2. Direct entry

### **UTME – Five Year Degree Programme**

In addition to the UTME score, the candidate should possess five credit passes in Senior Secondary Certificate (SSC) to include English Language, Mathematics, Biology or Agricultural Science, Chemistry and Physics in not more than two sittings.

### **Direct entry mode**

Candidates must have at least 2 credit passes in advanced level or its equivalents in Chemistry and Biology plus Five SSC (or its equivalent) credit passes prescribed for UTME entry mode. Diploma Holders with a minimum of Lower Credit plus Five SSC (or its equivalent) credit pass level at a maximum of two sittings are eligible for consideration for admission into 200- and 300- levels, respectively.

### **Duration**

The minimum duration for the programmes is 5 academic sessions (5-year duration) for candidates who enter through the UTME mode. Direct entry candidates admitted to the 200-level in agriculture programmes will spend a minimum of 4 academic sessions (4-year duration) while those admitted to the 300 level will spend a minimum of three years (3-year duration).

### **Graduation Requirements**

To graduate, a student shall have undergone 4 or 5 years of study depending on his/ her entry point, including a one-year (12 months) of practical training programme. The activities of the practical year should include periodic seminars on the student's work as a way of stimulating interest as well as the presentation of a written report to be graded at the end of the year. Course workload must meet the graduation requirements. Candidates admitted through the UTME mode shall have registered for at least a minimum of 150 credit units of courses for the 5-year track and 120 credit units for the 4-year (direct entry) track as indicated under course requirements. Candidates must also have registered and passed all the compulsory courses specified for the programme.

The submission of an undergraduate project report based on supervised research is another graduation requirement, which must not be compromised. This requirement exposes the student to problem-solving techniques and provides him/her with an ability to organize ideas from literature and research findings. In short, it prepares the student for the work ahead and for further training at the postgraduate level. This area of academic preparation needs to be maintained and further developed.

**BABCOCK UNIVERSITY (BU)**  
**DEPARTMENT OF AGRICULTURE**  
**COURSES**

**100 LEVEL**

COURSE CODE	COURSE TITLE	SEMESTER	
		1 <sup>ST</sup>	2 <sup>ND</sup>
	<b>GENERAL EDUCATION COURSES</b>		
BU-GST 011	Citizenship Orientation	0	
BU-GST 012	Citizenship Orientation		0
GST 111	Communication in English	2	
BU-GST 120	ICT Fundamentals & Office Productivity Management	1	
BU-GST 105	Use of Library and Study Skills	2	
GST 112	Nigerian Peoples and Culture		2
BU-GST 112	Health Principles		1
BU-GST 126	Life and Teachings of Christ the Messiah		3
	<b>CORE COURSES</b>		
AGG 102	Introduction to Agriculture I		2
BU-AGG 103	Economics of Indigenous Medicinal Crops	2	
AGG 112	Introduction to Agriculture II		1
BU-AGG 114	Introduction to Digital Agriculture		2
BIO 101	General Biology I	2	
BIO 107	General Biology Practical I	1	
CHM 101	General Chemistry I	2	
CHM 102	General Chemistry II		2
CHM 107	General Chemistry Practical I	1	
CHM 108	General Chemistry Practical II		1
MTH 101	Elementary Mathematics 1	2	
MTH 102	Elementary Mathematics II		2
PHY 101	General Physics I	2	
PHY 102	General Physics II		2
PHY 107	General Physics Practical I	1	
PHY 108	General Physics Practical II		1
	<b>Total (37 Credits)</b>	<b>18</b>	<b>19</b>

**200 LEVEL**

COURSE CODE	COURSE TITLE	SEMESTER	
		1 <sup>ST</sup>	2 <sup>ND</sup>
	<b>GENERAL EDUCATION COURSES</b>		
BU-GST 021	Citizenship Orientation	0	
BU-GST 022	Citizenship Orientation		0
ENT 211	Entrepreneurship and Innovation	2	
BU-GST 215	Adventist Heritage	3	
BU-GST-290	Introduction to Data Analytics	1	
GST 212	Philosophy, Logic and Human Existence		2
BU-GST 200	Communication in French		1
BU-GST 220	Origins and Science		1
	<b>CORE COURSES</b>		
AGR 201	Principles of Agronomy	3	
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology		3
AGR 203	Introduction to Forest Resources and Wildlife Management	2	
AGR 204	Introduction to Animal Production		2
AGR 205	Introduction to Fisheries and Aquaculture	3	
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology		2
BU-AGR 201	Agricultural Microbiology	2	
BU-AGR 207	Introduction to Soil Science	2	
BU-AGR 208	Introduction to Ecosystem Analysis		2
BU-AGR 209	Agricultural Biochemistry and Animal Nutrition	2	
BU-AGR 210	Essentials of Food Security		2
BU-AGR 212	Anatomy and Physiology of Farm Animals		1
	<b>TOTAL (36 Credits)</b>	<b>20</b>	<b>16</b>

**300 LEVEL**

COURSE CODE	COURSE TITLE	SEMESTER	
		1 <sup>ST</sup>	2 <sup>ND</sup>
	<b>GENERAL EDUCATION REQUIREMENTS</b>		
BU-GST 031	Citizenship Orientation	0	
BU-GST 032	Citizenship Orientation		0
BU-GST 310	Data Analysis Using Advanced Excel   SPSS   Power BI   Tableau	1	
BU-GST 317	Fundamentals of Christian Faith	3	

BU-GST 312	Family Life		1
GST 312	Peace and Conflict Resolution		2
ENT 312	Venture Creation		2
	<b>CORE COURSES</b>		
AGE 305	Data Science and Statistical Computing	2	
AGE 306	Application of Computer to Agriculture		2
AGE 307	Introduction to Farm Management and Accounting	2	
AGX 311	Principles of Rural Sociology	2	
ANS 302	Introduction to Animal Breeding and Genetics		2
ANS 304	Non-Ruminant Animal Production		2
ANS 305	Ruminant Animal Production	2	
BU-ANS 309	Feeds and Feeding	2	
CPS 301	Arable Crops Production	2	
CPS 302	Permanent Crops Production		2
CPS 304	Crop Genetics and Breeding		2
SOS 302	Introduction to Agric. Mechanization		2
SOS 303	Introductory Pedology and Soil Physics	2	
	<b>TOTAL (35 Credits)</b>	<b>18</b>	<b>17</b>

#### 400 LEVEL (PRACTICAL YEAR)

COURSE CODE	COURSE TITLE	SEMESTER	
		1 <sup>ST</sup>	2 <sup>ND</sup>
	<b>GENERAL EDUCATION REQUIREMENTS</b>		
BU-GST 041	Citizenship Orientation	0	
BU-GST 042	Citizenship Orientation		0
BU-GST 440	E-Project Management and Simulation	1	
BU-GST 400	Religion and Social Ethics		3
	<b>CORE COURSES</b>		
AGE 404	Farm Records and Accounting		2
BU-AGE 406	Agricultural Marketing Techniques		2
AGX 410	Community Agricultural Extension		2
BU-AGX 411	Field Trip and Seminars	2	
ANS 403	Animal Products, Processing and Marketing	2	
ANS 405	Animal Husbandry Techniques (cattle, sheep, goats, poultry, pigs and rabbits)	2	
BU-ANS 406	Feed Manufacturing		2
BU-ANS 408	Micro-livestock Production		2
CPS 401	Crop Production Techniques I	3	
CPS 403	Crop Protection I	3	
CPS 406	Farm Mechanization Practices		2
BU-CPS 412	Organic Agriculture and Practice		<u>2</u>

SOS 402	Soil Survey, Sampling, Classification and Taxonomy	2	
AGR 499	SIWES Report	2	
	<b>TOTAL (34 Credits)</b>	<b>17</b>	<b>17</b>

## THE FINAL YEAR

During the first four years, all students pursue a common programme. In the fifth year, they would be allowed to choose options. In addition to prescribed academic courses in the option area, students must carry out a research-oriented project. The project and the course work for the final year should carry a minimum of 30 units with the project work accounting for 6 units. The major areas in which a student can choose an option include: Agricultural Economics and Extension, Animal Science, and Crops/Soil Science. The prescribed coursework in the option year should be made up of 80% of courses from the option area and 20% from other major areas of Agriculture. The approved courses to be offered in the various options are as follows:

### 500 LEVEL AGRICULTURAL ECONOMICS/AGRICULTURAL EXTENSION OPTION

COURSE CODE	COURSE TITLE	SEMESTER	
		1 <sup>ST</sup>	2 <sup>ND</sup>
	<b>GENERAL EDUCATION REQUIREMENTS</b>		
BU-GST 051	Citizenship Orientation	0	
BU-GST 052	Citizenship Orientation		0
BU-GST 500	Seminar on Adventist Heritage		3
BU-GST 540	Introduction to Digital Marketing		1
	<b>CORE COURSES</b>		
AGE 501	Seminar on Adventist Heritage	2	
BU-AGE 502	Resource Economics		2
BU-AGE 503	Principles of Microeconomics in Agriculture	2	
BU-AGE 504	Principles of Macroeconomics in Agriculture		2
AGE 505	Research and Statistical Methods	2	
BU-AGE 507	Econometrics in Agricultural Economics and Extension	2	
BU-AGE 508	Agricultural Policy and Development		2
BU-AGE 509	Agribusiness	2	
BU-AGE 511	Agricultural Marketing and Cooperatives	2	
BU-AGX 501	Diffusion of Innovations	2	
AGX 503	Agricultural Extension Administration and Supervision	2	
AGX 504	Programme Planning and Evaluation		2
BU-AGX 509	Rural Community Development Technology and Social Change	2	
AGE 590/ AGX 590	Research Project		6

	<b>AGRICULTURAL ECONOMICS OPTION</b>		
AGB 501	<i>Agribusiness Value Chain Analysis</i>	2	
AGB 503	Business Law	2	
AGE 512	Project Monitoring and Evaluation in Agriculture		2
	<b>AGRICULTURAL EXTENSION OPTION</b>		
AGX 503	Systems Thinking for Changing Agriculture	2	
AGX 505	Gender and Sustainable Agricultural Development	2	
AGX 513	Multimedia Resource and Application in Agriculture	2	
AGX 502	Extension Communication Systems and Methods		2
AGX 514	Teaching, Learning Methods in Agricultural Extension		2
	<b>TOTAL (34 CREDITS)</b>	<b>20</b>	<b>20</b>

**Note:** Final year Agricultural Economics or Agricultural Extension (option) students will register for a total of 40 units (including 2 units each semester, under either of the options).

#### **500 LEVEL ANIMAL SCIENCE OPTION**

COURSE CODE	COURSE TITLE	SEMESTER	
		1 <sup>ST</sup>	2 <sup>ND</sup>
	<b>GENERAL EDUCATION REQUIREMENTS</b>		
BU-GST 051	Citizenship Orientation	0	
BU-GST 052	Citizenship Orientation		0
BU-GST 500	Seminar on Adventist Heritage		3
BU-GST 540	Introduction to Digital Marketing		1
ANS 501	Applied Animal Breeding and Genetics	2	
ANS 502	Animal Experimentation and Research Techniques		2
BU-ANS 503	Poultry Production and Hatchery Management	2	
BU-ANS 515	Monogastric Animal Production (Swine and Rabbit)	2	
ANS 505	Reproductive Physiology and artificial Insemination	2	
ANS 506	Pasture and Range Production and Management		2
BU-ANS 507	Monogastric and Ruminant Animal Nutrition	2	
BU-ANS 508	Animal Health and Diseases		2
BU-ANS 509	Phytogenics in Animal Production	2	

BU-ANS 511	Animal Behaviours, Welfare and Ethics	2	
BU-ANS 512	Animal Products and Processing		2
BU-ANS 513	Precision Livestock Production and Nutrients' Utilization	2	
BU-ANS 517	Sustainable Livestock Production	2	
ANS 590	Project		6
	<b>TOTAL (36 Credits)</b>	<b>18</b>	<b>18</b>

### 500 LEVEL CROP SCIENCE/ SOIL SCIENCE OPTION

COURSE CODE	COURSE TITLE	SEMESTER	
		1 <sup>ST</sup>	2 <sup>ND</sup>
	<b>GENERAL EDUCATION REQUIREMENTS</b>		
BU-GST 051	Citizenship Orientation	0	
BU-GST 052	Citizenship Orientation		0
BU-GST 500	Seminar on Adventist Heritage		3
BU-GST 540	Introduction to Digital Marketing		1
BU-CPS 501	Pesticides Application and Toxicity	2	
CPS 503	Plantation Crops and Orchard Management	2	
BU-CPS 504	Pasture and Forage Production		2
CPS 505	Methods of Field Experimentation	2	
BU-CPS 506	Physiology of Crop Growth and Yield		2
BU-CPS 507	Plant Breeding	2	
BU-CPS 509	Biotechnology and Tissue Culture in Agriculture	2	
BU-CPS 511	Automation in Crop Production	2	
BU-CPS 514	Seed Production and Certification		2
BU-CPS 515	Contemporary Practices in Landscape Design	2	
*BU-SOS 503	Soil Irrigation and Drainage	2	
*BU-SOS 505	Fertilizers, Fertilizer Manufacture and Fertilizer Use	2	
SOS 502	Soil Fertility Management and Plant Nutrition		2
CPS 590/SOS 590/ HLM 590	Final Year Project		6
	<b>CROP SCIENCE OPTION</b>		
HLM 502	Vegetable Crops Production (Olericulture)		3
	<b>SOIL SCIENCE OPTION</b>		
BU-SOS 502	Soil Microbiology		1

	<b>TOTAL [31 Units Soil Science/33 Crop Science Credits]</b>	18	19/21
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**Notes:** \*Both Crop Science and Soil Science (option) students will register for these courses. However, the Crop Science (option) students will register for a total of 39 units including a 3 unit course while Soil Science (option) students will register for a total of 37 units including a 1 unit course.

**Babcock University (BU)**  
**Agriculture**  
**Agriculture**  
**B. Agriculture**  
**Course Contents and Learning Outcomes**

**100 Level**

**GST 111: Communication in English (2 Units; C) (LH 15; PH 45)**

**Learning Outcomes**

At the end of this course, students should be able to:

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

**Course Contents**

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letters, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

**GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)**

**Learning Outcomes**

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and

8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

### **Course Contents**

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people,; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition, citizenship and civic responsibilities; indigenous languages, usage, and development,; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation.; Re-orientation Strategies: Operation Feed the Nation (OFN), Green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

### **AGG 102: Introduction to Agriculture I (2 Units C: LH 30)**

#### **Learning Outcome**

At the end of these lectures, students should be able to:

1. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;
2. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
3. be familiar with the role of technologies in the transformation of agriculture; and
4. explain potentials and constraints to sustainable agricultural production

#### **Course Content**

Meaning and Scope of Agriculture. Importance of Agriculture to an expanded economy. Agricultural Ecology. Genetics, Agronomy. Rocks and Soil formation. Soil and Water Conservation. Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods. Cropping Systems, Planting Patterns and Plant Densities. Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement

## **BU-AGG 103: Economics of Indigenous Medicinal Crops (2 Units: Core; LH=15, PH=45)**

### **Senate-approved relevance**

The mandate to deliver on the Sustainable Development Goals (SDGs) 1, 2 and 3 has imposed huge responsibility on the agricultural food production system. Significant proportion of the indigenous crops and livestock raised in the agro-ecological systems are more often managed to meet the food and dietary needs with less intentional focus on their medicinal values. Most of the indigenous crops are repositories of vital bioactive substances, which have helped in the sustenance of human and livestock health and longevity. These crops when properly documented, characterised, cultivated can be harnessed in the treatment of most human and livestock diseases of modern times as well as serve as precursors in the discovery of new drugs. Babcock University is committed to education, training, and capacity building of students and extension workers in the application of natural health remedies to improve the wellbeing and health status of Nigerians via the cultivation and utilization of the indigenous medicinal plants. This course is aimed at building capacity in the natural management of human diseases through the production and economics of indigenous crop plants.

### **Overview**

The varieties of disease and high probability of the emergence of new ones call for an integrated approach to disease management and sustainable health. Increased awareness and cultivation of the African indigenous crop plants will meet food needs and much more. They also serve as veritable medicinal sources for the treatment of common disease in humans and livestock. Hence, the need for an intensive production and understanding of the economic values of medicinal crops is critical to the actualization of the SDG 3. This course is designed to build capacity in the knowledge and use of the indigenous medicinal crops, promote the awareness of the indigenous medicinal crops and explore the immense medicinal potential locked-up in the crop plants, for economic and medicinal purpose. It will equip learners with robust knowledge and requisite skill needed in the utilization of their bio-active components in the treatment of diseases.

### **Objectives**

#### **The objectives of this course are to:**

1. Identify the diversity in indigenous crop plants with medicinal values which are yet to be introduced into the agro-ecological system.
2. Discover the ecological distribution of medicinal crop plant in Nigeria
3. Describe the botany of indigenous medicinal crops
4. Enumerate the climatic and soil factors in crop production viz-a-viz indigenous medicinal crop plants
5. Explore available methods of cultivation
6. Identify the pest and diseases associated with indigenous medicinal crop plants and their management protocols
7. Explore the medicinal uses of the indigenous crops in human and livestock diseases
8. Describe the economics of the Nigerian indigenous medicinal plants
9. Identify the various bio-active substances present in the indigenous medicinal plants
10. Explore the isolation of the bio-active substances present in the medicinal crop plants
11. Describe the principles of drug discovery

12. Indicate opportunities of incorporating these bioactive substances into drug discovery

### **Learning Outcomes**

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

1. Identify at least six (6) Nigerian indigenous medicinal crop plants and their medicinal uses
2. Identify the huge diversity and distribution of Indigenous crop plants in Nigeria
3. Illustrate the ecological distribution with a map of three (3) named Nigerian indigenous medicinal crop plants in at least three (3) agro-ecological zones in Nigeria.
4. Identify cultivation methods for at least four (4) Nigerian indigenous medicinal crop plant
5. Identify at least two (2) pests and three (3) diseases of five (5) indigenous medicinal crop plants in your area and outline four (4) management methods for control
6. Explain the economic potentials of indigenous medicinal crop plants in Nigeria
7. Identify at least four (4) bio-active substances present in different parts of at least four (4) indigenous medicinal crop plant
8. List three (3) diseases or ailments that can be cured or ameliorated by named indigenous crop plants.

### **Course Contents**

Biblical references of medicinal plants. Concepts of indigenous medicinal crop plants. Taxonomy of Nigerian indigenous crop plants. Pests of indigenous of crop plants. Ecological distribution and diversity of indigenous medicinal crop plants. Trends in production of indigenous crop plants. Classification of Nigerian medicinal crop plants. Characterization of plant parts with medicinal values. Principles and practice of cultivation. Livestock pest and disease management using indigenous plants. Characterization of the bio-active substances in the indigenous crop plants. Basic isolation technique of bioactive substances from medicinal crop plants. Plant sample preparation for laboratory analysis. Economics of Nigerian indigenous medicinal crop plants. Economic importance of Nigerian indigenous medicinal crop plants. Markets of indigenous medicinal crop plants. Marketing of indigenous medicinal crop plants.

## **AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)**

### **Learning Outcomes**

At the end of these lectures, students should be able to:

Explain the history of agricultural development and the role of the public and private sectors.

1. Identify and analyse the factors of agricultural production and the role of various resources
2. Explain the constraints of technology and mechanization, and the role of agricultural extension transformation.

### **Course Contents**

History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics.

## **BU-AGG 114: Introduction to Digital Agriculture (2 units; Core; LH=30; PH=Nil)**

### **Senate-approved relevance**

Agriculture is no exception to digital revolution. Training and producing high quality agriculture graduates who are well grounded in the knowledge and understanding of the application of digital apparatus to the achievement of sustainable agricultural production, agricultural entrepreneurship and value-chain management is pertinent and relevant to Nigeria curriculum. The relevance is obvious as graduates of agriculture from Babcock University will be able to appreciate and operationalize agricultural enterprise digitally. This is in consensus with the Babcock University pursuit of excellence in agriculture and senate approval of new courses with global impact and competitive advantage.

### **Overview**

Digital Agriculture Technology (DAT) is the application of ICT and data ecosystems to support the development and delivery of timely, targeted information and services to make farming profitable and sustainable, while delivering safe nutritious and affordable food for all. Digitalizing agriculture enables farmers and agribusiness entrepreneurs to increase their productivity, efficiency and competitiveness, facilitate access to markets, improve nutritional outcomes and enhance resilience to climate change. Application of DATs range from mobile apps to digital identities for farmers to solar applications for agriculture to portable agriculture devices. DATs are increasingly becoming indispensable in the global food and agriculture sector, from fast and convenient information delivery to providing virtual marketplaces. Considering the fact that digital technologies can accelerate agro-food outcomes, when juxtaposed with low adoption rates of the same, the World Bank's operations are increasingly incorporating digital agriculture as a critical element in its operations. Thus, this course is imperative.

### **Objectives**

The objectives of the course are to:

1. Assess types of ICTs and how digital technologies are applied in agriculture.
2. Explore the key drivers of ICT-enabled services in agriculture.
3. Expound the background of precision agriculture, GPS technologies and applications.
4. Explain Principles of Digital Development with application to agriculture.
5. Analyse policies relevant to use ICT and Digital Tools for Enhancing Productivity on the Farm.
6. Describe the use of ICT to match cropping practices to climatic trends.
7. Assess data collection with ICT and digital tools.
8. Explain how to predict food supplies, target social programs, or promote yield technologies.
9. Explain the potential of digital agriculture to transforming extension and advisory services.
10. Describe ways of empowering Smallholder Farmers through digital agriculture.
11. Discuss Digital Tools in Financial Services.
12. Profile procedure for strengthening agricultural market access with ICT and Digital Tools.
13. Assess digital agriculture and market intelligence.
14. Analyze use of ICT for Remote Sensing, Crowdsourcing, and Big Data.
15. Describe Artificial Intelligence and machine learning in agriculture.

### **Learning Outcomes**

1. On completion of the course, the students should be able to:

2. Assess, at least 5 types of ICTs and DATs that can be used in agriculture
3. Identify at least 5 key drivers of ICT-enabled services in agriculture
4. Explain background of precision agriculture, GPS technologies and applications
5. Explain at least 5 principles of Digital Development with application to agriculture
6. Analyze at least 5 policies relevant to the use of ICT and Digital Tools for enhancing productivity on the Farm
7. Assess 3 data collection methods with ICT and digital tools
8. Explain at least 5 ways to predict food supplies, target social programs, or promote yield technologies.
9. Identify at least 6 potentials of digital agriculture to transforming extension and advisory services
10. Describe at least 5 Digital Tools in Financial Services
11. Discuss the scope of artificial intelligence, remote sensing, crowdsourcing, and big data analytics in agriculture.

### **Course Contents**

Uses of ICTs and digital technologies in agriculture. Drivers of ICT-enabled services in agriculture. Precision agriculture. GPS technologies and applications. Principles of Digital Development with application to agriculture. Policies relevance to use of ICT and Digital Tools on the Farm. ICT and climate trends. Data collection with ICT and digital tools. Potential of digital agriculture to transforming extension and advisory services. Empowering Smallholder Farmers through digital agriculture. Digital Tools in agricultural financial services. Strengthening agricultural market access with ICT and Digital Tools. Digital agriculture and market intelligence. ICT for Remote Sensing. ICT for Crowdsourcing. ICT for Big Data. Artificial Intelligence in agriculture.

### **BIO 101: General Biology I (2 Unit C: LH 30)**

#### **Learning Outcomes**

At the end of this course, students should be able to:

1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

#### **Course Contents**

Cell structure and organization. Functions of cellular organelles. Characteristics and classification of living things. Chromosomes, genes their relationships and importance. General reproduction. Interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarckism, Mendelian laws, explanation of key genetic terms). Elements of ecology and types of habitat.

### **BIO 107: General Biology Practical I (1 Unit C: PH 45)**

#### **Learning Outcomes**

At the end of the course, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

#### **Course Contents**

Common laboratory hazards: prevention and first aid; measurements in biology. Uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy and proportion. Use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101**.

### **CHM 101: General Chemistry I (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the students should be able to:

1. define atom, molecules and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation–reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using LeChatelier’s principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

#### **Course Contents**

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence Forces. Structure of solids. Chemical equations and stoichiometry; Chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry. Rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

### **CHM 102: General Chemistry II (2 Unit C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine the rate of reaction to predict mechanisms of reactions;
7. identify classes of organic functional groups with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe the basic properties of Transition metals.

### **Course Contents**

Historical survey of the development and importance of Organic Chemistry. Fullerenes as fourth allotrope of carbon, uses as nanotubes, nanostructures, and nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

### **CHM 107: General Chemistry Practical I (1 Unit C: PH 45)**

#### **Learning Outcomes**

At the end of this course, the students should be able to:

1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

#### **Course Contents**

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

### **CHM 108: General Chemistry Practical II (1 Unit C: PH 45)**

#### **Learning Outcomes**

At the end of this course, the students should be able to:

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;

5. perform solubility tests on known and unknown organic compounds;
6. conduct elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

#### **Course Contents**

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

### **MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units: C LH 30)**

#### **Learning Outcomes**

At the end of this course students should be able to:

1. explain basic definition of Set, Subset, Union, Intersection, Complements and use of Venn diagrams;
2. solve quadratic equations;
3. Solve trigonometric functions;
4. identify various types of numbers; and
5. solve some problems using Binomial theorem.

#### **Course Contents**

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, real sequences and series. Theory of quadratic equations. Binomial theorem. Complex numbers. Algebra of complex numbers. The Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

### **MTH 102: Elementary Mathematics II (2 Units C: LH 30) (Calculus)**

#### **Learning Outcomes**

At the end of this course students should be able to:

1. identify the types of rules in differentiation and integration;
2. describe the meaning of Function of a real variable, graphs, limits and continuity; and
3. solve some applications of definite integrals in areas and volumes.

#### **Course Contents**

Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.

### **PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the student should be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics.
4. apply Newton's laws to describe and solve simple problems of motion.
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating

objects.

6. explain and apply the principles of conservation of energy, linear and angular momentum.
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

### **Courses Contents**

Space and time. Units and dimension, Vectors and Scalars. Differentiation of vectors: displacement, velocity and acceleration. Kinematics. Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion. Conservation principles in physics. Conservative forces. Conservation of linear momentum. Kinetic energy and work. Potential energy. System of particles. Centre of mass. Rotational motion: Torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia. gyroscopes and precession. Gravitation: Newton's Law of Gravitation. Kepler's Laws of Planetary Motion. Gravitational Potential Energy. Escape velocity. Satellites motion and orbits.

### **PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the student should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of ac voltages and currents in resistors, capacitors, and Inductors.

#### **Course Contents**

Forces in nature. Electrostatics; electric charge and its properties, methods of charging. Coulomb's law and superposition. electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators, current, voltage and resistance. Ohm's law and analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère's laws. magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz's laws. Step-up and step-down transformers: Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

### **PHY 107 - General Practical Physics I (1 Unit C: PH 45)**

#### **Learning Outcomes**

At the end of this course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

#### **Course Contents**

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

### **PHY 108 - General Practical Physics II (1 Unit C: PH 45)**

#### **Learning Outcomes**

At the end of this course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data; and
6. prepare and present practical reports.

#### **Course Contents**

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements. The treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

**Babcock University (BU)**

**Agriculture**

**Agriculture**

**B. Agriculture**

**Course Contents and Learning Outcomes Course Contents and Learning Outcomes**

**200 Level**

**ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)**

**Learning Outcomes**

At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce.

**Course Contents**

Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

**GST 212. Philosophy, Logic And Human Existence (2 Units C: LH 30)**

**Learning Outcomes**

A student who has successfully gone through this course should be able to:  
know the basic features of philosophy as an academic discipline;

1. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
2. know the elementary rules of reasoning;
3. distinguish between valid and invalid arguments;
4. think critically and assess arguments in texts, conversations and day-to-day discussions;

5. critically assess the rationality or otherwise of human conduct under different existential conditions;
6. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
7. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

#### **Course Contents**

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character moulding, etc.

### **AGR 201: Principles of Agronomy (3 Units C LH 45)**

#### **Learning Outcomes**

Students will be equipped with:

1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices.

#### **Course Contents**

Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end use technologies. Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

### **AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (3 Units C: LH 45)**

#### **Learning Outcomes**

At the end of the course students should be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;

2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

### **Course Contents**

The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and the nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

### **AGR 203: Introduction to Forest Resources & Wildlife Management (2 Units C: 15 LH; 45 PH)**

#### **Learning Outcomes**

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and raise seedlings of economic tree species.

#### **Course Contents**

Renewable natural resources availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry

and wildlife to the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

### **AGR 204: Introduction to Animal Production (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, the students are expected to have known the following:

1. Prospects and problems of the animal industry;
2. Identification/description of types of farm animals;
3. Feeds and feeding management of farm animals;
4. Housing and management systems of different livestock;
5. Principles of animal health management;
6. Animal breeding and breed improvement principles; and
7. Basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

#### **Course Contents**

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and rabbits). Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

### **AGR 205: Introduction to Fisheries and Aquaculture (2 Units C: 30 LH)**

#### **Learning Outcomes**

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

#### **Course Contents**

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic

structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park, etc. Scope of fisheries and aquaculture.

### **AGR 206: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: 30 LH)**

#### **Learning Outcomes**

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

#### **Course Contents**

Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post-harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

### **BU-AGR 201 Agricultural Microbiology (2 Units; Core; LH=15; PH=45)**

#### **Senate-approved relevance**

The institutional additional course BU-AGR 201 is designed to educate students on the fundamentals of microbiology as it pertains to knowledge of the genera and species of microorganisms that cause economically important diseases of plants and animals in Nigeria and elsewhere. In addition, the course will also create awareness of the importance of microbes such as rhizobia and mycorrhizae that can enhance plant growth and nutrient uptake, or probiotic bacteria that can competitively crowd out harmful GIT microbes in farm animals. With increasing concerns about the impact of agriculture on the environment, students will learn about sustainable farming practices that incorporate microbiology to reduce chemical inputs, prevent soil erosion, and promote biodiversity. The practical will cover microbial isolation techniques and the application of the principles of disinfection and sterilization in the prevention and control of plant and animal diseases. The field of agricultural microbiology offers various career opportunities such as working in research labs, consulting firms, government agencies, or agricultural biotech

companies. This course will help students acquire the skills and knowledge needed to pursue these careers.

### **Overview**

Agricultural microbiology is a critical area of study that has significant implications for agriculture, food production, and the environment with implications for sustainable agriculture and food security. Agricultural microbiology involves: understanding of the complex interactions that occur between microorganisms and plants, soil, and water, as well as the role of microorganisms in the production, processing, and preservation of food; study of the physiology, genetics, and ecology of microorganisms that are relevant to agriculture; exploration of the potentials of beneficial microbes.

Some examples are, nitrogen-fixing bacteria, to enhance plant growth and increase crop yields. Investigation of the role of microorganisms in the degradation of agricultural pollutants and the prevention of plant diseases; microbes in animal health and disease; principles of sterilization and disinfection; principles of bacterial isolation and cultivation; identification of pathogenic bacteria and fungi and the diseases they cause in plants and animals; the use of microbial fermentation in the production of cheese, yogurt, beer, and wine, among others; the use of microbial preservation techniques, such as canning, drying, and pickling, to extend the shelf life of food products.

### **Objectives:**

The objectives of this course are to:

1. Expound on fundamental principles of microbiology and their application in agriculture;
2. Discuss diversity and functions of microorganisms in soil, water, plants, and animals in agricultural systems;
3. Explain interrelationships between microorganisms and other components of agricultural systems, including crops, livestock, and environmental factors.
4. Describe the basic principle of sterilization and disinfection as a means of preventing disease occurrence in livestock production,
5. Explain how bacteria and fungi are isolated and cultivated.
6. Expound on how to identify some plant and animal diseases of importance in agriculture.
7. Develop critical thinking skills and how to apply scientific methods to investigate microbiological issues in agriculture in students.
8. Prepare students for careers in agricultural microbiology research, teaching, or related fields.

### **Learning Outcomes:**

Upon completion of the course, students should be able to:

1. Explain the concepts of microbial morphology, physiology, genetics, and ecology.
2. Identify 5 major groups of microorganisms relevant to agriculture.
3. Describe at least 5 characteristics and interactions of microorganisms.
4. Explain at least 3 principles of microbial diversity and evolution, and their implications for agricultural systems.
5. Analyze at least 5 impacts of microbial interactions on plant and animal health, soil fertility, and environmental quality.
6. Apply at least 2 laboratory techniques for isolation, identification, and characterization of agricultural microorganisms.
7. Explain experimental design, data analysis, and scientific communication through research projects or case studies in agricultural microbiology.

8. Evaluate at least 5 ethical, social, and economic implications of microbial applications in agriculture.

### **Course Contents**

The history and development of microbiology. Characteristics of micro-organisms of plant and animal. Microbial isolation techniques. Principles of bacterial isolation and cultivation. Pathogens and diseases. Beneficial microorganisms. Basic principles of sterilization and disinfection. Inflammation and healing of lesions associated with infections. The pathogenesis of infectious diseases. Characterization of micro-organisms. Plant-microbes interaction. Microorganisms in crop production. Soil microbiology. Microbial genetics. Biotechnology applications and disease control. Food preservation. Bio-remediation. Roles of micro-organisms in soil health and ecosystem. Agriculture and microbial diversity. Ethical considerations.

### **Minimum Academic Standards**

Crop laboratory

### **BU-AGR 207 Introduction to Soil Science (2 Units; Core; LH=15; PH=45)**

#### **Senate-approved relevance**

This course is designed to provide students with a foundational understanding of soil and its importance in various fields. Through this course, students will learn about the physical, chemical, and biological properties of soil. They will also be introduced to the different types of soil and how they affect plant growth, crop production, and environmental sustainability. In addition, students will explore the impact of human activities on soil health and strategies for soil conservation and management. The knowledge gained in this course is crucial for students pursuing careers in agriculture, environmental science, soil conservation, and many other related fields. It is also relevant for those interested in understanding the role of soil in global food security and sustainable development. Overall, Introduction to Soil Science is an essential course for any student looking to gain a comprehensive understanding of soil and its significance in various disciplines. It equips students with the necessary knowledge, skills and Bible-based values to tackle real-world challenges related to soil health, conservation, and management, making it a valuable inclusion to Babcock university curriculum.

#### **Overview**

Soil science is a multidisciplinary field that encompasses various disciplines such as biology, chemistry, physics, and ecology. Therefore, the course must cover a range of topics that will enable students to develop an understanding of the complexities of soil science. The course will start with an introduction to soil science, where students will learn the basic principles and concepts of the subject. This will include the definition of soil, its functions, and its importance in agriculture, forestry, and environmental management. The students will also be introduced to the physical, chemical, and biological properties of soil and the interrelationships among them. The course will equally focus on soil formation, classification, and properties. Students will learn about the factors that influence soil formation and how they affect soil properties.

The course will also cover the different soil classification systems and how they are used to categorize soils based on their physical, chemical, and biological properties. The course will then move on to soil fertility, plant nutrition, and soil management. Students will learn about the role of soil in plant growth and development, the essential nutrients that plants require, and the different methods of soil management that are used to optimize crop yields and promote soil health. Finally, students will learn about the environmental impact of different land uses, the importance of soil conservation, and the different techniques that are used to mitigate soil degradation.

## **Objectives**

The objectives of this course are to:

1. Expound on fundamental principles of soil science
2. Discuss physical, chemical, and biological properties of soil
3. Discuss soil formation and soil classification systems
4. Explain importance of soil in agriculture, ecosystem function, and environmental management
5. Develop critical thinking and problem-solving skills related to soil science

## **Learning Outcomes**

On successful completion of this course, students should be able to:

1. Explain at least 5 physical, chemical, and biological properties of soil.
2. Describe the processes of soil formation
3. Identify 4 soil classification systems.
4. Evaluate the role of soil in agriculture, ecosystem function, and environmental management.
5. Analyze 4 problems related to soil science
6. Identify 5 ways of solving soil related problems.

## **Course Contents**

Fundamental principles and concepts of soil science. Soil composition. Soil formation. Soil physical properties. Soil functions in natural and managed ecosystems. Physical and chemical processes of soil formation. Soils in sustaining plant growth and ecosystem services. Soil environment and living organisms. Human impact on soil quality and health. Soil reaction. Soil colloids. Soil formation. Physical properties of soil. Soil fertility. Soil nutrient cycling. Soil organic matter. Soil microorganisms. Soil erosion. Soil conservation. Soil management practices. Techniques for soil type identification. Soil analysis and evaluation.

## **Minimum Academic Standard**

Soil laboratory

## **BU-AGR 208 Introduction to Ecosystem Analysis (2 Units; Core; LH=15; PH=45)**

### **Senate-approved relevance**

The need for sustainable food production to boost food security requires an intentional mastery of the climate and ways of mitigating their effects on crop and livestock production. This need calls for a paradigm shift in the training of graduates of agriculture, who will be equipped to provide viable solutions to the adverse effects of climate change on agriculture and food production in Nigeria. This course is designed towards training new agriculture scientists, who will be well armed with requisite knowledge and skill on the protocols of climate analysis in accordance with BU Senate's new program development plans geared toward promoting environmental sustainability to boost food production in line with the SDGs of the UN.

### **Overview**

The agricultural sector is one of the key contributors to the GDP, promoting wellbeing and sustainable food status, as well as providing sustainable employment to the citizenry. To achieve sustainable food production through agriculture, there is the need to understand the climate, where crops and livestock are raised as well as the effect of the interactions between the climate, crops and livestock. Unfortunately, the inconsistent changes in the global climate have affected agriculture adversely. Some of the immediate adverse effects of climate change on agriculture

include soil losses, crop failures, pest and disease insurgences, erratic weather and untold economic hardship of the populace.

Geographic Information Systems and other climatological tools in ecosystem analysis will provide robust information on agro-ecosystem climate for proper management of crops and livestock to guarantee optimum food production and food security. In view of changing climate and general agrarian systems, this course is germane to training in agriculture. It is also pertinent to the current and future contributions of Babcock University to agriculture in Nigeria.

### **Objectives**

The objectives of the course are to:

1. Discuss weather variable and their effects on agriculture production
2. Identify cultural practices deployed to mitigate adverse climatic effects on crop and livestock production
3. Expound on the need for climatic studies
4. Describe types of tools deployed in weather stations for climatic studies
5. Reveal the need for plant identification and classification.
6. Assess the effect of photoperiodism on flowering in crops
7. Describe the process of cloud formation and rainfall, evaporation and evapotranspiration.
8. Explain the climate of West Africa and visit a weather station and Identify types of tools deployed in weather stations for climatic studies
9. Identify the relationship between agriculture and climate with reference to crop, livestock, diseases and pests
10. Discuss the basic concepts of GIS and demonstrate the use of available GIS software programs
11. Identify the basic concept of cartography and geography
12. Apply the knowledge acquired in climatic studies and GIS to enhance efficiency in crop and livestock production

### **Learning outcomes**

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

1. Distinguish between weather and climate
2. Identify at least five (5) weather variables and list at least four (4) effects of weather variables on crops and livestock production
3. Name at least four (each) seasonal crop and livestock pest and disease
4. Identify 8 equipment deployed in weather analysis
5. Describe at least five (5) factors relevant for siting a weather station
6. Explain the concept of photoperiodism.
7. Identify four (4) crops that are sensitive and neutral to photoperiods
8. Describe the mechanism of cloud and rainfall
9. Measure the amount of rainfall on a rainy day
10. Describe the mechanism of wind, evaporation and evapotranspiration and describe the climate of West Africa
11. Identify the relationship between agriculture and climate viz-a-viz crops, livestock, pests and diseases
12. Utilize the GIS software programmes

### **Course contents**

Concept of Weather and Climate. Identification and description of weather variable. Weather and agricultural production. Weather effects Mitigation by Cultural practices. Equipment and tools for

ecosystem and weather analysis. Mechanism of rain formation and rain fall. Mechanisms of temperature and heat. Mechanisms of wind and evapotranspiration. Measurement of Weather Variables. Photoperiodism and flowering of crops. Climate of West Africa. Climate and Agriculture. Basic concept of vector in GIS. GIS software programmes and agricultural predictions. Introduction of cartography and Geography.

**BU-AGR 209 Introduction to Agricultural Biochemistry and Animal Nutrition (2 Units; Core; LH=15; PH=45)**

**Senate-approved relevance**

An introduction to the chemistry of nutrients in feeds and feedstuffs and their metabolism, utilization in living organisms, is covered in Introductory Agricultural Biochemistry and Animal Nutrition. Living things need food to survive, and its constituent nutrients are essential to animals' ability to perform various activities. In order to improve the students' comprehension and appreciation of the many classes of nutrients' functions in the chemical and biological processes related to the living process, this course seeks to provide knowledge on the chemical nature of those nutrients. The University Senate therefore considers it imperative to include in the curriculum of the Department of Agriculture the course, Introduction to Agricultural Biochemistry and Animal Nutrition to support the philosophy of the University in training the total man by providing proper nourishment for livestock and the populace.

**Overview**

The nutrients provide necessary components for rejuvenating cells that are degenerating, supply of energy for the body's essential functions, such as development, work, or production and raw resources for bodily tissue formation in growth. The main nutrients that are important to study in this course are nucleic acids, proteins, and the amino acids that make up each of them, the lipids, minerals, vitamins, and nucleoproteins as well as enzymes and hormones.

This course is germane to all the students of agriculture. It is aimed at providing sufficient information to deepen student's understanding and appreciation of the application of biochemistry and nutrition to agriculture in a practical based manner. This course aligns with the uniqueness of BU interest in delivery of qualitative agricultural curriculum

**Objectives**

The objectives of this course are to:

1. Explain the chemistry and importance of carbohydrates and their relevance in nutrition.
2. Describe the properties of proteins and their various metabolic forms and functions.
3. Profile the role of amino acids as building blocks of proteins
4. Explain the role of nucleic acids and nucleoproteins in genetics, reproduction and transmission of hereditary factors
5. Illustrate the chemistry of lipids and its importance in physiological processes.
6. Discuss the roles of minerals and vitamins in the maintenance of homeostatic balance and mediation of metabolic reactions in the skeleton, tissues, body fluids, digestive juices, etc.
7. Assess the effects of nutrients deficiencies on the state of health of the living animal.
8. Describe the inexhaustible roles of enzymes and hormones in animal metabolism and their modes of operation.

**Learning Outcomes**

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

1. List five (5) importance of carbohydrate in nutrition
2. Enumerate at least five essential and 5 non-essential amino acids

3. Identify 5 nutrient deficiency symptoms of nutrients
4. Enumerate four (4) roles of nucleic acids and nucleoproteins in genetics, reproduction and transmission of hereditary factors
5. List 4 roles of minerals and vitamins in the maintenance of homeostatic balance and mediation of metabolic reactions in the skeleton, tissues, body fluids, digestive juices,
6. Discuss chemical composition of Animal body
7. Illustrate the important of nutrients in Animal production
8. Develop cultivation method for one named Nigerian Indigenous medicinal crop plant
9. Identify pests and disease associated with two named indigenous medicinal crop plants in your area and outline four management methods for control
10. Identify 4 importance of water in nutrition of animals.
11. Explain the interrelationship of metabolism to animal management.
12. List 3 diseases or ailments that can be cured or ameliorated by named indigenous crop plants.
13. List 4 functions of hormones and enzymes in Animal Nutrition

### **Course Contents**

Chemistry of micro-nutrients. Macro-nutrients functions. Classification and function of enzymes and hormones. Chemical composition of animal body. Water and animal nutrition. Metabolism of micro-nutrients. The importance of Urea cycle. Food and animal body. Nutrient types. Egg Production. Nutrient deficiency and symptoms. Maintenance of homeostatic balance. Concepts of nutrient requirements. Classification of Diseases. Metabolism to Animal Management. Indigenous Pests and Diseases. Treatments of Indigenous Pests and Diseases.

### **Minimum Academic Standard**

Animal laboratory

### **BU-AGR 210 Essentials of Food Security (2 Units; Core; LH=30; PH=Nil)**

#### **Senate-approved relevance**

Training and producing high quality agriculture graduates who are well grounded in the knowledge and understanding of food security and healthy living as desired in the SDGs is a priority of the Babcock University academic pursuit. The relevance is obvious as graduates of agriculture from Babcock University will be able to apply their expertise from their respective sub-areas in agriculture (Agricultural Economics, Animal Science and Agronomy) to educate others and improve the food security status of the communities they find themselves for a healthy life.

#### **Overview**

Food Security is a very serious contemporary issue globally. Agriculture is the strong base upon which the food security status of any community, nation or household rests as agricultural production is the source of food availability which is the main determinant of being food secure. Preparing students of agriculture in the understanding and achievement of food security at both the national and household levels is therefore quite paramount.

The knowledge so acquired will equip the students to meet the needs of the relevant SDGs of zero hunger, healthy living and poverty reduction. The course is therefore very important as it touches on all areas of sustainable agriculture to make food available as well as a source of income for accessibility and affordability.

#### **Objectives**

The objectives of the course are to:

1. Describe terminologies related to food security, including hunger, food security pillars poverty and malnutrition
2. Analyze causes of hunger and food insecurity and examine hunger and food insecurity in local communities, Nigeria, ECOWAS region and Sub-Saharan Africa
3. Explain trends and commonalities in food and agricultural production in Sub-Saharan Africa
4. Examine the importance of sustainable agricultural production in the achievement and sustenance of food security status
5. Analyze the effects of climate change and water resources on food production
6. Estimate food security status at household and national levels and analyze the challenges in ensuring food security in Nigeria and some specific African countries
7. Analyze gender differentiated roles and relationships in food production and food security
8. Describe the role of women in agricultural production and identify factors affecting women vulnerability to food insecurity
9. Identify and analyze the role of institutions in food security and identify coping strategies in case of food insecurity and practical steps for eliminating food insecurity at the household, community and national levels
10. Itemize policy making bodies and policy reforms for increasing food security

### **Learning Outcomes**

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

1. Define food security and describe the relationship between it and hunger, poverty and malnutrition
2. Describe the 4 key food security pillars
3. Examine food insecurity status and hunger in their local communities and in ECOWAS region and Sub-Saharan Africa
4. Explain trends in food production among Sub-Saharan African nations and identify commonalities in their food security status
5. Define sustainable agricultural production and list out its importance in achieving sustainability of food security status
6. List 6 challenges facing the achievement of food security in Nigeria and in at least four African countries
7. Describe the role of women in ensuring food security and list the factors that affect their vulnerability to food insecurity
8. Identify at least 4 institutions, both local and global and state their role in the food insecurity quest
9. List 3 policy bodies and policy reforms and state their contributions for improving food security status in Nigeria
10. Identify not less than four practical steps for elimination food insecurity at household community and national levels respectively

### **Course Contents**

Food security. Concept definition. Key pillars of food security. Causes and consequences of hunger and food insecurity. Food security status in our local communities. Food security status in ECOWAS region and Sub-Saharan Africa. Trends in food production and food security status among Sub-Saharan nations. Sustainable agricultural production and food security. Challenges and opportunities of food security. Factors influencing food security. Measurement of food security. Gender roles in agriculture and food security. Women's role in food security. Vulnerability to food

insecurity. National and international institutions in food security. Policy making bodies and policy reforms and food security. Practical steps for eliminating food insecurity. Coping strategies.

### **BU-AGR 212 Anatomy and Physiology of Farm Animals (1 Unit; Core; LH=0; PH=45)**

#### **Senate-approved relevance**

The course AGR 212 supports the vision and mission of Babcock University by emphasizing the role of God as creator of all things, wild animals and livestock species inclusive. Students of Agriculture in BU will be exposed to knowledge of the normal structural and functional configuration of food animal species at the ultracellular, cellular, tissue, organ and systemic levels, and how various body systems work together to ensure that these animals, each one according to its own kind, yields products that are of benefit to mankind, for the Bible acknowledges that all that God created was good (Genesis 1:25).

#### **Overview**

Knowledge of the structure (i.e. anatomy) and normal functions (i.e. physiology) of the external and internal organs of farm animals is important to livestock production because the benefits that can be derived from each species is associated with the extent of development and normal functioning of its organs.

This course will describe: the biological levels of organization of living things; comparative anatomy of the digestive and reproductive tracts of farm animals; the physiological basis of homeostasis, negative feed-back, water balance, thermoregulation, growth and development, milk let-down and egg production.

#### **Objectives**

The objectives of this course are to:

1. Define the key terms used in the description of the anatomical structures of farm animals.
2. Describe the cellular levels of organization, chemical of living cells, functions of cellular components and types of cell division.
3. Explain homeostasis, and its regulation and importance in farm animals.
4. Highlight the similarities and differences in the digestive tracts of farm animals such as the domestic fowls, pigs, cattle and rabbits.
5. Describe the similarities and differences in the anatomical structures of the reproductive tracts of farm animals such as the domestic fowls, pigs, cattle and rabbits.
6. Discuss the anatomy and physiology of the nervous system of domestic animals
7. Describe the physiological basis of growth and development in farm animals
8. Explain the physiology of lactation and milk let-down.
9. Clarify the physiology of egg laying.

#### **Learning Outcomes**

Upon completion of the course, students should be able to:

1. Explain at least 5 key terms used in describing the positions, forms and functions of the anatomical structures of farm animals.
2. Identify 10 differences in the anatomical structures of the digestive tracts of various species of farm animals.
3. Identify 10 differences in the reproductive tracts of different species of farm animals.
4. Explain at least 5 principles and benefits of homeostasis, water balance and thermoregulation in farm animals.
5. Identify at least 5 structures that comprise the nervous and hormonal systems of farm animals, and their normal functions.

6. Explain at least 5 physiological basis of growth and development, lactation, milk let down and egg production.

**Course Contents**

Key Definitions. Cellular levels of organization. Homeostasis and homeostatic mechanisms. Chemical composition of the cell. Functions of cellular components. Cell division. Comparative anatomy of the digestive system of farm animals. Comparison of the anatomical features and functions of the reproductive organs of farm animals. Physiological basis of growth. Development in farm animals. Nervous systems of farm animals. Hormonal systems of farm animals. Functions of the nervous systems. Functions of the hormonal systems. Physiological basis of lactation and milk let-down reflex. Physiology of egg laying. Anatomy and physiology of the nervous systems of farm animals.

**Minimum Academic Standard**

Animal laboratory

**Babcock University (BU)**  
**Agriculture**  
**Agriculture**  
**B. Agriculture**  
**Course Contents and Learning Outcomes**

**300 Level**

**GST 312: Peace and Conflict Resolution (2 Units C: LH 30)**

**Learning Outcomes**

At the end of the course, students should be able to:

1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism; enumerate security and peace building strategies; and
4. describe roles of international organisations, media, and traditional institutions in peace building.

**Course Contents**

Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis.

**ENT 312: Venture Creation (2 Units C: LH 15; PH 45)**

**Learning Outcomes**

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;

2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

### **Course Contents**

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, Ecommerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy etc. Digital business and e-commerce strategies).

### **AGE 305: Data Science and Statistical Computing (2 Units C: LH 15; PH 45)**

#### **Learning Outcomes**

At the end of the course, the students should be able to:

1. explain the properties of data;
2. determine appropriate sampling techniques and the use of different data collection instruments;
3. analyse cross-sectional and time series data and interpret the results;
4. formulate hypotheses and make decisions using appropriate test statistics; and
5. apply correlation and regression analyses to solve agribusiness problems.

#### **Course Contents**

Basic concepts of statistics. Frequency distribution, measures of location, measures of dispersion.

Probability distribution. Normal and binomial distribution. Sampling data collection, data processing techniques, statistical inference, tests of hypothesis – F-test, T-test, Chi-square.

Analysis of variance, analysis of covariance. Correlation and regression analyses. Formulation of

research objectives, field experimentation, collection and processing of data. Analysis of secondary data.

### **AGE 306: Application of Computer to Agriculture (2 Units C: LH 15; PH 45)**

#### **Learning Outcomes**

At the end of the course, the students should be able to:

1. explain basic information technology terms;
2. use the computer and software packages to create databases; and
3. store information and analyze it using common software such as the Microsoft Excel and Access, SPSS, SAS, R statistics, E Views etc.

#### **Course Contents**

Information technology (IT) in information production, storage and retrieval. Information technology in communication, output generation and delivery. IT and automation in agriculture. IT applications in agricultural production and marketing, consumption and product utilization.

### **AGE 307: Introduction to Farm Management and Accounting (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, the students should be able to:

1. explain the components of farm management and the function of a farm manager;
2. create different types of farm records and prepare farm budgets;
3. estimate and compare measures of business financial performance;
4. create farm plan using budgeting linear programming approaches;
5. post business transaction into credit and debit categories; and
6. prepare financial statements such as; the profit and loss accounts, balance sheets and trial balance.

#### **Course Contents**

Meaning, scope and objectives of agricultural management. Functions and tools of farm management. Effects of socio-economic environment on farm management functions. Steps in farm management decisions. Organization of farm-firm; farm selection, farm layout, enterprise selection and the distribution of investment. The need for farm management information and the positive and normative approaches to farm management information collection. Farm records and accounting. Principles of farm asset valuation and depreciation. Farm budgeting, including complete, partial and breakeven budgeting. Linear programming as a tool for farm enterprise planning. Analysis of farm business performance- measures of efficiency, financial position and farm business size. Book keeping as an accounting tool. Assets and liabilities. Balance sheets and Profit and Loss Accounts. Trial balance. Finance and capital appraisal tools. Depreciation methods and analysis.

### **AGX 311: Principles of Rural Sociology (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, the students should be able to:

1. define rural sociology and make valid comparison with urban sociology on the basis of their special attributes;

2. define and comprehend the basic sociological terms as used in the field of sociology;
3. discuss the major rural social institutions, their functions and roles; and
4. describe leadership dynamics and other rural social processes and their roles in changing the lives of rural dwellers.

### **Course contents**

Meaning, nature and scope of rural sociology. Organization of societies. Basic sociological concepts. Major social institutions. Analysis of the structure of rural agrarian systems and societies. Community characteristics of rural people. Social system. Components or characteristics of a social system. Social processes. Social stratification. Social mobility. Social change. Dimensions of social change and their potentials in the modernization of rural societies. Sources of social change in society. Socialization process. Social conflict and social control. Group dynamics. Internal group dynamics. External group dynamics. The social action processes. leadership patterns. Types of leadership. Implication of rural sociology for extension work.

### **ANS 302: Introduction to Animal Breeding and Genetic (2 Units C : LH 30)**

#### **Learning Outcomes**

At the end of the course, the students are expected to have learnt/understood:

1. brief history of genetics enunciating the contributions of Charles Darwin, Gregor Mendel, E. H. Hackel. A. Weisman, W. Batesman etc.;
2. the chromosome compliments of common farm animals (cattle, sheep, goat, pig etc);
3. the helical nature of the DNA molecule and the base pairing system;
4. the role of the DNA and RNA in genetic coding;
5. monohybrid and Dihybrid inheritance using cross diagrams and the Punnet square;
6. how to distinguish between qualitative (descriptive) and quantitative (metric) traits;
7. the different gene actions (additive, dominance, epistasis etc.);
8. the different breeding systems (inbreeding, cross breeding, line breeding etc.), and
9. how to estimate heritability and repeatability of traits.

#### **Course Contents**

History of genetics. Chromosomes structure, number and variations. Gene and genotype. Genetic code. Mendelism; fundamental principles of inheritance, quantitative and qualitative characters and their inheritance. Different types of gene actions, values and means, repeatability, heritability etc. Animal variation and selection principles. Breeding and environmental effects, in- breeding, pure line breeding, cross breeding and other breeding methods.

### **ANS 304: Non-Ruminant Animal Production (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course students are should be able to:

1. explain clearly the production and management of poultry, swine and rabbits;
2. identify and discuss the attributes, problems and prospects of each species;
3. identify and describe of various enterprises (growing, fattening, hatching, breeder);
4. explain the management practices peculiar to each enterprise (Housing, health, breeding, and feeding) and

5. describe the processing and marketing of stock and products.

### **Course Contents**

Poultry production: problems and prospects. Swine production: problems and prospects. Rabbit production enterprises: problems and prospects. Management systems of breeding stock; broilers, cockerels, ducks and turkeys. Hatchery enterprises and factors affecting hatchery operations. Housing, equipment and feeding principles of poultry, rabbits and pigs. Production and management practices. Livestock Economics. Health management of stock. Processing and marketing of poultry, pigs and rabbits.

### **ANS 305: Ruminant Animal Production (2 Units C: LH 30)**

#### **Learning Outcomes**

1. Students are expected to acquire knowledge of:  
attributes, problems and prospects of cattle, sheep and goats in Nigeria;
2. identification and description of the various enterprises (meat production, milk production, etc.);
3. management practices peculiar to each species and enterprises in each in terms of:  
-Housing and equipment needs  
-Feeds and feeding requirement  
-Health and health management  
-Reproduction management/regulation; and
4. marketing and the economics of these enterprises.

#### **Course Contents**

Cattle production: Problems and prospects in Nigeria. Indigenous and exotic breeds of beef and dairy cattle. Dairy and beef production systems. Dairy and beef production enterprises. Sheep and goat production – breeds, management systems. Management of breeding stock, growing and young animal, Housing, equipment and feeding principles of cattle, sheep and goats. Health management of ruminant animals. Marketing of animals and their products.

### **BU-ANS 307 Feeds and Feeding (2 Units; Core; LH=15; PH=45)**

#### **Senate-approved relevance**

Agriculture's livestock sector is critical to meeting human demand for animal protein. The competition between man and livestock for food necessitates the study of available feed resources. Babcock University is located in Ogun State, which is a nerve center for commercial poultry production in Nigeria. The abundance of unexplored alternative feed ingredients from agro-allied industries in and around the state for the support of livestock production is a justification for teaching and research in this area. An understanding of the classification and composition of these feed resources to meet the nutrient requirements of livestock is crucial to the development of the livestock industry. The University Senate considers harnessing the knowledge of these feed resources by students important for profitable livestock production.

#### **Overview**

Ban on importation of poultry products from the neighbouring countries through Nigerian borders, including Idi-Iroko in Ogun State, has increased the intensification of poultry and livestock in the state. Consequently, feed mills have also sprung up in different areas. In spite of ingredients like maize coming in from the North, the cost of feed is continually increasing. The global trend in

animal nutrition is the exploration of available potential feed resources for the production of livestock at minimal cost. The rich vegetation of the south-west Nigeria is a source of potential indigenous livestock feed. The cost of imported feed additives and the process of procurement are burdensome to farmers and feed mills in the state. The risk of unstandardized synthetic feed additives is also apparent. The course will expound the various types and classifications of livestock feeds, feed resources, basic feed mill operations, ration formulation and basic chemical analysis of feedstuffs as well as the utilization of agro-industrial by-products in livestock production. This is very essential to achieving a robust tutelage in agriculture at BU.

### **Objectives**

The objectives of this course are to:

1. Describe the basic principles of feeds and feeding
2. Classify feed resources
3. Evaluate the quality of feed and feedstuffs
4. Determine the nutrient and anti-nutrient composition of feed ingredients
5. Explore the concept of alternative feed resources
6. Examine the utilization of agro-industrial by-products in livestock production
7. Expound on the dynamics and importance of different feed stuffs in feed formulations at the feed-mills
8. Describe the concept of feeding standards and ration formulation

### **Learning Outcomes**

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

1. Classify at least 10 different feed ingredients used in Nigeria Livestock industry
2. Determine the proximate analysis of feedstuffs
3. Evaluate the quality of feedstuffs by physical and biological methods
4. Identify four (4) anti-nutritional factors in feed ingredients
5. Highlight five (5) alternative feed resources and their utilization in Nigerian feed industry
6. Calculate the amount of nutrients in the feed consumed by livestock
7. Conduct sampling of different feed ingredients for laboratory analysis
8. Develop an effective maintenance programme in feed-mill operations

### **Course Contents**

Types of livestock feeds. Nutritive value of Nigerian feeds and feeding stuffs. Factors affecting the nutritive value of feed ingredients. Feeding standards used in livestock production. Toxins and potential toxins feeds. Alternative feed ingredients. Ration formulation. Balanced ration evaluation. Digestive experiments. Economic livestock feeding and feed-mill industry. Usage of different feed stuffs or ingredients. Proximate analysis and nutritive value of Nigerian feed stuffs. Utilization of Agric-industrial by-products. Protein and energy requirements of livestock. Methods for evaluating the nutritive value of feeds. Receiving and sampling of feed ingredients. Maintenance program in feed mill operation. Demands and supply of livestock feeds and concentrate.

## **CPS 301: Arable Crops Production (2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, student will be able to:

1. discuss diversity of arable crops;
2. discuss the need for crop improvement;.
3. explain crop production procedures;

4. describe harvesting and produce handling techniques; and
5. explain the utilization of each crop commodity.

#### **Course Contents**

Origin, distribution, soil, and climatic requirements for classes of arable crops, specifically cereals, legumes, root crops, fibre crops, vegetables, and other important arable crops in Nigeria. Concept of improved crop varieties and the importance in crop productivity. Production practices, harvesting, utilization, processing, storage, and economic aspects of some selected major arable crops.

### **CPS 302: Permanent Crops Production (2 Units C: LH 30)**

#### **Learning outcomes**

At the end of the course, the students will be able to:

1. identify important plantation crops and discuss their specific production requirements;
2. describe different crop improvement techniques;
3. discuss the food and industrial relevance of each of the crops; and
4. describe different methods of processing and preservation of the crop produce

#### **Course Contents**

Origin, distribution, soil, and climatic requirements of important permanent crops such as cocoa, oil palm, rubber, coffee, coconut, mango, sugar cane, bananas, plantains, citrus, kola, cashew, etc. Production practices, improvement, harvesting, utilization, processing, storage, and economic aspects of some selected permanent perennial crops.

### **CPS 304: Crop Genetics and Breeding (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the basics concepts of genetics and plant breeding;
2. describe specific plant breeding methods;
3. explain the concept of inheritance in crop plants;
4. explain the sexual and asexual methods of plant propagation; and
5. Discuss the place of plant breeding in crop improvement.

#### **Course contents**

Cell structure and components, chromosomes; structure, number and variations, linkage and crossing over, mutation and genes in population. Multiple alleles, mitosis and meiosis. Theory of evolution. Fundamental principles of inheritance. Mendelism. Introduction to population and quantitative genetics. Objectives and general principles of crop breeding including their application to self-pollinated, cross pollinated and vegetatively propagated crops. General and special methods of selection in inbreeders and out-breeders; compatibility, male sterility. Heterosis. Polyploidy in crop breeding, and mutation breeding.

### **SOS 302: Introduction to Agricultural Mechanization (2 Units C: LH 30, PH 45)**

#### **Learning Outcomes**

Students will be able to:

1. explain the goals and principles of agricultural mechanization. Basic mechanics: force, distance, time, velocity scalar and vector quantities, etc. Principles of two and four stroke engines; internal combustion engines, electric motors. Farm power transmission lines;

2. define and demonstrate importance of mechanization of agricultural practices: from the field to the table. On-site experience of land preparation operations and equipment used;
3. Perform land clearing (felling and stumping), and ploughing, tillage operations (ridging and harrowing); planting/sowing operations, herbicides/pesticides and fertilizer distribution operations;
4. handle some harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including safety in use of preservatives and
5. handle some livestock machines and equipment, automated food conveyors, milking watering and meat processing and canning. Planned visits to mechanized agricultural farms.

### **Course Contents**

Goals and principles of agricultural mechanization. Basic mechanics: force, distance, time, velocity

scalar and vector quantities, etc. Principles of two and four stroke engines; internal combustion engines, electric motors. Farm power transmission lines. Importance of mechanization of agricultural practices: from the field to the table. On-site experience of land preparation operations

and equipment used. Land clearing (felling and stumping), and ploughing, tillage operations (ridging and harrowing); planting/sowing operations, herbicides/pesticides, and fertilizer distribution operations. Harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including safety in use of preservatives. Livestock machines and equipment, automated food conveyors, milking watering and meat processing and canning. Harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including safety in use of preservatives.

### **SOS 303: Introductory Pedology and Soil Physics (2 Units C: LH 30)**

#### **Learning Outcomes**

Students will be able to:

decipher the differences and distinguish between soil and land, between land and landscape;

1. determine how soils are formed, factors and processes involved in soil formation and soil differentiation, the myriad of processes operating within the soil medium concurrently and simultaneously;
2. explain the concept of the soil system as a natural body, as a disperse system and as an open system;
3. describe the peds as the smallest units of the soil structure, levels of structural organization, Soil micro-morphology, and the creation of soil structure and pore volume.
4. discuss the origin of the soils on which all plants/crops are grown, and as the bedrock of agriculture and by direct implication food security;
5. characterize their soils and employ their knowledge of the soil characteristics and manage all types of soils, including problem soils for food production food security;
6. explain the meaning, scope, soil constituents, and their relations with the broad area of soil science, as well as with crop growth and crop development;
7. and explain soil mechanics, heat, light, energy and other classical physics concepts to the soil plant atmosphere continuum; the mechanical behaviour (rheological behaviour of the soil

mass and the effects of soil physical conditions on plant growth, as well as the management of soil physical conditions for optimal agricultural production.

### **Course Contents**

Introductory: Soil, land and landscape. Processes in the soil environment. Jenny's factors of soil formation: The parent material. Climate, organisms, relief, and time. Soils as the bedrock of agriculture. Soils as non-renewable natural resource. Soils as a disperse system. Peds and pores, levels of structural organization, Soil micro-morphology, the creation of soil structure, pore volume. Approaches to the concept and study of soils: pedological or edaphological? Weathering of rocks and minerals: types of weathering, types of parent materials. Soil profile development: processes and factors of profile development; nomenclature and identification of soil horizons: master and sub-horizons and layers, transitional and combination horizons, suffix symbols, soil catena concept. Reactions and processes of soil genesis: weathering and end-products of inorganic and organic fractions; Inorganic components of soils; rocks and minerals, primary minerals, secondary minerals, clay minerals (1:1 and 2:1). eluviation and illuviation of bases, silica, aluminum, iron, clay, and organic matter; development of pans, nodules, and concretions; progressive soil development; soil orders and the genesis of their diagnostic horizons. Concepts and basic definitions of soil physics. Soil physics as a complementary branch of soil science. Physical & rheological properties of the soil. Mechanical composition of Soils: soil structure, soil texture, dynamic properties of soils. Soil air and aeration, soil thermal properties, soil water content I (tension etc), Soil water II (energy state forces acting on soil water), Soil water III (flow of water in soil, Darcy's law, Stoke's law, hydraulic conductivity, etc), Soil water IV (water infiltration into soils and soil water re-distribution, infiltration equations). Soil physics applications (Soil water for plants and management of soil physical conditions). Appreciation of soil physical fertility as just important as chemical and biological fertility.

**Babcock University (BU)**  
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**Course Contents and Learning Outcomes**

**400 Level**

**AGE 404: Farm Records and Accounting (2 Units C: PH 90)**

**Learning Outcomes**

At the end of the course, the students should be able to:

1. apply the knowledge and skills acquired from the principles and theories taught at the lower levels at the different Industrial training locations or farms where their practical training is situated;
2. prepare formats for different farm records such as production, sales, inventory etc.; and
3. analyze and interpret organizational financial performance from their financial records.

**Course Contents**

Objectives of records and accounts. Types of records. Importance of production records. Analysis of farm records. Farm inventory-valuation and depreciation. Farm financial accounts. The farm as a firm.

**BU-AGE 406 Agricultural Marketing Techniques (2 units; Core; LH=0, PH=90)**

**Senate-approved relevance**

Producing high quality graduates who have the high skill of taking their product through the marketing system by understanding how to apply techniques that would give them a good share of the market is very much in agreement with Babcock University mission to address current challenges in agriculture particularly in the marketing system. This carries the relevance of getting the produced food from the production point to the consumption point with minimum loss or waste. This makes food available at where, when and how it is needed. An important commitment of the Babcock University senate is to produce agriculture graduates with a mastery of agricultural marketing techniques, through their practical year, would therefore get the food to where it is needed thereby eradicating hunger as stipulated in the SDG 1.

**Overview**

Agricultural marketing being the link between production and consumption of agricultural products needs the actors to grasp good practical techniques in the performance of the marketing functions. Agricultural products have such characteristics that make their marketing quite delicate as a result of their biological nature and seasonality. This highlights the importance of taking students in agriculture through a practical course that makes them understand the practical techniques of handling agricultural products through the marketing system. The course is therefore designed for students to have hands-on experience in the marketing of agricultural products applying the techniques they have been taught in theory.

**Objectives**

The objectives of the course are to:

1. Classify products according to their marketing needs
2. Examine the extent of processing required for a given product
3. Determine the processing method to apply for a crop

4. Process a given product into its different by-products
5. Perform advertisement and other promotion strategies
6. Practice different storage methods
7. Determine the appropriate type of transportation mode for a given product
8. Explore different selling methods
9. Illustrate price determination techniques
10. Demonstrate packaging techniques

### **Learning Outcomes**

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

1. Classify at least, 10 products according to their marketing needs
2. Indicate the depth of processing required for a given product
3. Determine at least five (5) appropriate processing method or techniques
4. Process at least one (1) product into its by-products
5. Perform 10 advertisement and other promotion strategies
6. Demonstrate 5 different storage techniques
7. Describe 5 appropriate transportation mode for a given product
8. Identify 5 selling methods fit for a product and environment
9. Fix at least 3 prices for different commodities
10. Package at least 7 products

### **Course Contents**

Practical illustration of the classification of products. Identification of marketing needs. Processing needs for different categories of agricultural products. Evaluation of biological characteristics of agricultural products. Practical marketing techniques for agricultural products. Traditional processing technology for different agricultural products. Modern processing technology for different agricultural products. Products and their by-products- hands-on experience with tree crops. Products and their by-products- hands-on experience with arable crops. Promotion strategies. Storage techniques for crop products. Storage techniques for livestock products. Advertisement strategies. Transportation modes in different environments. Selling methods. Price determination techniques. Packaging styles for different crop products. Packaging styles for different livestock products.

## **AGX 410: Community Agricultural Extension (2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students should be able to:

1. explain the value of group formation in community and apply collective approach to solving community problems;
2. collect field data and analyse; and
3. plan and execute development interventions in a community.

### **Course Contents**

Concept of community. Groups in community. Social change and agents of change. Use of participatory tools in problem identification and solution. Survey methods. Data collection/questionnaire administration. Use of interventions in community development.

## **BU-AGX 411 Field Trip and Seminars (2 units; Core; LH=0, PH=90)**

**Senate-approved relevance**

This course aims to give B. Agricultural students experiential learning opportunities through a dual system of classroom instruction and internships in important agricultural industries/ agro-allied sector. Field trips serve to increase enthusiasm, thinking ability, and connect the university curriculum to the workplace and the industries. It aids in completing the three-part learning process. This is consistent with BU's vision and goal to guarantee that graduates have the education, growth, and development of lasting practical and hands-on skills, and having a gown-town approach. Today's graduates need to be aware of the skills that are actually needed in the workplace and how to apply the academic theory they have learned to real-world situations. As a result, field trips would help students build their inventive human ability and internship skills.

### **Overview**

The course up-levels students' knowledge and understanding of developing new economies while creating an appreciation of the forces that drive and shape the global economy. It also gives students industrial-based expertise in how to translate ideas and theories into significant economic prospects. Also, the students will have the chance to build their modern, globally relevant abilities more quickly and intentionally for employability and job generation.

The three domains of teaching and learning outcomes—cognitive, affective, and psychomotor domains—will also be better understood by students in this course. It will also improve their observational skills and enable them to connect what they learned in class with what they experienced on the field trip. Students' participation in this course will help them better connect with the material, develop their emotional intelligence. Exposure to this course will foster the academia-industrial linkages.

### **Objectives**

The objectives of this course are to

1. Explain the meaning and concept of field trip and its relevance to experiential learning,
2. Describe the domain of teaching and learning,
3. Highlight the advantages and benefit of field trip,
4. Define the economy and how to join the economy through employment, self-employed and entrepreneurship,
5. Illustrate how to plan a successful field trip and components of field trip report,
6. Describe how to introduce an idea to potential investors while on field trip.

### **Learning Outcomes**

At the end of this course, the students should be able to:

1. Discuss the meaning and concept of field trip,
2. Explain the three (3) domains of teaching and learning,
3. Highlight at least 5 advantages and benefits of field trip,
4. Define the economy and how to join the economy through employment, self-employed and entrepreneurship,
5. Illustrate how to plan a successful field trip
6. Prepare a field trip report of a specified agro-allied sector visited.

### **Course Contents**

Explanation of the meaning and concept of field trip. Case studies in field trips. Teaching and learning objectives of field trip. Domains of the trainees. Advantages and benefits of field trip. Disadvantages of field trip. Understanding the economy of field trip. Seminar Presentation. Explanation of Field Days. Differences between field trip and field days. Practical experience of joining the economy. Planning a successful field trip. Design of questionnaire. Administration of

questionnaires on Field trips. Setting the stage and planning the field trip. Field trip report writing. Pitching to potential investors.

### **ANS 403 (404): Animal Products, Processing, Handling and Marketing (2 Units C: PH 90)**

#### **Learning Outcomes**

At the end of this practical, hands-on course, the students are expected to have learned the following:

1. pre-slaughter handling of different classes of farm animals;
2. dressing percentage of all various farm animals;
3. prime cuts;
4. packaging of dressed animal products;
5. marketing of animals and their products;
6. egg quality, handling, storage and grading;
7. how to identify quality meat;
8. methods of meat preservation;
9. meat inspection and grading;
10. processing of abattoir by-products;
11. production of blood meal, bone ash, feather meals; and
12. hides and skin processing such as flaying, curing and tanning.
13. handle meat animals prior to and after slaughter;
14. handle the carcass, offal and meat obtained after slaughter;
15. handle meat, milk and eggs in hygienic ways;
16. process meat, milk, and poultry products and
17. market these products.
18. Preparation for slaughtering, evisceration and dressing percentages. Care of carcass and its cuts, processing and care of hides, skin and wool. Processing, microbiology and storage of meat, milk and poultry products. Milk hygiene; effect of cooking on meat and milk flavour. Post-harvest physiology of animal products; egg quality and grading. Chemistry and nutritive value of meat and eggs. Milk by-products-butter, cheese and whey; preparation and storage of beef products – bacon, sausage and ham; food additives; flavours and aroma. Marketing and distribution of keep routine farm records such as purchases, mating/breeding records, production records, vaccination/herd health records, etc;

#### **Course Contents**

Pre-slaughter handling of different classes of farm animal. Slaughtering methods. Dressing and post-mortem changes in meat. Carcass cuts and measurement of carcass quality. Marketing of live animals and animal products. Visit to abattoirs. Processing of abattoir by-products: production of blood meal, bone ash, hooves, etc. Hides and skin processing. Visits to well-established dairy farms. Milk processing and dairy microbiology.

### **ANS 405: Animal Husbandry Techniques and Livestock recording and identification (2 Units C: PH 90)**

#### **Learning Outcomes**

At the end of this practical, hands-on course, the students should have learned the following:

1. routine practices in the husbandry of cattle, sheep, goats, poultry, pigs and rabbits;
2. management systems of cattle, sheep, goats, poultry, pigs and rabbits;

3. nutrient requirements, daily rations and feeding of cattle, sheep, goats, poultry, pigs and rabbits;
4. vaccination schedules and general health care of cattle, sheep, goats, poultry, pigs and rabbits;
5. common farm operations such as handling, control and grazing of ruminant animals;
6. keep routine farm record such purchases, mating/breeding record, production record, vaccination/herd health records etc;
7. identify each animal on the farm through naming, ear tagging, branding, tattooing, ear notching;
8. use modern methods of animal identification such as microchip implants, radio wave frequencies, etc;
9. carry out contact tracing in disease surveillance; and,
10. easily identify sick animals for isolation and treatments

### **Course Contents**

Production and management systems for cattle, sheep, goats, poultry, pigs and rabbits. Housing and space requirements. Ruminant animal feeding, Monogastric animal feeding. Regular routine management practices (daily, weekly, monthly, etc.) in cattle, sheep, goats, poultry, pigs and rabbit production; dehorning, castration, debeaking, vaccinations, disease surveillance. Common farm operations; handling and restrain techniques, grazing and herding. Animal identifications. Methods of animal identifications: naming, ear-tagging, skin branding, tattooing, ear-notching, electronic/digital. Routine farm records: farm purchases, mating/breeding records, production records, vaccination/herd health records. Identification of sick animals for isolation and regular treatment.

### **BU-ANS 406 Feed Manufacturing (2 units; Core; LH=0, PH=90)**

#### **Senate-approved relevance**

The world population growth and GDP growth of meat consumption mean that more grains and feed ingredients are being used to meet the rising demands for animal protein. Production of animal feed requires several important processing and quality control steps, and only quality feed ingredients will produce quality feed. Hence, the need to understand the basic principles of feed manufacturing process and the need to use specific equipment in each feed manufacturing process for the production of quality feed for our livestock. Also, health and food safety concerns are putting pressure on better-quality feed ingredients. The BU Senate considers harnessing the knowledge of these feed resources, which are abundant in Ogun State, where BU is located, by students to enhance their entrepreneurial skills in the area of feed milling. The programme is further geared towards producing self-employed graduates with sufficient technical, productive and entrepreneurship skills, and who are relevant to themselves, the agricultural industry and the society, as well as contribute effectively to national development goals in agriculture.

#### **Overview**

This course is designed to promote knowledge-based feed manufacturing practices. It would equip learners with robust knowledge and requisite skills needed in the feed manufacturing processes. It will also enable entrepreneurial skills that can make the student specialize in feed production. It will entail method sourcing of feed ingredients, storage, processing, and quality control. Also, the economics and management of feed-mill operations, marketing, and sales promotion in the feed-mill industry will be evaluated. Safety regulations pertaining to feed manufacturing procedures will be evaluated.

The course will give an overview of the feed manufacturing industry in the world and Nigeria in particular, ways of sourcing for cheap and quality feedstuffs as well as quality control measures before milling and after milling operations. The students will be exposed to the standard designs and modes of operations of standard feed mills. Also, profitability measures and marketing in feed manufacturing industry will be adequately described to the students.

### **Objectives**

The objectives of this course are to:

1. Describe the current world feed manufacturing industry situation
2. Identify how the feed manufacturing connects to the food chain
3. Expound on basic feed manufacturing process.
4. Identify the basic principle of maintenance in feed mill operation
5. Explain the importance of quality control in feed mill operation.
6. Identify available marketing system used in feed manufacturing industry
7. Elucidate the importance of good storage on quality of feed and livestock

### **Learning Outcomes**

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

1. Discuss current state of feed manufacturing in Nigeria and world feed manufacturing industry
2. Illustrate the connection between feed manufacturing and the food chain
3. State three (3) methods employed in ration, concentrate and premix production
4. Identify three (3) feed milling practices and processes
5. Enumerate four (4) good manufacturing practices and standard operating procedures in feed mills.
6. Identify three (3) ways of sourcing for raw materials for the feed-mill and handle ingredients used in feed mills.
7. Highlight two (2) methods of sample collection for analysis feed ingredients in feed mill.
8. List four (4) importance of particle size in livestock production.
9. Itemize three (3) factors affecting quality of raw materials in feed mill operation.

### **Course Contents**

Overview of the Nigerian feed-mill industry. Feed mill establishment and operation. Feed milling machine designs. Feedstuff sourcing and quality control. Principles and techniques of manual and computerized feed formulation. Economics and management of feed-mill operations. Marketing and sales promotion in the feed-mill industry. Safety regulations pertaining to feed manufacture. Feed manufacturing process. Pest management in Feed mills. Environment and feed milling. Quality assurance in a feed mill operation. Equipment maintenance and grain quality management. Receiving and sampling of feed ingredients. Developing an effective maintenance program in feed mill operation. Demands and supply of livestock feed and concentrate. Microbiological and chemical hazards in feed production. Product evaluation and quality determination. Principle of feed milling operations. Principles of instrumentation and analysis in the feed industry. Plant layout and design of different capacities of feed mills. Record keeping in feed mill operation

### **BU-ANS 408 Micro-Livestock Production (2 units; Core; LH=0, PH=90)**

#### **Senate-approved relevance**

In Nigeria the demand for food of animal origin is growing much faster than production due to improved health, education, higher income per capita and ever-increasing population growth. The rapid growth in the human population has overtaken the production of animal products. As a result,

it has become necessary to enhance output through the use of new animal protein sources or their creation. Because livestock products will be out of reach for the common person unless alternate sources of animal protein are discovered, the use of micro-livestock species as a workable option to supply the demand for animal products is non-negotiable. Given the significant rise in the human population and urbanization, micro-livestock is projected to gain importance. In tandem with Babcock University to promote human development and food security, this course is intended to provide B. Agriculture students with fundamentals of micro-livestock production with specific practical experience ideal for work in agro-allied sectors as well as other farm-related fields and inventory as a farm manager.

### **Overview**

This course is important as micro-livestock also provide ways by which acute protein shortage could be minimized in developing countries especially in Nigeria. It is important to expose students to the management of these livestock specie and how effectively they can be marketed in order to make much profits from their distribution.

This course is designed to provide students with historical background, world production, distribution, and the importance of micro livestock. The characteristics of different micro livestock as important meat-producing animals. Students will learn the fundamentals of feeding micro-livestock like snails, guinea pigs, grass cutters, African giant rats, rabbits, etc. in this course.

### **Objectives**

The objectives of this course are to:

1. Highlight economic importance of micro livestock to meat production
2. Describe the current world micro livestock production
3. Elucidate the limitations to micro livestock production
4. Identify the characteristics of five micro livestock
5. Explain the nutritional requirement of five micro livestock
6. Identify various breeds of rabbits, grass cutters and snails.
7. Explain various housing and equipment for raising five micro livestock
8. Identify some common diseases of micro livestock.
9. Demonstrate basic management practices in micro livestock

### **Learning Outcomes**

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

1. Identify five (5) micro livestock and their features
2. List five (5) economic importance of micro livestock
3. Elucidate four (4) limitations to micro livestock production
4. Identify three (3) characteristics of each of these micro livestock
5. Discuss nutritional requirement of five (5) micro livestock
6. Discuss two (2) breeds of rabbits, grass cutters and snails.
7. Summarize various housing and equipment for raising three (3) micro livestock
8. Identify three (3) common diseases of micro livestock.
9. Explain five (5) basic management practices in micro-livestock

### **Course Contents**

Common terminologies used in micro-livestock production. Definition of little-known animals with promising economic features. Biology of micro-livestock species. Nutritional behavioural patterns of micro-livestock. Feeding methods under different systems of management. Feed resources and alternative feed ingredients used in micro livestock production. Nutrient requirement of micro livestock. Appropriate technology for feeding micro livestock. The basic principle of

micro-livestock. Rearing methods for different micro livestock. Benefits and Limitations to micro livestock production. Different breeds of micro-livestock. Breeding methods and characteristics of micro livestock. Factors to be considered in selecting foundation m or replacement stock in micro livestock. Common diseases of mini-livestock animals and their control. Effects of micro-livestock production on household livelihood.

### **CPS 401: Crop Production Techniques I (3 Units C: PH 135)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. perform initial aspects of crop production enterprise; and
2. plan for and initiate crop production activities.

#### **Course Contents**

Selection of seeds and other propagules for planting. Land clearing/preparation and tillage. Planting techniques and appropriate plant population management. Early crop management practices for good crop establishment.

### **CPS 403: Crop Protection I (3 Units C: PH 135)**

#### **Learning Outcomes**

At the end of the course, trainees would have:

1. competence in field insect pest management;
2. ability to identify specific disease symptoms on crops; and
3. competence in overall crop protection in crop production enterprise.

#### **Course Contents**

Practical identification of pests and disease pathogens on crop field. Familiarization with and mode of use of pest and disease control equipment. Practical involvement in insect pest management, disease control on diverse crops, nematode management. Practical aspects of phytosanitary.

### **CPS 406: Farm mechanization Practices (2 Units C: PH 90)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. have Adequate knowledge of farm machines and implements;
2. have sufficient skill in tractorization activities in crop cultivation; and
3. appreciate of the inherent need for mechanization in crop production.

#### **Course Contents**

Familiarization with farm machines. Farm implements, their uses and coupling methods practically demonstrated. Tractor operation for basic field operations – ploughing, harrowing, and ridging. Involvement in equipment and tractor routine maintenance activities.

### **BU-CPS 407 Organic Agriculture and Practice (2 Units; Core; LH=0; PH=90)**

#### **Senate-approved relevance**

Attaining sustainable food security, one of the goals of the United Nations calls for the intensification of food production. This has led to the adoption of technology and inputs in order to boost yield in crop and livestock products. The use of inputs such as inorganic fertilizer, pesticides, chemical supplements and machines, among others, in crop and livestock production

has been an issue in contemporary agriculture, because of their side effects on the health of consumers of such products as well on the environment, where their residues may be toxic. Organic agriculture promotes the practice of crop and livestock production that conforms to natural ecological process, discouraging any practice involving the use of inorganic chemical in agriculture. The need for sustainable food production to boost food security requires an intentional mastery of the climate and ways of mitigating their effects on crop and livestock production. This course is designed to train and promote the culture of organic agriculture among new breed of agriculturists, in accordance with BU Senate's new program development plans geared toward promoting environmental sustainability to boost healthy food production in line with the SDGs of the UN.

### **Overview**

Organic agriculture in Nigeria is still in its infancy. The awareness and advocacy for organic farming became intensified as a result of the immense health benefits of organically grown crops and livestock and the adverse environmental and health effect of the use of agrochemicals like pesticides and inorganic fertilizers in agriculture.

Organic agriculture is a system of crop and livestock production that sustains the health of soils, ecosystems and consumers of such agriculture products. It is a holistic production management system which promotes and enhances agro-ecosystem health, biodiversity and biological cycle and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system.

### **Objectives**

The objectives of the course are to:

1. Describe the concept and development of organic agriculture
2. Identify the principles of organic agriculture and identify the various types of organic farming
3. Discover the need and benefits of organic agriculture and distinguish between conventional agriculture and organic agriculture
4. Describe the scope of organic agriculture and discuss organic farming system
5. Demonstrate cultural practices and biological processes in organic agriculture
6. Describe composting principle, stages, types and factors and practice composting methods
7. Describe the soil food web and nutrient cycle
8. Identify soil management and land preparation in organic agriculture
9. Identify available bio-fertilizer type and methods of application
10. Describe the organic crop production systems like cereals, vegetables, fruits, tree crops, rotational grazing pasture management
11. Discover the principles and practice of mushroom cultivation and apiculture
12. Identify and describe pest management practices in organic agriculture
13. Identify and apply entrepreneurial opportunities in organic agriculture and identify the available organic livestock production systems.

### **Learning Outcomes**

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

13. Define the concepts of organic agriculture and the origin, history and philosophy of organic agriculture
14. List at least four (4) requirements of organic agriculture and the general scope of organic agriculture

15. Identify the distinction between conventional farming and organic farming and integrate cultural practices and biological processes into organic agriculture
16. Identify at least five (5) composting procedures and develop an efficient composting technique
17. explain the soil nutrient cycle and describe the principle and practice of crop rotation and its benefit in crop and soil management
18. Describe five (5) steps each in the cultivation of mushroom and apiculture and identify at least three bio-fertilizers
19. Apply at least three (3) organic methods in plant protection
20. Identify at least 5 organic methods in the production of vegetables and fruit and tree crops
21. Describe organic methods in livestock production like Pasture dairy, cow dairy, goat and milk
22. Explain the policies and incentives of organic production and procedures for inspection and certification of organic farms and also the entrepreneurial opportunities in organic agriculture

### **Course Contents**

Concept of Organic agriculture. History and development of organic agriculture. Principles of organic agriculture. Types of organic farming and benefits and need of organic farming. Scope and requirements of organic farming, Conventional versus Organic farming. Cultural practices and biological processes. Bio-fertilizers and application procedures. Soil nutrient cycles. Crop rotation and cover cropping. Bio-fertilizer types and application in organic agriculture. Organic crop product system. Rotational grazing and pasture management. Organic livestock production system. Production techniques in mushroom and apiculture. Policies for organic production and procedure for inspection and certification of organic farm. Entrepreneurial opportunities in organic farming.

### **SOS 402: Soil Survey, Sampling, Classification and Taxonomy (2 Units C: PH 45)**

#### **Learning Outcomes**

Students will be able to:

1. know the land-use act, land tenure system in Africa, and how to commence entrepreneurship and establishment of large/Small scale farms; basic principles of land surveying, simple surveying mathematics;
2. practice chain surveying and plot graphs of details; make use of compass instrument; theodolite, ranging poles, levelling equipment, maps and practice map reading;
3. carry out photogrammetry and photo-interpretation;
4. explain the importance of soil surveys and the need to classify soils, soil survey scales and kinds of soil survey, soil mapping units, soil survey operations and what relationships exist between soil genesis and soil surveys;
5. define and describe concept of benchmark soils, defining soil series. Soil survey reports: essence of soil classification, types of soil classification (natural and technical), basic characteristics of the United States Division of Agriculture (USDA) soil orders and their Food and Agriculture Organization of the United Nations (FAO) and World Resources Board (WRB) equivalents;
6. describe basic problems associated with the soil orders, management of soil orders for agricultural and other purposes, profile characteristics of major soil orders in Nigeria; and
7. perform Soil classification in relation to land use suitability for rain-fed and irrigated agriculture, land capability, productivity indices. Presentation and interpretations of soil survey results and information.

#### **Course Contents**

The importance of soil surveys and the need to classify soils. Guides to soil surveys: soil survey scales and kinds of soil survey, soil mapping units, soil survey operations. Understanding what we see in terms of soil genesis: concept of benchmark soils, defining soil series. Soil survey reports: essence of soil classification, types of soil classification (natural and technical), basic characteristics of the USDA soil orders and their FAO (WRB) equivalents, basic problems associated with the soil orders, management of soil orders for agricultural and other purposes, profile characteristics of major soil orders in Nigeria. Soil classification in relation to land use suitability for rain-fed and irrigated agriculture, land capability, productivity indices. Presentation and interpretations of soil survey results and information. Selection of soil sampling spots; criteria for selecting sampling spots in the field, greenhouse potted soils, nursery sites, plantation sites, polluted sites etc. Sinking of soil profiles and soil profile description: morphological properties. Methods of taking soil samples from land surfaces and soil profile pits for physical, chemical, and biological properties for purposes of characterization, classification, fertility assessment, fertilization and engineering and mineralogical studies. Appreciation and use of simple soil sampling tools and equipment in the field. Quality control and quality assurance measures in transportation of samples, storage of samples.

### **AGR 499: SIWES Report (2 Units C: PH 45)**

#### **Learning Outcomes**

At the end of the course, the students should be able to:

1. write a report of the practical year activities and demonstrate the ability to present it; and
2. explain how to establish an agricultural enterprise.

#### **Course Contents**

Scientific writing and farm record practices. Submission of final report on practical year/Students Industrial Work Experience Scheme (SIWES)

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**500 Level Agricultural Economics and Extension Option**

**AGE 501: Agricultural Production Economics (2 Units C: LH 30)**

**Learning Outcomes**

At the end of the course, the students should be able to:

1. critique common production functions, specify production functions and determine the optimal level of production and input/factor use;
2. derive equations for farm input demand and output supply functions;
3. use production data to estimate technical, allocative and economic efficiencies; and
4. use linear programming for farm decision making.

**Course Contents**

The nature of agricultural production problems, goals and objectives of agricultural production. Principles of resources use with particular reference to the optimum level of resources use. Principles of optimum product combination. Empirical production functions. Supply and cost elasticity. Production and production planning in agriculture using the methods of linear programming and simulation; production decision making under risk and uncertainty; types of production risks and uncertainties in agriculture. Production diversification and risk minimization. Uncertainty management with the use of subjective probability and the game against – nature approaches.

**BU-AGE 502 Resource Economics (2 Units; Core; LH=30; PH= Nil)**

**Senate-approved relevance**

Core to the mission of Babcock University is to engender training facilitating sustainable farming. Sustainable farming connotes sustainable use of our land, labour, water, animal and plant resources. Beyond the interest of the Babcock university senate in this quest, achieving sustainable agriculture, while sustaining the environment is increasingly recognized as a key societal goal and well highlighted in many of the SDGs. Resource Economics as a course involves the development of policies directly relevant to the management of these resources. Therefore, Babcock university senate has identified this course as pertinent and relevant to agriculture degree program at Babcock University.

**Overview**

Resource economists study interactions between economic and natural systems, with the goal of developing a sustainable and efficient economy. It is a multi - disciplinary field of academic research. It cuts across the pure and applied science fields. Resource economics is the study of how society allocate scarce resources (mainly natural). The course resource economics focuses on principles of sustainable utilization of resources, whether renewable or non-renewable and how this can help achieve sustainable food production and alleviate poverty as highlighted in the SDG 1. Furthermore, the course combines science, economics, agrarian law, policy, real estate and project design and implementation to produce a unique educational experience for students.

**Objectives**

The objectives of the course are to:

1. Identify the scope resource economics.
2. Compare resource economics with environmental economics and agricultural economics
3. Describe Renewable, Non-renewable, and Environmental Resources
4. Describe resource depletion problem
5. Explain the concept of land economics
6. Compare the demand and supply problem with land
7. Discuss economic theory applicable to land management.
8. Identify the public policies relating to land use including land use act
9. Identify compatibility of alternative land uses
10. Analyze agricultural structural policies
11. Assess agricultural land reforms
12. Describe economic justification for land reform
13. Examine issues in agricultural rural development
14. Examine issues in integrated rural development
15. Describe the problems of rural development
16. Explain the concept of land use capacity
17. Explain basic application of agrarian law to resource economics
18. Explain economics of forestry
19. Discuss economics of fisheries

### **Learning Outcomes**

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

1. Identify what makes up a resource in economic sense.
2. Compare resource economics with environmental economics and agricultural economics
3. Identify at least five (5) Renewable, Non-renewable, and Environmental Resources
4. Describe at least three (3) cases of resource depletion problem
5. Explain the concept of land in economic sense
6. identify at least five (5) demand and supply problems with respect land resource
7. Discuss at least three (3) economic theories applicable to land management.
8. Identify at least five (5) public policies relating to land use including land use act
9. Identify at least five (5) agricultural structural policies
10. Assess different agricultural land reforms
11. Describe at least five (5) economic justifications for land reform
12. Discuss at least five (5) problems of rural development
13. Explain the concept of land use capacity
14. Explain basic application of agrarian law to resource economics
15. Explain economics of forestry
16. Discuss economics of fisheries

### **Course Contents**

Scope of resource economics. Resource economics with environmental and agricultural economics. Renewable and Non-renewable Resources. Environmental Resources. Resource depletion problem. Concept of land economics. Demand and supply problem with land. Economic theory applicable to land management. Public policies relating to land use. Compatibility of alternative land uses. Analyze agricultural structural policies. Agricultural and land reforms. Economic justification for land reform. Issues in agricultural rural development. Issues in integrated rural development. The problems of rural development. The concept of land use

capacity. Basic application of agrarian law to resource economics. Economics of forestry. Economics of fisheries.

### **BU-AGE 503 Principles of Microeconomics in Agriculture (2 Units; Core; LH=30)**

#### **Senate-approved relevance**

End hunger, achieve food security and improve nutrition is at the heart of the sustainable development goals. At the same time, climate change is already impacting agriculture and food security and will make the challenge of ending hunger and malnutrition even more difficult. For the farming sector, it is crucial to use the economic principle of choice while utilizing the resources that God has provided. Since this is in tandem with Babcock University vision to contribute to hunger eradication, the university is poised to provide education to facilitate the achievement of this end. The course, principles of microeconomics in agriculture, is not just another microeconomic course because it is uniquely designed to enable students to understand the fundamentals of microeconomics as a study of the individual firm particularly to the agricultural sector and the effects of individual decisions. The key role of microeconomics is to examine how a farmer could maximize its production and capacity so that it could lower prices and better compete in its industry. The desire of the Babcock university Senate is to initiate a strong focus on food production activities in aspects of the curricula that are used for academic purposes at the Babcock University.

#### **Overview**

According to the United Nations, in 2015, there are still 836 million people in the world living in extreme poverty (less than USD1.25/day). And according to the International Fund for Agricultural Development (IFAD), at least 70 percent of the very poor live in rural. Microeconomics is basic to assessing economic principles at the household level. Thus, a comprehensive study in Economics as applied to Agriculture requires a thorough understanding of Principles of Microeconomics. The course offers an introduction to microeconomics, a fundamental branch of economics. Additionally, it introduces the theory of the firm, its components, production and cost theories, and models of market structure while taking into account the laws of supply and demand. Public initiatives intended to address this market failure are taken into consideration as the many causes of market failure are evaluated.

#### **Objectives**

The objectives of the course are to:

1. Explain how the decisions made affect demand and supply for goods and services, which in turn affect market prices
2. Describe how people, firms and households decide on how to allocate their limited resources in the markets.
3. Expound on theories of production and costs and their application in agriculture.
4. Describe market equilibrium analysis under perfect and imperfect competition
5. Explain general equilibrium models;
6. Discuss methods that markets use to settle on the relative prices among goods and services, and to allocate scarce resources to many alternative uses.

#### **Learning Outcomes**

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

1. Use supply and demand diagrams to analyze the impact of overall changes in supply and demand on price and quantity.
2. Solve a consumer's utility maximization problem mathematically and graphically;

3. Solve a firm's cost minimization problem mathematically and graphically.
4. Analyze the behavior of firms in a perfectly competitive market in the short-run and the long-run.
5. Calculate producer, consumer surplus under perfectly competitive market.
6. Analyze the behavior of firms in a monopoly or oligopoly, and calculate the resulting changes in producer

### **Course Contents**

Supply analysis. Demand analysis. price effect on consumption. Substitution effect on consumption. Theory of consumer behaviour and household demand. Theories of production. Theories of Cost analysis. Cost minimisation. profit maximisation in production. Utility maximisation problems. Theory of the firm-short run. Theory of the firm-long run. Marginal productivity theory of distribution. Market equilibrium analysis under perfect condition. Market equilibrium analysis under imperfect competition. General equilibrium models. Welfare economics.

### **BU-AGE 504 Principles of Macroeconomics in Agriculture (2 Units; Core; LH=30; PH=Nil) Senate-approved relevance**

A major backbone, for pure and applied economics, for training and for producing high quality agriculture graduates, who are well grounded in the knowledge and understanding of macroeconomics, is pertinent. The study of macroeconomics is very important for evaluating the overall performance of the economy in terms of national income. The national income data helps in anticipating the level of fiscal activity and understanding the distribution of income among different groups of people or households in the economy. Thus, the use and/or application of macroeconomic principles to agriculture is very relevant especially to an agrarian economy like Nigeria, and it is in tandem with Babcock University mission of contributing to the development of sustainable agriculture.

### **Overview**

Macroeconomics is a branch of economics dealing with the performance; structure; behavior; and decision-making of an economy as a whole. This includes regional; national; and global economies. Macroeconomics is the study of the aggregated indicators such as GDP; unemployment rates; national income; price indices; and the interrelations among the different sectors of the economy to better understand how the whole economy functions. It also develops models that explain the relationship between such factors as national income; output; consumption; unemployment; inflation; saving; investment; international trade; and international finance. This course will address principles and theories of economics as it relates to agriculture at the aggregate level. It will address concepts of unemployment, inflation, empowerment and so on. This is germane to the study of agriculture as it is to be taught to deepen understanding of the above highlighted peculiar issues and their effects on the economy. Furthermore, in line with BU mission to produce excellent graduates, the course affords capacity building in students in addressing national development issues and policies.

### **Objectives**

The objectives of the course are to:

1. Identify the scope macroeconomics application to agriculture.
2. Assess the measurement of national income
3. Profile the difficulties in measuring national income
4. Identify the problems of national income accounting in African and Nigeria

5. Assess four (4) theories of consumption
6. Describe three (3) types of inflation

### **Learning Outcomes**

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

1. Explain 7 basic differences between macroeconomics and macroeconomics while identifying at least five (5) macroeconomic issues.
2. Assess three (3) measurements of national income
3. Identify at least five (5) difficulties in measuring national income
4. Describe at least five (5) problems of national income accounting in African and Nigeria
5. Differentiate between the three (3) types of inflation
6. Describe four (4) theories of consumption

### **Course Contents**

Basic differences between macroeconomics and macroeconomics. National account and national income determination. Measurements of national income. Difficulties in measuring national income. Problems of national income accounting in African and Nigeria. National Income models and functions. Aggregate supply function. Aggregate demand function. Consumption function. Savings function. Income determination. Equilibrium in the Keynesian model. The Withdrawal-Injection Approach. The concept of multiplier. Commodity and money market. General equilibrium model. Fundamentals of economic growth and fluctuations. Inflation and consumer price indices. Types of inflation. Balance of trade and payment. Theory of consumption.

## **AGE 505: Statistical and Research Methods (2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, the students should be able to:

1. Conceptualize a research problem and design a research plan;
2. apply appropriate sampling techniques to obtain samples from natural populations;
3. design data collection instruments and undertake data collection through interviews and the use of questionnaires;
4. analyse, present and report results of collected data; and
5. formulate study hypotheses and make statistical decisions using the t, f, and chi square, and other statistics.

### **Course Contents**

Estimate and interpret correlation and regression analyses using data collected from field surveys.

Methodology and problems of farm and market surveys for data collection. Sampling techniques, including simple random, stratified random, cluster and systematic sampling techniques.

Tabulation and presentation of statistical data with emphasis on histograms, graphs and frequency

distributions. Measures of central tendency: mean (arithmetic and geometric), mode, median, quartiles and deciles. Measures of dispersion: variance, standard deviation, skewness and kurtosis. Probability distributions binomial, normal, poisson, e.t.c. Statistical inference point and interval estimation. Test of hypothesis. Correlation analysis, simple linear, multiple and partial correlation. Simple linear and multiple linear regression analyses.

**BU-AGE 507 Econometrics in Agricultural Economics and Extension (2 Units; Core; LH=30; PH=Nil)**

**Senate-approved relevance**

Core to the mission of Babcock University is to produce graduates with efficient analytical skills and ability to use their skills to solve agricultural problems at the national and international levels. Econometrics, especially with its application to agricultural economics and extension, provides students with these skills. Decisions are made every day using econometrics in practically every professional field. Businesses use it to decide how to market a product or their brand, educational institutions use it to determine their acceptance rate or adoption of technologies, the agriculturists use it to forecast crops yield, diseases prevalence and marketers also use it to forecast the price of the product market and the direction of markets. It is in view of this that BU senate found this course as very germane to the agriculture programme at Babcock.

**Overview**

The study of economic data using statistical and mathematical techniques is known as econometrics. The term "econometricians" refers to people who work in the field. By utilizing statistical tools including probability, statistical inference, regression analysis, frequency distributions, and more, econometricians test economic theories and hypotheses. Econometricians can foresee future economic trends by comparing the outcomes of their tests of economic theories with actual data and observations.

This course is designed to build the capacity of students in application of analytical tools to assessing economic data. Since Nigeria is an agrarian economy, the institution has added the course, and the aim is to convert qualitative economic concepts into quantitative information that people can use through statistical modeling and analysis.

**Objectives**

The objectives of the course are to:

1. Discuss basic statistics and probability theories
2. Describe meaning and scope Econometrics.
3. Explain Correlation theory
4. Define rank correlation and partial correlation
5. Distinguish between simple and multiple regression and interpretation.
6. Compute Confidence interval
7. Explain properties of Least Square Estimations (LSE)
8. Identify Econometric problems in the model
9. State the assumptions of the linear stochastic regression model
10. Explain the violation of assumption-multicollinearity, heteroscedasticity, autocorrelation, linear and non-linear functions estimation with deficient data.

**Learning Outcomes**

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

1. Define econometrics
2. State how econometricians proceed in their analysis of an economic problem
3. Describe Correlation theory and use it to measure the strength or degree of linear association between two (2) variables
4. Distinguish between the rank correlation and partial correlation
5. Estimate and interpret linear regression models
6. Compute Confidence interval computation and be able to report the results of their work in a non-technical and literate manner.

7. List all the properties of Least Square Estimations (LSE)
8. Explain at least 3 econometric problems in models
9. Itemize at least 6 assumptions of the linear stochastic regression model
10. List violation of assumption-multicollinearity, heteroscedasticity, autocorrelation in a model
11. Identify 3 ways how violation of assumption-multicollinearity, heteroscedasticity, autocorrelation in a model can be solved.

### **Course Contents**

Basic statistics and probability. Definition and Scope of Econometrics. Correlation theory. Measure of linear correlation. Rank correlation. Partial correlation. Simple regression. Multiple regression and interpretation. Confidence interval computation. Properties of least square estimations. Econometric problems. The assumption of randomness. Zero mean. Constant variance and normality of the disturbance variable 'Ui'. Violation of assumption-multicollinearity. Heteroskedacity. Autocorrelation. Linear and non-linear functions. Estimation with deficient data.

### **BU-AGE 508 Agricultural Policy and Development (2 Units; Core; LH=30; PH=Nil)**

#### **Senate-approved relevance**

Agriculture, the first profession of the earliest man, was commanded in the beginning and taught by God, the Creator Himself. Food indisputably takes the lead in man's hierarchy of needs. To guarantee constant supply of safe food therefore, all the temporal dynamics of hunger and poverty, either at the household level or at national level, must be addressed as part of national development agenda. All these can be addressed by formulation and implementation of developmental agricultural policies. The production and supply of safe food aligns with BU vision and the national target to achieving the SDGs. The aim of this course is to give better understanding of to the fundamentals of agricultural policy and development. Thus, BU senate has found it relevant in the study of agriculture at Babcock.

#### **Overview**

Agricultural development and policy examine the concepts of growth and development, policies and programmes that have addressed national development over the years and strategies to address failures. Historically, before the advent of crude oil in Nigeria, agriculture was the mainstay of Nigerian economy. The country was well respected among nations of the world for its contributions to global output of some major food and cash crops. The share of agriculture in the GDP was highest and unemployment was considerably low. The needs for the country to be self-reliant in food production, resuscitate the dying manufacturing industrial sector and also by extension, protect the country's sovereignty have become topical issues in many fronts.

Issues and contents that will engender real national development are carefully infused into the content of this course to equip students for positions of responsibility in the public space. This course will expose students to workable and pragmatic policy framework which is essential to national development. It will also inculcate in the students the potential to formulate developmental agricultural policies.

#### **Objectives**

The objectives of this course are to:

1. Explain the concepts of growth, development and agricultural planning
2. Discuss the theories and models of agricultural development
3. Assess the need for agricultural policy objectives
4. Describe the types and importance of agricultural policy.
5. Evaluate new and past agricultural policies and programmes.

6. Explain the challenges of effectiveness and implementation of past agricultural policies in Nigeria.
7. Categorise the problems of agriculture in developing countries

### **Learning Outcomes**

On completion of the course, the student should be able to

1. Distinguish between growth and development.
2. Discuss 5 theories of growth and development
3. Explain at least 7 roles of agriculture in national industrial development.
4. Appraise a national, continental and global policy as it relates to agriculture.
5. Identify at least 5 paths to progressive economic transformation and development for two under-developed countries.
6. Suggest at least 7 ways of addressing the problems of Nigerian agricultural policies.

### **Course Contents**

History of agricultural policies and programmes in Nigeria. Need for agricultural policy objectives. Comparisons between growth and development. Theories of agricultural development. Theories of national growth. Policies of agricultural development. Role of Agriculture in the economy. Agriculture and rural development. Problems of Agricultural development and planning. Integrated rural development planning. Agriculture in national industrial development. Economic basis of growth and development. Global policy as it relates to agriculture. Continental policy as it relates to agriculture. National policy as it relates to agriculture. Paths to progressive economic transformation.

## **BU-AGE 509 (510) Agribusiness (2 Units; Core; LH=30; PH=Nil)**

### **Senate-approved relevance**

Training and producing high quality agriculture graduates who are well grounded in the knowledge and understanding of agricultural entrepreneurship, value-chain management and general development of the upstream and downstream sub-sectors of agriculture, is what this course supports. This is important to the first 4 SDGs and equally a priority of the Babcock University academic pursuit. The relevance is obvious as graduates of agriculture from Babcock University will be able to appreciate the fact that agriculture is basically a business enterprise. Furthermore, they would be able to apply their expertise from their respective sub-areas in agriculture (Agricultural Economics, Animal Science and Agronomy) to the business environment thereby contributing positively to economic growth.

### **Overview**

Agribusiness is the complete value chain in agriculture, from the raw materials and resources necessary to create biological products to distributors and retailers that get products to end consumers. In other words, Agribusiness represents all providers of value-added activities in agriculture. It links input providers, producers, processors, and other services to consumers of crops, livestock, and other natural resources. We can therefore say that Agribusiness is a business that earns most or all of its revenue from agriculture. According to FAO it denotes the collective business activities that are performed from farm to fork.

The course is very important to the study of agriculture at BU as it touches on all areas of the application of management of agricultural activities for profitable business ventures. Clearly, the achievement of sustainable agriculture, poverty reduction especially in an agrarian economy like Nigeria hinges on this.

## **Objectives**

The objectives of the course are to:

1. Identify the scope and basic components of agribusiness.
2. Assess farming as business
3. Describe the requirements of setting up agribusiness firm.
4. Appraise the performance of agribusiness in Nigeria
5. Discuss application of biblical principles to agribusiness in theory and practice

## **Learning Outcomes**

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

1. Explain at least two (2) definitions of agribusiness and relate them to other forms of doing business
2. Describe three (3) key players in the agribusiness environment
3. Analyze the application of economic and management principles (at least three (3)) to agribusiness.
4. Explain the scope of the agribusiness system
5. Explain two (2) trends in the upstream and downstream sectors with respect to the Nigerian economy.
6. Explain five (5) ways that agribusiness development can be instrumental in achieving sustainable agricultural production
7. Discuss five (5) factors influencing selection of agribusiness organization
8. Describe how to set up an agribusiness firm

## **Course Contents**

Definitions of agribusiness. Scope of agribusiness. Organization and operation of farm business enterprise selection. Resource mobilization and allocation. Factors influencing selection of agribusiness organization. Determinants of the size of agribusiness unit. Farming as business. Coping strategies and shock adjustments in agribusiness. Agribusiness economics and management. Evolution of farming. The business of agribusiness. Special marketing arrangements. Concepts of entrepreneurship. Financial and legal requirements for establishing agribusiness. Application of managerial and behavioural models to agribusiness management. Performance of agribusinesses in Nigeria. Agribusiness firm set-up.

**BU-AGE 511 (512) Agricultural Marketing and Cooperatives (2 Units; Core; LH=30; PH=Nil)**

### **Senate-approved relevance**

Training highly qualified and academically empowered graduates that are relevant to the system and that would bring about the most desired positive change in the economy is in tandem with the Babcock University faith-based educational goal. The relevance of this cannot be over-emphasized as such a change is very much desired in an area that serves as a conduit between the agricultural and non-agricultural sectors of an economy, which is the position of agricultural marketing linked with the strength in unity derived from the cooperatives. Graduates equipped with this double-edged empowerment would give a good lead in the achievement of no poverty, zero hunger/food security, good health and well-being, decent work and economic growth, responsible production and consumption and adequate livelihood as stated in SDGs 1, 2, 3, 8 and 12. Babcock University graduates of agriculture will fit in positions that would bring about the desired positive change in

the marketing system to streamline production and consumption and create utilities desired for healthy living and economic growth and development.

### **Overview**

Nigeria has a vast agricultural material base and with the current global trend of change, agriculture also needs to undergo some positive changes to measure up with the expectation of the digital age especially in the area of food processing and distribution. New areas of opportunities and challenges are therefore being created that desire new arrangements and techniques through agricultural marketing while the involvement of the agricultural cooperatives gives room for the creation of new and heavier investments to reap the benefits of economies of scale. There is also an increasing awareness that it is not sufficient to produce crop and/or animal products, they must be adequately marketed to avoid or at least reduce post-harvest losses and wastes while the farmer receives optimum benefits from his marketed surplus and consumers have good satisfaction. This course addresses the link between the farm and non-farm sectors as dual roles to play in economic growth. The need or necessity therefore of grooming Babcock University graduates of agriculture in this very important area of agricultural marketing and cooperatives cannot be over looked. The course is therefore designed to equip students with the rudiments of agricultural marketing and cooperatives in line with modern marketing techniques and the need for a paradigm shift.

### **Objectives**

The objective of the course is to:

1. Describe the concepts of marketing and agricultural marketing
2. Identify the functions of agricultural marketing
3. Describe the organisational setting in agricultural marketing
4. Classify markets by products and transaction types
5. Analyse demand and supply in a marketing system
6. Assess marketing efficiency
7. Assess marketing margins for different products
8. Analyse prices and price trends
9. Examine consumer behaviour in consumption
10. Assess e-marketing for agricultural products locally and internationally
11. Identify challenges in agricultural marketing and the need for paradigm shift.
12. Classify agricultural cooperatives
13. Examine how cooperative societies are formed, financed and managed
14. Identify the role of agricultural cooperatives in agricultural marketing
15. Examine the place of the cooperative structure in national and international food distribution

### **Learning Outcomes**

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

1. Describe the concept of agricultural marketing
2. Explain three (3) functions performed in agricultural marketing
3. Describe the five (5) organisational settings in agricultural marketing as regards marketing institutions
4. Classify markets in line with agricultural products sold and type of transactions carried out
5. Describe 1 marketing system with regards to its structure, conduct and performance
6. Determine the demand and supply and their point of equilibrium of a product
7. Assess marketing efficiency of a system (both physical and pricing efficiency)
8. Analyse the creation of utilities in agricultural marketing
9. Estimate the marketing margin and its components for at least 5 products

10. Analyse price relatives, price trends, price volatility
11. Assess e-marketing for agricultural products locally and internationally
12. Classify agricultural cooperatives
13. Examine how cooperatives are formed, financed and managed
14. Identify 5 roles of agricultural cooperatives in agricultural marketing
15. Examine 1 role cooperative structure plays in facilitating food distribution locally and globally

### **Course Contents**

Meaning and concept of agricultural marketing. Marketing functions performed in agricultural marketing. Agricultural Marketing institutions. Classification of markets according to products marketed and transactions. Market structure and performance of agricultural marketing systems. Demand and supply analysis in agricultural marketing. Marketing efficiency Creation of utilities in agricultural marketing. Marketing margin analysis for agricultural products. Price trends. Consumer behavior indifference curve analysis. E-marketing for agricultural products. History of agricultural cooperatives. Steps in cooperative formation. Cooperative classification according to types and structure. Cooperative financing. Cooperative management. Cooperatives in agricultural marketing. Cooperative structure and food distribution.

### **BU-AGX 501 (502) Diffusion of Innovations (2 Units; Core; LH=30; PH=Nil)**

#### **Senate-approved relevance**

This course is hinged at familiarizing the students with the rudiments of diffusion and adoption of innovation. This is important for the attainment of sustainable agricultural practices and value chain developments. Furthermore, to strengthen the knowledge of extension and agriculture, there is need for students to understand why people behave the way they do, what informs their decision in adopting an innovation and what informs the rate and speed at which they adopt, which will be a pointer to a grand understanding of agriculture with the ability of establishing agricultural firms. Thus, this course aligns with BU's mission to produce graduates with a broad understanding of agriculture as an enterprise, and equipped to establish agricultural firms for the society and improvement in the well-being of the Nation.

#### **Overview**

Diffusion and Adoption of Innovations aims to provide students with the processes of diffusion and adoption of innovation. It also intends to identify characteristics of innovation, rate of adoption, adopter categories and the roles of opinion leadership and Change agents. It also highlights evaluation and selection of innovations directed at National development. At the end of the course, we shall be able to identify the factors enhancing effective agricultural extension in rural areas. An integrated approach is used in the study of Diffusion and Adoption of Innovations in which both national and locally specific aspects are examined. National and local experiences are highlighted to illustrate certain issues.

#### **Objectives of the course:**

The objectives of this course are to:

1. Define of Adoption, Diffusion of Innovations
2. Explain the perception of Innovation Characteristics
3. Explain the concept of innovation decision process
4. Identify Social System Norms and how it affects Innovation
5. Illustrate Socio-economic effects of mass adoption of Agricultural Innovation

#### **Learning Outcomes:**

At the end of this course, the students should be able to:

1. Enumerate 5 elements of diffusion,
2. Explain 5 processes of adoption and innovation, as well as diffusion of innovation
3. Identify 7 characteristics of innovation, rate of adoption and adopter categories
4. Differentiate between leadership and Change agents
5. Expound on the diffusion of innovations and implication of the processes

**Course Contents**

Meaning and elements of diffusion. Elements of diffusion. The innovation decision process. Rate and Adoption of Innovation. Differences between Adoption and Diffusion. Models of Adoption and Innovation. Stages of adoption. The characteristics of innovations. Factors determining rate of adoption. Adopter categories and characteristics. Community characteristics and adoption. Opinion leadership. Change agents. From theoretical perspectives on diffusion of innovations. Generalizations from diffusion studies in Nigeria and other developing countries. Sectors related to differential rates of adoption of new agricultural technology. Comparing diffusion of innovation in other developing countries.

**AGX 503: Agricultural Extension Administration and Supervision (2 Units C: LH 30)**

**Learning Outcomes**

At the end of the course, students should be able to

1. explain the meaning of administration in extension;
2. apply the concept of supervision in extension work; and
3. evaluate the performance of an extension organization in discharging its responsibilities.

**Course Contents**

Concept, theories, principle and guidelines of administration. Organization and supervision of agricultural extension services in Nigeria. Current status of extension administration in Nigeria. Staff recruitment, selection, placement and supervision. Budget development and fiscal control. Public relations in extension. Concept of leadership and leadership dynamics. Monitoring of programmes. Evaluation of programmes. Assessment of extension work accomplishment.

**AGX 504: Extension Programme Planning and Evaluation (2 Units C: LH 30)**

**Learning Outcomes**

At the end of the course, students should be able to:

1. define administration in extension, monitoring and evaluation and their functions in extension work;
2. appreciate community participation in development projects; and
3. differentiate between monitoring and evaluation.

**Course Contents**

Planning process. Principle and concept of programme planning. Steps in planning. Concept of monitoring and evaluation. Importance of program planning in agricultural extension. Clientele participation. Plan of work and calendar of work. Evaluation approaches. Logic models for programme evaluation. Corruption and its implication in agriculture and the economy.

**BU-AGX 509-Rural Community Development Technology and Social Change (2 Units;  
Core; LH=30; PH=Nil)**

**Senate-approved relevance**

Core to Agricultural Extension is the provision of teaching, research and extension services. This includes issues and strategies towards promoting sustainable livelihood options, poverty alleviation and rural economy. This course intends to train agricultural students to become rural development experts equipped with knowledge in theory and methods for development studies, political economy and sociology, agrarian structures and rural based social movements among others. The highlights of this course are to familiarize the students with basic structure of the society as they relate to community development. Through this course, Babcock University will be fulfilling her mission of community development, hence graduates of this course will in turn foster the relationship that has been established over the years.

**Overview**

This course will identify areas of local agriculture and community development vis-a-vis global current trends. The course will expose the students to understand the meaning and intricacies of community development and how social change occurs in any given area. It also exposes students to theories governing social change as it relates to rural community development. The course will provide an understanding of the application of development theories to the appraisal of community development and social change in Nigeria. This course will build in the learners, the appreciation of the group dynamics in social community. The students will thereafter be able to formulate policies that will foster community development and social change.

**Objectives**

The objectives of this course are to:

1. Expound on community development and social change.
2. Discuss meaning and intricacies of community development as well as the meaning and processes of social change.
3. Review how community development and social change are connected.
4. Discuss forms of social change.
5. Explain micro and macro approaches to social change.
6. Analyze types of social change.
7. Discuss theories of development.

**Learning Outcomes**

On successful completion of the course, the students should be able to:

1. Discuss the concept of rural community development
2. State three (3) sociological and economic policy perspectives to development
3. Explain two (2) underlying theories of rural development
4. Explain the concept of social change
5. Discuss community as a unit of social change
6. Define macro and micro approaches to social change
7. Discuss the concept of community development
8. Explain three (3) problems of constitution and infrastructures in rural Nigeria
9. Describe two (2) elements and processes of change
10. Discuss four (4) dimensions of change
11. Discuss two (2) theories of development
12. Explain three (3) types of social change

13. Discuss one (1) resistance and conductive force of change
14. Explain social movements and changes in contemporary Nigeria
15. Discuss two (2) theories of social movement

#### **Course Contents**

Concept of community development. Concept of social change. Unit of social change. Micro and macro approaches to social change. Elements and processes of change. Dimension of change. An overview of the theories of development. Types of social change. Measurement of change in rural areas. Conductive and resistance forces of changes. Social movements and changes in contemporary Nigeria. Problems of constitution and infrastructures in rural Nigeria. Theories of social movement. Changes in contemporary Nigeria. The meaning of traditional institutions. Traditional institutions and their transformation. Case studies in community development and social change.

#### **AGE 510/AGX 599: Research Project (4 Units C: PH 180)**

##### **Learning Outcomes**

At the end of the course, students should be able to:

1. formulate a research problem and develop a research proposal;
2. carry out a field survey or source of secondary data, analyze the data using appropriate analytical tools and computer software; and
3. interpret the results and write a project report.

##### **Course Contents**

Formulation of problem statements and development of research objectives and hypothesis. Analytical research methods: descriptive, statistical/quantitative and judgmental; primary data collection; sources and collection of secondary data. Presentation of research findings in narrative, tabular and graphical forms. Report writing.

#### **AGB 501: Agribusiness Value Chain Analysis (2 Units C PH 90)**

##### **Learning Outcomes**

At the end of course, students, should be able to:

1. explain the essence of value addition to business enterprise;
2. verify the different methodological approach to value chain analysis of commodities;
3. identify the various stakeholders in the value chain;
4. estimate value added at each stage of chain; and
5. integrate commodities along the chain.

##### **Course Contents**

History of value chain. Concept of value chain analysis. Horizontal value chain analysis. Vertical value chain analysis. Methodology of value chain analysis. Analysis of value chain. Value chain development. Value addition. Value chain mapping. Value chain integration. Value addition estimation. Value chain strategies.

#### **AGB 503: Business Law (2 Units C: LH 30)**

##### **Learning Outcomes**

At the end of the course, the students should be able to:

1. provide legal backing to the establishment of business enterprise;

2. apply legal decision in the running of the Agribusiness enterprise;
3. familiarise with the various legal sectors and their jurisdictions; and
4. understand the Conditions governing business transactions with individuals and corporate organisations.

### **Course Contents**

The Nigerian legal system divisions and sources of Nigerian law common law and equity. Case law and precedent. Legislation including the nature and effects of Military Decrees, edicts and statutes. Interpretations. Customary law and Sharia law – meaning and scope. The court system: Outline of the structure and hierarchy of courts. Officers of the court. Qualifications of judges. Compositions and jurisdictions of various court summons. Outline of the nature of special tribunals. Forms of legal liability substance. Comparison and contrasts between criminal and civil ability. Defamation (i.e libel and slander). Negligent misstatements and passing off. Law of contract-nature and essential elements of a valid contract. Offer and acceptance: consideration formality, capacity, consent vitiating factors. Privity of contract, terms of contracts, discharge of contract, remedies for breach of contract, termination of contract, etc. Law of Agency-its creation and types. Rights and duties of principal and agents termination of agency. Sale of Goods-meaning and types of relevant goods. Conditions: warranties and caveat emptor doctrine, transfer of title and risks. The duties and rights of seller and buyer. Breach of the sale of goods contract and remedies. Law of Tort-Definition of Tort. Tort of Professional negligence, vicarious liability, criminal and civil liability. Hire purchase- its meaning and formation, the right and obligations of the parties. Contract of employment- the nature and formation of contracts of employment, rights and duties of employers and employees, termination and dismissal, and remedies for breach of employment contract, redundancy. Insurance contract- Its meaning, features and outline of concepts and principles; insurable interest, premium, indemnity and fixed sum insurance, subrogation and contribution. Assignment of policy, partnership;- Definitions, nature and types; general and limited partnerships; formation and articles of partnership, types, rights and duties of partners. Relationship of partners with each other and with third partners, dissolution of partnership. Banking and Negotiable instruments. The legal relationship of banker and customer and their mutual duties. The meaning and characteristics of negotiable instruments (Bill of Exchange, Cheques, promissory notes, etc.); Right and duties of the parties to a Bill of Exchange including the rights and duties of the holder in due course. Cheques and their crossing. Trust and Estate. Administration- Appointment, duties, powers, rights and accounts of trustees, executors and administrators. Bankruptcy- Issue of receiving order. Appointment duties and powers of official receiver and trustee in bankruptcy. Statement of affairs and deficiency.

### **AGX 503: Systems Thinking for Changing Agriculture (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students should be able to:

1. state the basic definitions of systems and system theory and their roles in extension delivery;
2. explain system thinking, principles and tools and how they are applied in extension work;151
3. explain chaos theory and its implication in agricultural extension; and
4. assess the psychology of clients and know when and how to bring about the desired change.

#### **Course Contents**

Evolution of systems thinking as a field of study. Basic definitions of systems. Systems theory. System thinking. Systems principles. Systems tools. The systems thinking approach. Use of

systems thinking. Systems thinking in organizations. Organizations as open systems. Five disciplines of systems thinking. Some applications of systems theory. Inquiry and advocacy. Chaos theory. Critical thinking. Basic assumptions underlying farmers' decisions, behaviours and attitudes. Psychology for extension personnel.

### **AGX 505: Gender and Sustainable Agricultural Development (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, students should be able to:

1. explain the concepts of gender and sustainable agricultural development.
2. Identify the roles of gender in different aspects of sustainable agricultural development;
3. apply various computer packages including Microsoft office, farm management softwares etc.; and
4. make use of the internet agricultural extension research.

#### **Course Contents**

Concept of gender. Concept of sustainable agricultural development. Gender and access to agricultural inputs, finance. Gender and agricultural production and aquaculture. Gender and agricultural processing. Gender and agricultural marketing. Gender and food consumption. Gender and agricultural cooperatives. Gender and climate change and environmental management. Gender and migration. Gender and agricultural extension services. Gender and agricultural policy making.

### **AGX 513: Multimedia Resource and Application in Agriculture (2 Units C: LH 30)**

#### **Learning Outcome**

At the end of this course, students should be able to:

1. explain the concept of multimedia resources in agriculture; and
2. identify different types of multimedia resources and their relevance in agriculture through hands-on experiences.

#### **Course Contents**

Concept of multimedia resource. Types of multimedia resources. Appropriate multimedia for teaching and learning in agricultural extension. Development e-resources/contents for agricultural extension teaching and technology delivery. Hands-on experiences of different multimedia resources. Challenges and benefits of multimedia resources in agriculture

### **AGX 502: Extension Communication Systems and Methods (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students should be able to:

1. apply the process of communication in extension work and evaluate alternative and current methods of communication; and
2. develop and use basic communication materials and tools.

#### **Course Contents**

Meaning and elements of communication process. Strategies in extension education and entertainment. Education for social change. Preparation and use of communication development models. Planning and developing information campaign. News gathering techniques. Mechanism and techniques for writing agricultural news for media, news evaluation and copy editing. Communication for innovation methods. Alternative extension methods. The concept of e-extension.

### **AGX 514: Teaching, Learning Methods in Agricultural Extension (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, students should be able to:

1. explain the concept of and Principles of Teaching and Learning in Agricultural Extension
2. understand Teaching-learning Methods in Agricultural Extension
3. demonstrate knowledge of the types of learning and the various methods of learning in Agricultural Extension, including their advantages and disadvantages
4. show understanding of the theories of learning in Agricultural Extension

#### **Course Content**

##### **Teaching-learning methods in Agricultural Extension. Concepts of teaching and learning.**

Principles of teaching and learning. Types of learning (Cognitive, Psychomotive and Affective Learning). Various methods of learning. Factors affecting learning. Teaching methods (Individual, Group and Mass). Disadvantages and Advantages of Teaching Methods. Audiovisual techniques and extension teaching aids. Preparation and use of teaching aids. Learning Theories in Agricultural Extension.

### **AGE 512: Project Monitoring and Evaluation in Agriculture (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, the students should be able to:

1. discuss the conceptual framework of agricultural projects;
2. design monitoring and evaluation plans for agricultural projects;
3. compare and rank projects using measures of project worth such as the Net Present Worth (NPW), Benefit-Cost (B/C) ratio, Net Present Worth (NPW); assess the impacts of development projects; and prepare feasibility report for an agricultural enterprise.

#### **Course Contents**

Conduct feasibility studies for small and large projects and submit a feasibility report on an agricultural enterprise of choice. Theory and practice of project appraisal at the local, regional and national levels. Estimating undiscounted and discounted measures of projects, evaluation and monitoring techniques. Provision of examples elucidating on the concepts of monitoring and evaluation as they apply to agriculture and rural development.

## **500 Level Animal Science Option Course Contents and Learning Outcomes**

### **ANS 501: Applied Animal Breeding and Genetics (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, the students are expected to have known:

1. the common metric characters in farm animals;
2. continuous and discrete variables;
3. how to compute the measures of central tendency and dispersion in economic traits;
4. how to partition the phenotypic variation into the genetic and environmental components;
5. how to estimate heritability and repeatability of economic traits, their genetic and phenotypic correlations;
6. common selection principles in Animal Science; and

7. breeding systems and the concept of genotype x environment interaction.

### **Course Contents**

Characters of economic importance in farm animals. Statistical tools for studying inheritance. Partitioning phenotypic variance and covariance. Estimation of genetic parameters (heritability, repeatability, genetic correlations). Selection principles and methods. Breeding (mating) systems. Breeding plans for different farm animal species. Foundation stock development. Genotype by environment interaction.

### **ANS 502: Animal Experimentation and Research Techniques (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, students will understand:

1. what an experiment is, the various steps taken to set up an experiment and formulate hypotheses;
2. how to conduct animal experiments in the different areas of Animal Science;
3. the basic statistical designs in animal experiment and when and how to deploy each;
4. how to collect and collate experimental data; and
5. how to employ appropriate statistical tools for data analysis, interpretation and results presentation.

#### **Course Contents**

Planning of experiments. Research techniques in animal Science; Dairy Science research, physiological research, applied genetics, animal nutrition research i.e. germ free animals, Annulations, Colostomy. Research techniques in pasture. Basic statistical designs in animal science research: Completely randomized design (CRD), Randomized complete block design (RCBD), Hierarchical design, repeat design, Animal model, etc. Analysis, interpretation and presentation of results.

### **BU-ANS 503 Poultry Production and Hatchery Management (2 Units; Core; LH=15; PH=45)**

#### **Senate-approved relevance**

The poultry sub-sector of Agriculture is critical in meeting the animal protein need of man. Poultry is one of the livestock cherished by many owing to the white tasty meat, as well as ease of management even with untrained individuals. This results in impairing the productivity of this livestock when poor husbandry practices are applied with no knowledge. It is imperative that students are adequately armed with the knowledge of poultry and hatchery management for better productivity. Babcock University is located in Ogun State which is in the southern part of the country and a nerve centre for commercial poultry production in Nigeria. The numerous unexplored alternatives feed ingredients from agro-allied industries in and around the state for livestock production are a justification for teaching and research in this indispensable area of the livestock value chain. Adequate understanding of the poultry and hatchery techniques by our students will better the poultry subsector of the livestock industries. The University senate considers harnessing the knowledge of these feed resources by students important for profitable livestock production.

#### **Overview**

Poultry farming in Nigeria produces essential food sources as well as industrial materials. Poultry products are rich in nutrients like minerals, protein, carbohydrates, and vitamins. With the increase in population, an expanding middle class, and an improvement in the income of the populace, the

demand for meat and nutrition is rising each year. Hatchery technology and its technique are also designed for resource efficiency, biosecurity, and built-in controls to produce the best quality bird for poultry production. The poultry sector has tremendous employment potential and would go a long way in reducing unemployment in Nigeria. This course is poised to produce agropreneurs with deepened understanding of the essentials of poultry production and hatchery management. The course will further enhance students in identification and control of nutritional and metabolic diseases of poultry through diets. Furthermore, the course will expose students to modern technology in hatchery management at commercial level.

### **Objectives**

The objectives of this course are to:

1. Define the term 'Poultry' and common terminologies as well as prospects and challenges of poultry production in Nigeria
2. Discuss management and feeding of Chicks, Growers, Layers and Ration Formulation
3. Identify housing and Equipment for Production of chicken
4. Discuss nutrition and diseases of broilers, layers and chicks
5. Describe poultry production plans, feasibility studies and poultry products utilization.
6. Highlight hatchery establishment and layout of infrastructures.
7. Itemize the factors affecting fertility and hatchability of eggs
8. Evaluate egg candling and turning, embryonic development and early mortality
9. Explain methods of sexing day old chicks, production or purchase of good quality hatchable eggs.
10. Highlight the importance of good hygiene and hatchery waste management.

### **Learning Outcomes**

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

1. Define five (5) common terms use in poultry' and hatchery technology.
2. Summarize the management and feeding of Chicks, Growers, Layers and Ration Formulation
3. Identify two (2) housing systems and five equipment use in poultry production
4. Appraise nutrition and diseases of broilers, layers and chicks
5. Describe poultry production plans.
6. Highlight hatchery establishment and layout of infrastructures.
7. Itemize four (4) factors affecting fertility and hatchability of eggs
8. List five (5) causes of early mortality and poor hatchability
9. Itemize hatchery hygiene, handling and marketing of hatched chicks.
10. Highlight the importance of good hygiene and hatchery waste management.

### **Course Contents**

History of poultry production in Nigeria. Prospects and problems of poultry production in Nigeria. Specific poultry production businesses. Management of some poultry species. Housing and equipment and production Systems. Management and principles of poultry production. Nutrition and diseases of chicken. Establishment of poultry farm. Poultry production plans. Poultry product utilization. Establishment of hatchery and layout of infrastructures. Management of breeders. Factors affecting fertility of eggs. Pre-incubation care of hatchable eggs. Egg candling and turning. Factors influencing hatchability of eggs. Sexing and marketing of chicks. Technicality of incubators. Production of hatchable eggs. Hatchery hygiene. Marketing of chicks. Management of hatchery waste.

**BU-ANS 515 (504) Monogastric Animal Production (Swine and Rabbits) (2 Units; Core; LH=30; PH=Nil)**

**Senate-approved relevance**

Swine and rabbits are source of animal protein to the Nigerian populace. Rabbit meat are special delicacy to people that relish them. They are source of lean meat and this helps in meeting the critical needs of men for animal protein. Babcock University is located in Ogun State which is in the southern part of the country and a nerve center for numerous agro-allied industries that produce by-products from their industries that can be utilized as feed ingredients for these monogastric livestock production. Hence the justification for teaching and research in this area of livestock value chain. Adequate understanding of the swine and rabbit techniques by our students will better the livestock industries. Babcock University considers harnessing the availability of the by-products in its environ as feed resources to further develop the livestock industry by equipping the students with necessary education students for profitable livestock production.

**Overview**

This course focuses on the scientific information pertaining to the production of feed and the feeding of all classes of farm animals. Therefore, it serves as the main guiding principle for the training of students in the Bachelor of Animal Science and Bachelor of Agriculture (Animal Science Option) programs. It covers nutrition for non-ruminant animals such as swine and rabbits as well as the utilization of current technology in feed production.

This course will deepen students' understanding of non-ruminant nutrition and how these species' diets affect their development, performance, digestion, and general health. It discusses non-ruminant animal nutrition concepts, their digestive systems and restrictions, how to prepare and combine feed in feedstuffs. Thus, the course forms a major fulcrum in the training of students in monogastric animal production and management.

**Objectives**

The objectives of this course are to:

1. Discuss swine and rabbit production in Nigeria.
2. Discuss the peculiar characteristic of swine and rabbit that distinguish them from other livestock.
3. Explain the factors affecting swine and rabbit production enterprise in Nigeria
4. Describe the housing for pigs and requirement for sitting piggery
5. Explain the mating methods and signs of heat in swine production
6. Discuss the techniques of establishing a commercial herd of swine and colony of rabbits, production plans, environmental requirements, production equipment and improvisation.
7. Expound on method of foundation stock selection for rabbits and pigs.
8. Discuss swine management practices and method of record keeping.
9. Describe common disease of swine and their control.
10. Evaluate feeds and feeding requirements for successful swine and rabbit production.

**Learning Outcomes**

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

1. List four (4) peculiar characteristic of swine and rabbit that distinguish them from other livestock.
2. Identify 10 constrains of swine production in Nigeria
3. Enumerate five (5) factors affecting swine and rabbit production enterprise in Nigeria
4. Highlight the requirement for sitting piggery
5. State three (3) mating methods and signs of heat in swine production
6. State three (3) qualities of good foundation stock in rabbit and pig production.

7. Discuss the three (3) types of pig production enterprise.
8. Discuss two (2) swine management practices and method of record keeping.
9. State three (3) ways of identifying sick animals in swine herd and rabbit colonies
10. Highlight four (4) methods of disease control in swine and rabbit production.

#### **Course Contents**

Swine production in Nigeria. Characteristics of swine and swine system. Common terminologies in swine and rabbit production. Breeds of pigs and rabbits. Importance of swine and rabbits in livestock production. Factors affecting swine production enterprise in Nigeria. Housing for pigs and requirement for siting piggery. Management of pregnant animals. Breeding and mating methods in swine enterprise. Housing design for rabbits and swine. Health care of swine and rabbits. Establishment of herd of swine and colony of rabbits. Production plans and environmental requirements. Production equipment and improvisation. Selection of foundation stock for rabbits and pigs. General types of pig production enterprise. Swine production systems. Management practices and record keeping. Swine diseases and control. Feeds and feeding requirements for swine and rabbit production. Marketing of swine and rabbit products. Rabbit diseases and control.

#### **ANS 505: Reproductive Physiology and Artificial Insemination (2 Units C: LH 15; PH 45)**

##### **Learning Outcomes**

The students are to know the following at the end of the course:

1. reproduction and the involvement of mature male and female animals in the act of reproduction;
2. male and female reproductive organs of the major parts in reproduction;
3. male and female gametes to be viewed under microscope to appreciate their forms and functions for the foetus/embryo formation;
4. AI with its merits and demerits side by side with natural insemination in livestock production. The role of male and female animals in AI, embryo transfer etc.; and
5. management practices in terms of feeding and handling that improve and encourage reproduction among farm animals.

##### **Course Contents**

The reproductive systems in male and female animals; Physiology of sperm and ovum. Endocrinology; reproduction, Egg production, pregnancy and foetal development. Fertility and sterility of farm animals. Role of AI in livestock production. Cloning, embryo transfer.

Management

of male donors; semen collection, evaluation, preservation and storage. Artificial insemination techniques.

#### **ANS 506: Pasture and Range Production and Management (2 Units C: LH 15; PH 45)**

##### **Learning Outcomes**

At the end of this course, the students should be able to:

1. distinguish between pasture and forage;
2. know the common and botanical names of common indigenous and foreign pasture and forage species;
3. establish and maintain a pasture land;
4. establish a fodder bank; germplasm collection, preservation and storage; and
5. understand what range management is.

##### **Course Contents**

Adaptation and botany of indigenous and introduced pastures and forage plants. Characteristics of grasses, legumes and shrubs. Establishment, production and seed production of pasture plants; the utilization and maintenance in permanent and temporary pastures. Forage legumes and their roles in tropical farming system. Fodder bank technology; shrubs and trees legumes. Agronomic management for seed production. Seed harvesting, processing and storage. Germplasm collection, preservation and storage. Range Management; Grazing Systems; Forage conservation, dry season feeds. (2 hour of lectures and 1 hour of practicals per week).

**BU-ANS 507: Monogastric and Ruminant Animal Nutrition (2 Units; Core; LH=15; PH=45)**

**Senate-approved relevance**

This course focuses on the study of livestock nutrition according to their digestive tracts. It is designed to provide the knowledge of the nutrient requirements of the ruminant animal and the processes and pathways through which these nutrients are properly utilized by the animal in the digestive tract. The nutrition of the monogastric animals has its peculiarities as these animals which include poultry; swine and the rabbit are single stomached. This is imperative to livestock management and development. This course supports the BU's vision and mission through its faith-based education such that the students will have good scientific knowledge to maintain livestock in good conditions through proper understanding of appropriate nutrition, so that they will be well nourished and used as resources for the glory of God and benefit of the human race.

**Overview**

This course provides proper understanding of the composition, availability and utilization of the nutrients contained in feedstuffs utilized in monogastric and ruminant animals' feeds. This is vital in adopting the correct design and formulation of rations. Proper feeding techniques are also highlighted in this course as it constitutes the bedrock of production of livestock feeds.

The course will expose the students to the science governing the ingestion, mastication, digestion, absorption and excretion of feed ingredients that results in the maintenance, growth, reproduction and production of monogastric and ruminant animals. The management of digestive tract diseases is also detailed in this course. All these are essential in the attainment of effective and efficient livestock management.

**Objectives**

The objectives of this course are to:

1. Explain the nature of Ruminant digestive system.
2. Discuss influences of rumen microbes and their importance in fibrous feed digestion.
3. Identify the use of non-conventional feeding resources particularly agro-industrial by-products and farm wastes in feeding cattle, sheep and goats.
4. Explain the concepts of Non-Protein- Nitrogen and the benefits of its use for ruminant feeding
5. Define monogastric animals.
6. Illustrate what the animal's digestive tract looks like and function of its various components.
7. Identify the classes of feed ingredients, their potentials, limitations, methods of preparation and combination in feed formulation.
8. Discuss basis for which substances are added in monogastric animal feeds.
9. Illustrate the effect of added substances in feeds on the final product.

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. State what monogastric and ruminant animals are.

2. Draw the digestive tracts of monogastric and ruminant animals.
3. State the peculiarities of the monogastric animal's digestive system as compared to other classes of animals.
4. State four (4) peculiarities of the ruminant animal's digestive system as compared to other classes of animals.
5. Explain the rumen environment, physiology and metabolic pathways.
6. Explain three (3) systems of energy and protein partitioning.
7. Discuss four (4) roles of nutrient types and feed additives in monogastric and ruminant animals feeds along with the consequences of their inadequacies.
8. Identify four (4) types of feedstuffs utilised in the formulation of feeds for these animals
9. Formulate feeds for these animals.
10. Perform proximate analysis.

### **Course Contents**

Principles of monogastric nutrition. Feeding behaviours. Water in relation to nutrition. Metabolic water computation and ration formulation. The structure of the Feed Industry. Feed evaluation. Feed mixing and manufacture. Feed Processing. Livestock Feed Regulation. Feed formulation. Storage and quality control of feedstuffs and foods. Microbiology of the rumen. Physiology of rumen action. Metabolic processing pathways. Non-protein nitrogen utilisation. Determination of digestion balance trials. Systems for energy evaluation. Schemes for protein values. Water in relation to nutrient and metabolism. Water requirements and their interrelationships in nutrition. Feed additives. Phytochemical Screening. Preparation of Hay and Silage. Quality Control and Feeding Standards. Feed Formulation for Monogastric and Ruminant Animals. Anatomy of Digestive Tracts of Monogastric and Ruminant Animals.

### **BU-ANS 508 Animal Health and Diseases (2 Units; Core; LH=30; PH=Nil)**

#### **Senate-approved relevance**

This course is designed to provide learners with tutelage on the management of poultry and livestock health. The course also provides information on the incidence and control of major diseases affecting the poultry and livestock industry. This is very germane to the general management of the poultry and livestock enterprises. This course has senate approval at BU because of its agreement with the University's keen interest in the functional and practical exposure of students to the knowledge and skills needed for the maintenance of farm animals in optimal health for sustained productivity.

#### **Overview**

An understanding of Animal Health is fundamental to sustainable food animal production and improved livelihoods of poultry and livestock farmers, especially in the rural areas of Nigeria. Across the country, animal diseases outbreaks in poultry and livestock farms are associated with sub-optimal productivity, morbidities and mortalities (including reproductive losses). Disease outbreak are not often limited livestock but could be zoonotic.

This course will acquaint students of who intend to major in Animal Science with up-to-date information on the etiological factors of the main causes of diseases and mortalities of farm animals in Nigeria. Furthermore, the course will provide appropriate measures to adopt for the prevention and control of spread of such diseases. This spread is usually among livestock but sometimes could be zoonotic via occupational exposure or the consumption of contaminated animal product.

#### **Objectives**

The objectives of this course are to:

1. Profile the principles of immunity and practical applications in animal production - primer and booster vaccinations; anamnestic immune responses.
2. Explain the need for regular, in-person farm visits, for the observation and assessment of farm animals for signs of ill health or disease.
3. Describe the etiology of the major viral, bacterial and parasitic diseases of farm animals, especially poultry and livestock species, and their prevention and control.
4. Describe the etiology, prevention and control of common zoonotic illnesses of farm animal origin in Nigeria.
5. Explain the importance of the inspection of foods of animal origin (especially milk and meat) in the prevention and control of zoonotic (animal-human) disease transmissions.
6. Identify the regulations governing the control of animal diseases in Nigeria including: The Animal Diseases (Control) Act, Cap. A17 of 2004; The Animal Diseases (Control) Act of 1988; and the Animal Diseases (Control) Act, 2022.

### **Learning Outcomes**

On completion of this course, the student should be able to:

1. Explain 10 key terms used in the field of Animal Health.
2. Describe at least 5 roles of specific environmental factors in the causation of diseases in farm animals especially poultry and livestock species.
3. Identify the importance of farm sanitation, zoo-sanitation and hygiene in the prevention and control of farm animal diseases.
4. List 10 appropriate steps to be followed during the handling of animals for the collection of samples meant for diagnosis of diseases.
5. Demonstrate the need for primer and booster vaccinations in farm animals.
6. Identify at the least 5 characteristic features of health and disease in farm animals.
7. Explain three (3) etiology and measures for the prevention and control of viral, bacterial and parasitic diseases of farm animals (poultry and livestock) in Nigeria.
8. List two (2) measures for the prevention and control of zoonotic diseases of farm animal origin in Nigeria.
9. State at least 7 importance of meat and milk inspection in the prevention and control of zoonotic disease transmissions of food animal origin.
10. Discuss at least 3 laws governing the control of animal diseases in Nigeria.

### **Course Contents**

Key terms applicable to animal health and diseases. Environmental and animal diseases. Principles of hygiene in poultry and livestock production. Principles of animal handling. Clinical examination of farm animals. Farm Sanitation. Methods of sample collection for diagnostic purpose. Causes of farm diseases. Etiological factors responsible for farm diseases. Principles of immunity and disease resistance of farm animals. Vaccination of farm animals. Signs of ill health or disease in farm animals. Etiology of the major diseases of farm animals in Nigeria. Prevention and control of diseases of farm animals. Meat and Milk inspection. Control of zoonoses associated with poultry and livestock production in Nigeria. Animal disease control legislations in Nigeria.

### **BU-ANS 509: Phyto-genics in Animal Production (2 Units; Core; LH=30; PH=Nil)**

#### **Senate-approved relevance**

The mandate to deliver on the Sustainable Development Goals (SDGs) 1, 2 and 3 has imposed huge responsibility on the agricultural food production system. Significant proportion of the

indigenous crops, grown in the agro-ecological systems are more often cultivated to meet the food and dietary needs with less intentional focus on their medicinal values. Most of the indigenous crops are repositories of vital bioactive substances, which have helped in the sustenance of the health status and longevity of the indigenous people/settlers of most communities in Africa. These bioactive components can be harnessed in the treatment of most diseases and health challenges of modern times as well as serve as precursors in the discovery of new drugs. Babcock University is committed to education, training, and capacity building of students in the application of natural health remedies to improve the wellbeing and health status of Nigerians via the cultivation and utilization of the indigenous medicinal plants. This is aimed at treatment of diseases and to ensure effective isolation and purification of bioactive substances from indigenous crop plants as precursors in the discovery of new drugs. This is the focus of this course.

### **Overview**

As a result of inability to meet the daily protein requirements by individuals in developing country, this calls for search of raising livestock with cheap and alternative feed without compromise in the quality of animal products and utmost focus on safety of such animal products. There is the urgent need to consider the potentials of various plants and their products within our environment and the need to observe the nutritional and medicinal potentials while also emphasizing the maximum level of safety of the plants and products.

This course will expose the students to the potential benefits as well as the risks involved in the use of plants and plants products in animal production. Also, detailed knowledge of phytochemicals and anti-oxidant potentials of phytochemicals in animal production will be exposed to students. Furthermore, the course will provide understanding to the risks of used phytochemicals as it affects livestock.

### **Objectives**

The objectives of this course are to:

1. Describe the potentials of phytochemicals in animal production
2. Identify the thresholds for some plant materials in animal production
3. Explain the impacts of phytochemicals on the digestive physiology of livestock
4. Identify the potential benefits and possible risks of identified phytochemicals on the health status of livestock.
5. Identify the antimicrobial effects of phytochemicals in animal production

### **Learning Outcomes**

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

1. Identify the mode of actions of phytochemicals.
2. Explain three (3) interrelationships between phytochemicals and nutrients.
3. Explain five (5) impacts of phytochemicals on basic physiological processes of the animal
4. Identify six (6) potential harmful and toxic plant products for livestock
5. Describe the nutritional and ethnomedicinal potentials of phytochemicals

### **Course Contents**

Overview of Phytochemicals and Mode of Action. Interactions Between Nutrients and Phytochemical Antinutrient. Interrelationships among Toxic Minerals. Heavy Metals. Biological Molecules and Nutrients. Animal Toxins and nutrients interactions. Microbial Toxins Interactions with Dietary Nutrients. Influence of phytochemicals on animals. Impact of phytochemicals on digestibility of nutrients. Influence of phytochemicals on physiological reactions. Antimicrobial influence of phytochemicals and intestinal morphology. The influence of phytochemicals on animals' immunity. Antioxidant effect of phytochemical substances. Phytochemicals and reproductive

performance of livestock. Phytobiotics and stress management. Ethnomedicinal perspectives of various plants. Phytobiotics for Animal Production and Health. The harmful and toxic plants for livestock.

**BU-ANS 511 (510): Animal Behaviour, Welfare and Ethics (2 Units; Core; LH=30; PH=Nil)**

**Senate-approved relevance**

Knowledge of behaviour of animal whether domesticated, laboratory or wild is a prerequisite to improving their welfare. The increasing use of animal in research also calls for an understanding of the ethics involved so as to guard against indiscriminate use and abuse. Thus the senate of the institution deems it fit to design a course of this nature that will espouse the welfare of the animal during experimentation as well as the ethics guiding their use in research. This is in line with BU Senate's focus to promote and sustain the welfare of the animals and thus guard against indiscriminate use in various aspects of the curricula that are used for academic purposes at BU.

**Overview**

Since domestication, farm animals have been an integrated and important part of human society. Animal agriculture is not only of great economic interest, employing a considerable number of people; it is also on the basis of a significant part of human culture and tradition. As for the farm animals themselves, their quality of life depends on human care. This has become a matter of increasing concern in society, and is discussed in terms of animal welfare. In much of the Western world, animal welfare legislation is continually being tightened and the issue is also being addressed by intergovernmental bodies.

This course intends to expose the students to the different behaviour of animal species and better understanding of the care of the different specie of animals. The students of this course will be acquitted with knowledge on the welfare, ethics and regulations that address handling of the animals. Furthermore, the students will be exposed to climate variabilities as they affect animals in their various ecological zones.

**Objectives**

The objectives of this course are to:

1. Discuss principles of animal behaviour, welfare and ethics.
2. Explain animal behaviour in the wild and under domestication.
3. Analyse the behaviour of different animal species.
4. Compare six conceptions of animal welfare.
5. Describe three philosophical frameworks used in animal ethics.
6. Appraise six factors that influence decisions about animal use.
7. Examine the legal and ethical frameworks that safeguard welfare
8. Describe four handling techniques of seven species of animal.
9. Discuss ethical rules and regulation guiding animal use in Nigeria and other countries.
10. Discuss the impact of climate change on the behaviour and welfare of different animal species in their ecological niche

**Learning Outcomes**

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

1. Explain three (3) principles of animal behaviour, welfare and ethics.
2. Explain the behaviour of animal in the wild and under domestication.
3. Discuss animal welfare.

4. Explain two (2) philosophical frameworks of animal ethics.
5. Describe ethical and legal framework safeguarding animal welfare.
6. Demonstrate three (3) handling techniques of certain animal species.
7. Compare ethical rules and regulations in three countries.
8. Explain the impacts of climate change on the behaviour and welfare of four animal species in their ecological niche.

### **Course Contents**

Effects of domestication on animal behaviour. Causes of behaviour responses in animals. Types of animal behaviour. Learning of behavioural responses. Behavioural adaptations of animals to environments. Abnormal behaviour. Principles of Animal behaviour. Concept of Animal welfare. Physiological frameworks of animal ethics. Various techniques for handling farm animals. Welfare issues as related to Animals. Animal ethics. Animal production rules and regulations. Concept of Climate Change. Climate Change and animal behaviour. Welfare of different species of animals.

### **BU-ANS 512 Animal Products and Processing (2 Units; Core; LH=15; PH=45)**

#### **Senate-approved relevance**

Meat quality has assumed a greater consumer significance and public attention. There is growing awareness of the link between diet and health and this is reflected in the demand for more information and for products which are healthy and of consistently high quality. Other concerns are about food safety and hygiene, especially the presence of micro-organisms, bacterial contamination and residues, as well as the welfare and husbandry conditions under which animals are kept. This effectively expresses the vision and goals of Babcock University in addressing the issue of global hunger and export-driven agriculture. Relevance is shown in students graduating with a stronger understanding of issues related to population growth, food supply shortages, and other preventative measures. Additionally, the program is designed to produce graduates who will be self-employed and have the necessary technical, productive, and entrepreneurial skills to be relevant to themselves, the agricultural sector, and society, as well as effectively contribute to the country's agricultural development goals.

#### **Overview**

The course is of utmost importance as it is the desire of God that we all be in good health. Hence the products consumed from animals should be well processed in highly hygienic environment with little or no microbial and chemical contamination. The course is also to widen the scope of students to ways of empowering themselves in various manufacturing/processing of animal products. This course will expose the students to the structure and composition of animal based-product. This course will also discuss the biochemical changes during slaughtering and its effects on product quality, processing technologies of animal-based product, as well as the effects of processing on product quality. The students will also be exposed to humane ways of slaughtering and handling animals as well as live animal evaluation and grading.

#### **Objectives**

The objectives of this course are to:

1. Differentiate between animal products and by-products from livestock production systems.
2. Explain the source, structure and composition of materials and various food products from animal origin.
3. Describe the physiological and biochemical changes in animal-based raw food materials.

4. Evaluate the characteristics of materials, processing procedures, and animal-based products in terms of food quality and safety.
5. Describe how the products from animals are produced, handled, processed and stored

### **Learning Outcomes**

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

1. Differentiate between animal products and by-products
2. List five (5) animal products and by products
3. Explain the state of meat, egg and milk industry in Nigeria
4. Describe 5 stages involved in the conversion of muscle to meat
5. Identify at least 6 properties of fresh meat and the best way to process and preserve meat
6. Identify at least 5 importance of packaging and different types of packaging for meat
7. Discuss how egg can be processed and stored
8. Describe the state of milk production in Nigeria
9. Describe three (3) nutritional and physico-chemical qualities of good milk
10. Explain two (2) milk storage and preservation techniques

### **Course Contents**

Dairy microbiology and milk processing. Livestock processing and preservation techniques. Preservation and storage of animal products. Body Composition and conversion of muscle to meat. Carcass quality evaluation in livestock. Egg quality and grading. Milk hygiene. Chemistry and nutritive value of animal products. Egg processing and storage. Animal products and human health. Livestock products. Importance of food safety to consumers. Meat-borne diseases and prevention. Chemical and antibiotic residues in meat. Common food poisoning organism. Egg contamination and spoilage. Food poisoning symptoms. Governmental agencies and food safety. Biochemistry of animal products. Live animal evaluation. Methods of Stunning and Slaughtering. Carcass evaluation. Meat processing and quality control. Abattoir Practices. Egg science. Preservation of eggs. Preparation of dehydrated egg products. Dairy Science. Determination of pH and acidity. Preparation of dairy products.

### **BU-ANS 513 Precision Livestock Production and Nutrient Utilization (2 Units; Core; LH=15; PH=45)**

#### **Senate-approved relevance**

The course will expose students to various ways of minimizing the cost of feed through precision farming techniques. By so doing, there will be reduction in wastage of feed which will in turn reduce cost of production in livestock production. This ultimately encourages increase in animal production with the excess resources available from precision farming. This supports food security and availability and also helps in provision of more food in the society. The course is very important in the reduction of hunger, a sustainable development which aligns with Babcock Mission of food availability to the populace.

#### **Overview**

There is need for adequate understanding of precision farming and effective nutrient utilization and metabolism for livestock sector of Agriculture to thrive. This will in turn reduce drudgery associated with general livestock management without precision, such, not been sustainable. Nutrient metabolism will facilitate the understanding of students on the mode of absorption of nutrients and various experimental studies especially as it relates to alternative usage of feedstuff in animal nutritional biochemistry study. The course will provide information on Precision

Agriculture technologies, covering both the applications and the different technologies that make precision farming possible. The course will also focus on nutritional metabolism of nutrients, digestion, absorption, transport, utilization and storage of macronutrients in livestock production. The course further exposes the students to effective record keeping and appropriate monitoring of livestock.

### **Objectives**

The objectives of this course are to

1. Explain the concept of precision livestock production
2. Identify the benefits and challenges of precision livestock production
3. Describe the metabolism of carbohydrates, proteins and lipids in animals;
4. Identify the roles of enzymes and hormones in animal production
5. Identify the roles of minerals, vitamins, and water in nutrient metabolism; and

### **Learning Outcomes**

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

1. Discuss 10 precision livestock production
2. Explain the application of precision livestock production in agricultural industry
3. Describe the metabolism of carbohydrates, proteins and lipids in animals
4. Explain the 10 roles of enzymes and hormones in nutrients' utilization by animals
5. Explain the 10 roles of minerals, vitamins and water in nutrients' utilization by animals

### **Course Contents**

Precision Agriculture overview. Benefits and Application of precision agriculture. Precision Agriculture for Sustainability and environmental protection. Macronutrients and post-absorptive metabolism. Integrated post-absorptive metabolism of lipids in tissues. Biosynthesis of fatty acids. Regulatory nutrients in post-absorptive lipid metabolism. Protein turnover and amino acid metabolism. Tricarboxylic Acid (TCA) Cycle. Gluconeogenesis and its importance in ruminants. Intertwining of glycolysis and gluconeogenesis. Regulation of post-absorptive carbohydrate metabolism. Regulatory nutrients in post-absorptive carbohydrate metabolism. Integration of metabolism in farm livestock. Inter-conversions of macronutrient intermediates. Liver in post-absorptive metabolism. Tissue-specific metabolism of macronutrients in fed-fast cycle. Regulatory role of the endocrine system.

## **BU-ANS 517 (516) Sustainable Livestock Production (2 Units; Core; LH=30; PH=Nil)**

### **Senate-approved relevance**

The increasing income and changing dietary preferences coupled with population growth have led to increased demand for livestock products. However, if not properly managed, this growth risks accentuating sustainability issues that span equity, environmental impacts, and public health. This endeared the Senate of the institution to place strong emphasis on the teaching and learning of environmentally sustainable livestock production practices. Thus, a course that is designed to understand the effect of animal production activities on planet health is in line with Senate's focus to promote sustainable livestock production in various aspects of the curricula that are used for academic purposes at Babcock University.

### **Overview**

The livestock sector is a pillar of the global food system and a contributor to poverty reduction, food security and agricultural development. This course seeks to examine the role that livestock plays in sustainable food systems. The course also shows how livestock production systems contribute to the preservation of biodiversity and to carbon sequestration in soils and biomass. The

influence of farm-based greenhouse gas emission on climate change is also core to the content of this course. Clearly, this course is designed to teach the improved livestock management practices which seeks to optimize human, animal, and planetary health. A major target of the course is to expose students to the transformations that accompany growth and create an opportunity to move the livestock sector toward more sustainable development. The course will also demonstrate how to improve livestock's contribution to human diets.

### **Objectives**

The objectives of this course are to:

1. Describe the global food system.
2. Discuss livestock sector as a pillar in the global food system.
3. Define sustainable food system.
4. Describe the drivers of growth in livestock sector.
5. Appraise livestock sector contribution to sustainable development.
6. Assess the effect of greenhouse gas emission to climate change.
7. Identify how livestock production can contribute to greenhouse gas emission.
8. Explain the implementation of good animal husbandry practices.
9. Describe adoption of environmentally sustainable energy technologies.
10. Discuss silvo-pastoral system as innovative approach to sustainable cattle ranching.

### **Learning Outcomes**

On completion of the course, the student should be able to

1. Appraise the global food system.
2. Evaluate livestock contribution to the global food system.
3. List three (3) drivers of change in the livestock sector.
4. Explain the need to move the livestock sector towards sustainable development.
5. Estimate the contributions of livestock sector to greenhouse gas emission.
6. Identify five (5) means of mitigating against climate change in livestock production
7. Explain "One Health" approach to optimize human, animal and planetary health.
8. Describe climate-smart livestock production practices.
9. Describe silvo-pastoral system of livestock production.

### **Course Contents**

Sustainable agriculture. Food security and poverty alleviation. Practices in sustainable Agriculture. Methods of sustainable agriculture. Drivers of change in livestock production. Effect of increased livestock production on the environment. Greenhouse gas Emissions. Effect of greenhouse gas production on climate change. Effect of greenhouse gas production on agriculture. Contribution of agricultural practices to Greenhouse gas. Good animal husbandry practices. Adoption of environmentally sustainable energy technologies. Silvo-pastoral system. Cattle Ranching. Innovative approach to cattle ranching.

### **ANS 599: Project (4 Units C: PH 180)**

Each student is expected to choose and execute a special project under a supervisor. Duration of the project is 2 semesters.

## **500 Level Crop/Soil Science Option Course Contents and Learning Outcomes**

### **BU-CPS 501 Pesticides Application and Toxicity (2 Units; Core; LH=15; PH=45)**

### **Senate-approved relevance**

The quality and quantity of agricultural produce has been significantly depressed by the activities of pests and diseases in recent times. This will no doubt, derail the possibility of attaining the zero hunger in the Sustainable Development Goal (SDG) of the United Nations in record time. Thus, the deployment of the chemical approach in combating pest and disease challenges in agriculture became more prominent, because of its speedy result on application. However, the use of chemical pesticides in crop protection is associated with several adverse effects such as toxic residues, pollution of water and soil, health challenges to consumers of agriculture produce, pest resurgence et cetera. This course is designed to train and promote the safe use of pesticides in agriculture to boost intensive food production without compromises on food quality, human health and environmental safety in accordance with BU Senate's new program development plans geared toward promoting environmental sustainability to boost healthy food production in line with the SDGs of the UN.

### **Overview**

This course provides a succinct and effective approach in pest and disease management in agriculture. It also focuses on the adoption of a monitored and skillful chemical approach in the management of pests and diseases as a rapid control approach. The management of pesticide toxicity is also detailed in the content of this course

This course intends to educate and train agriculturists on the safe use of pesticide to achieve their full benefits. This course will introduce pesticide formulation and application equipment. The course will also demonstrate to the students' best practices in calculating pesticide quantity and application procedures.

### **Objectives**

The objectives of the course are to:

1. Discuss the concepts of pests and pesticides
2. Trace the history of the use of pesticides in pest management
3. Identify the principles of pest management.
4. Classify pesticides to types based on types of pest, active ingredient and mode of action
5. Explain the management of pesticide toxicity in agro-ecosystem
6. Categorize pesticides formulation and describe types of pesticide application equipment in agriculture and identify pesticide application equipment
7. Identify the functional parts of pesticide application equipment
8. Outline the maintenance protocols for pesticide application equipment
9. Calculate pesticides quantity needed for specific field applications
10. Practice the techniques of pesticides application and identify the effects of pesticides on the ecosystem and economy

### **Learning Outcomes**

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

1. Define the concepts of pests and pesticide and trace the history of the use of pesticides in pest management
2. Explain three (3) principles of pest management and classify six pesticides based on their active ingredients
3. Explain the mode of action of pesticides and identify three types of pesticides toxicity
4. Estimate the acute toxicity of a pesticides
5. Manage two (2) pesticides and poisoning on victims
6. List six (6) effects of pesticides toxicity and identify at four pesticide formulation

7. Describe four (4) pesticide application equipment and describe two principles of pesticides application equipment
8. Calibrate two (2) pesticide sprayers and calculate number of pesticides needed for a specified spray operation
9. Describe four (4) effects of pesticide in the ecosystem

#### **Course contents**

Concepts in pesticides application. Definition of Pests and pesticides. Origin of pests and use of pesticides. Principles of pest management. Classification of pesticides. Mode of action of pesticides. Pesticide toxicity. Types and effects of pesticide toxicity. Symptoms of pesticides poisoning. First aid treatment of pesticide poisoning. Pesticides formulation. Classification of pesticides application equipment. Calibration of pesticides application equipment. Calculation and mixing of pesticides. Principles and techniques of application of pesticides. Maintenance of pesticides application equipment. Effects of pesticide in the ecosystem.

### **CPS 503: Plantation Crops and Orchard Management (2 Units C: LH 30)**

#### **Learning Outcomes**

1. Students are groomed with a theoretical background which would help in practical handling of requirements for production of arable and tree crops; and
2. Distinguish the peculiarities in the production practices for arable and plantation crops.

#### **Course Contents**

Soil and climatic requirements; growth requirement, weed control and water use. Improved varieties; production practices, diseases and pests, harvesting, handling, processing, storage, marketing, and utilization of field and plantation crops. Growth requirements of cereals, root, tubers, sugar crops, cocoa, citrus, oil palm, etc. Management and production of field crops. Fertilisation; water use and weed control.

### **BU-CPS 504 Pasture and Forage Production (2 Units; Core; LH=15; PH=45)**

#### **Senate-approved relevance**

Studying pasture and forage production will help students understand the process of feed production, especially in relation to the dairy and meat industries. With a sound knowledge of pasture and forage production, students can make informed decisions on efficient livestock feeding which in turn will facilitate sustainable food production practices. This is in accordance with Babcock mission to support production of safe and quality animal protein. Graduates of agriculture, after taking this course, will be able to explore job opportunities in livestock meat and feed management.

#### **Overview**

The course introduces students to the principles of grassland husbandry. Students are trained in identification and propagation of indigenous and introduced pasture and forage plants in Nigeria. The course also highlights methodologies for designing pasture and range land research. Other aspects like physiology of regrowth, concepts of efficiency in primary and secondary production and factors affecting them are also part of the content of this course.

This course intends to expose students to appropriate grassland management and forage management principles. Learners are trained on the identification of indigenous and introduced pasture plants. The course will also demonstrate to the students the best practices with respect to establishment of pasture and range land.

#### **Objectives**

The objectives of the course are to:

1. Analyze the principles of grassland husbandry
2. Summarize the botany of selected tropical grasses
3. Identify fifteen indigenous and introduced pasture plants
4. Demonstrate the propagation of some selected pasture plants
5. Explain the concept of regrowth
6. Compute pasture and range land research methods

### **Learning Outcomes**

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

1. Define the terms Pasture and Forage crops
2. Identify the five (5) common pasture and forage crops in their localities.
3. State the specific and common names of 10 pastures and forage crops
4. Describe the morphological structure of grasses, legumes and browse plants.
5. List at least 7 steps to consider in pasture establishment.
6. Discuss four (4) methods used in improving and maintaining a good pasture.

### **Course Contents**

Principles of grassland husbandry. Pasture and forage crops. Botany of forage crop. Botany of tropical grasses. Identification of indigenous pasture. Identification of forage plants. Propagation of indigenous pasture and forage plants. Propagation of introduced pasture and forage plants in Nigeria. Physiology of regrowth. Concepts of efficiency in primary and secondary production. Importance of forage crops. Factors affecting the nutritive values of forage and forage intake. Irrigation practices. Dry season feeds. Pasture and rangeland. Pasture management. Research methods.

## **CPS 505: Methods of Field Experimentation (2 Units C: LH 15; PH 45)**

### **Learning Outcomes**

1. At the end of the course, learners should understand the concept experimentation, its purpose, and procedure; and
2. They should have a bit of the knowledge of data collection, collation, and analysis.

### **Course Contents**

Principles of field experimentation in crop science. Research methodology; experimental plot layout and experimental designs, field survey; normal distribution and sampling; measurements and data analysis. Sources of variation in field experiments. Single factor and factorial experiments. Analysis of variance, data transformation and means separation. Data collation and interpretation. Concept of mean, standard deviation, standard error, least significant difference, Duncan's multiple range test. Result presentation in tables and figures.

## **BU-CPS 506 Physiology of Crop Growth and Yield (2 Units; Core; LH=30; PH=Nil)**

### **Senate-approved relevance**

This course focuses on the study of the physiology of crop with a target at growth and yield of crops. The ultimate target of the course is to equip student with knowledge and skills to manipulate crop production for higher yield which will contribute to food security. Babcock university is poised to contribute to furtherance of Nigeria's renewed commitment for food sufficiency through training of undergraduates that are adequately equipped with the comprehensive theoretical knowledge and practical skills required for meaningful engagement in crop agriculture. This is

congruent with Babcock university vision to train new generation of agriculturist with requisite knowledge of crops.

### **Overview**

The physiology of crop growth and yield curriculum is designed to impart knowledge in a broad sense in all aspects of crop physiology relating to growth and yield. It emphasizes a study of the complete physiological processes in plants. It teaches the deployment of modern technology in meeting the emerging challenges of food insecurity and grooming learners for the development of a sustainable enterprise in crop production.

An appropriate delivery of the contents of the course would produce not just scientists but entrepreneurs in crop production, value addition to crop produce as well as packaging of final crop produce. The course introduces students to the fundamental principles involved in core physiological processes in crop plants, and how the physical environment of the crop/plant influences these processes.

### **Objectives**

The objectives of the course are to:

1. Demonstrate how growth is measured in crop/plant.
2. Discuss dry matter accumulation and distribution in plant.
3. Identify some plant characters and explain their roles in improving plant growth and yield.
4. Express how growth/development can be managed in plant.
5. Discuss agronomic processes involved in producing some crops.
6. Discuss environmental factors that can influence crop growth and development.

### **Learning Outcomes**

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

1. State five (5) physiological processes in plants.
2. List five (5) morphological organs in plants with specific physiological processes.
3. Name the inorganic components of plants.
4. Outline the steps involved in C<sub>3</sub> and C<sub>4</sub> pathways.
5. Outline the measurement of growth.

### **Course Contents**

Inorganic components of plants. Sources of plant nutrition. Metabolism of nutrient elements. The physiology of stomata. Water stress and drought. Physiological processes in plants. Morphological organs in plants. Inorganic components of plants. Plant hormones and usage. Photorespiration. C<sub>3</sub> and C<sub>4</sub> pathways. Crasulacean acid metabolism. Nitrogen metabolism. Secondary metabolism in plants and their products. Chemical ecology. Measurement and control environment. Improved crop performance.

## **BU-CPS 507 (508) Plant Breeding (2 Units; Core; LH=30; PH=Nil)**

### **Senate-approved relevance**

The global community is currently battling with food insecurity challenges arising from the souring world population of above eight billion people. Nigeria has also contributed significantly to this number being the most populous nation in Africa. This calls for urgent intervention in rapid food production by improving existing crops to maximise their yield per unit area of cultivation. Hence the need to enhance the genetic potential of crop through rigorous selection of elite genotypes in several characters associated to yield and resistant to pest and diseases through plant breeding and the application biotechnology. An effective step in this direction would lead to food security. In recognition of the need to enhance qualitative and quantitative food production to meet

national and global need via exports to achieve sustainable food security, this course has been designed to train agricultural scholars to develop skills in the technique of plant breeding in accordance with BU Senate's new program development plans geared toward promoting food security in line with the SDGs of the UN.

### **Overview**

This course focuses on the processes needed for collecting, selection and hybridization of elite crop materials. The course exposes students to core concept of plant breeding and its nexus with crop improvement. Also, the relationship between plant breeding, pest and disease control is detailed in this course. Details of potentials of plant breeding to enhance yield and other desirable qualities to meet food security needs is part of the content of this course.

This course is designed to build capacity in students with respect to plant breeding practices in order to ultimately achieve food security as well as meet industrial raw material needs. Learners will be exposed to the concepts of heredity and variation. Students will be taught the principles of plant breeding, the interaction between environment and heredity, breeding methods and germplasm resource collection and conservation.

### **Objectives**

The objectives of the course are to:

1. Discuss concepts of Plant breeding
2. Explain the principles of plant breeding in crop improvement
3. Appraise the interaction between the environment and heredity in crop improvement.
4. Discuss the role of lethal gene and their control.
5. Explain breeding systems and associated terms
6. Discuss the breeding methods employed in breeding self-pollinated and cross-pollinated plants and illustrate roles of plant breeding in pest and disease control in crops.
7. Describe the principle and practice of Germplasm resource collection, and conservation as a pre-requisite for crop breeding and evaluate six major crops grown in Nigeria
8. Illustrate the application of biotechnology in plant breeding.

### **Learning Outcomes**

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

1. Define the concepts of heredity and plant breeding
2. Apply three (3) principles of plant breeding
3. Explain the interaction between the environment and heredity
4. Identify lethal genes and their control and describe two breeding systems in plant (in-breeding, out-breeding)
5. Describe at least three (3) breeding methods applied in breeding self - and cross- pollinated crops for yield and pest resistance
6. Describe at least (5) roles of plant breeding in pest and disease control in crops
7. Describe three (3) procedures for germplasm resource collection and conservation
8. Evaluate four (4) major crops grown in Nigeria
9. Illustrate the biblical evidences of plant breeding
10. Discuss at least 5 applications of biotechnology in plant breeding

### **Course Contents**

Definition of plant breeding. Heredity and variation. Principles of Plant Breeding. Environment and heredity. Lethal genes and their control. Crop improvement. Breeding systems. Breeding methods. Procedures in self- and cross-pollinated crops. Pest resistant crops. Plant breeding in pest and disease control. Germplasm resource collection. Conservation of crops. Evaluation and

utilization of Nigerian crops. Elements of plant breeding in the bible. Biotechnology in plant breeding.

**BU-CPS 509 (510) Biotechnology and Tissue Culture in Agriculture (2 Units; Core; LH=15; PH=45)**

**Senate-approved relevance**

Crop improvement via classical breeding to overcome food insecurity and boost agricultural produce to meet global food demand is grossly limited. The limitation is largely due to the barriers of incompatibility, sterility and embryonic failures arising from crosses between distant crop relatives with desirable characters. The classical breeding approach takes advantage of the sexual reproductive systems to transfer useful genes followed by rigorous selection for crop improvement. This crop improvement approach is limited in result due to incompatibilities in the genome of distant crosses, sterility, et cetera. Hence, the need to optimize the outcomes of genetic transfers for crop improvement and enhance the genetic potential of crops through rigorous selection of elite genotypes in several characters associated to yield and resistance to pest and diseases through biotechnology and tissue culture. In recognition of the need to enhance qualitative and quantitative food production to meet national and global need via exports to achieve sustainable food security, this course has been designed to train agricultural scholars to develop skills for crop improvement through Biotechnology and Tissue Culture in accordance with BU Senate's new program development plans geared toward promoting food security in line with the SDGs of the UN.

**Overview**

Some of the challenges limiting the commercial cultivation of crop to boost food production can be overcome through crop improvement. So far classical crop breeding following rigorous selection of genotypes with desirable characters and their hybridization has been the prominent research approach in the improvement of crops. This course is focused on the applications of biotechnology and tissue culture to achieve sustainable agriculture. crop improvement approach has huge limitations that would not permit for meaningful successes in the genetic improvement of crops. Limitations such as incompatibility, especially with crosses involving interspecific hybrids, seed sterility and non-viable embryos, would not allow for the introgression of novel genes into the genome of cultivated crops to enhance their genetic potentials.

Students taking this course will be able to apply biotechnology and tissue culture approaches to circumvents the limitations of the classical crop breeding and provide huge opportunity for crop improvement. This course will enhance the understanding of students in the discovery of the molecular structure of the DNA which has enabled unlimited possibilities in agricultural crop improvement. Learners will also be able to appreciate the accuracy of crop improvement programme.

**Objectives**

The objectives of the course are to:

1. Discuss the concepts of Tissue culture and Biotechnology
2. Explain the molecular structure of genes and DNA replication, transcription and translation and protein synthesis
3. Explain Mutation and its role in crop improvement
4. Explain the scope of biotechnology and summarize the steps involved in Genetic engineering
5. Describe the protocol of gene cloning and the Process of DNA isolation from cells
6. Illustrate the principle and practice of DNA amplification using the Polymerase Chain Reaction (PCR)

7. Describe DNA sequences and the functional analysis of genes and molecular marker.
8. Illustrate the use of MAS in crop improvement
9. Discuss the application of tissue culture in agriculture
10. Describe the principle of tissue culture and be able to list three aspects of tissue culture

### **Learning Outcomes**

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

1. Define at least 5 concepts of Tissue culture and Biotechnology
2. Explain at least four (4) steps involved in DNA replication, transcription, translation and protein synthesis
3. Outline at least four (4) steps involved in tissue culture
4. Explain at least three (3) steps involved in gene cloning
5. Describe five (5) steps involved in gene isolation from cells
6. Perform the four (4) main steps involved in the amplification of DNA
7. Outline at least four (4) molecular markers used in agriculture crop improvement
8. Describe three (3) components of culture medium for tissue culture
9. Classify at least 5 different aspects of Tissue culture and
10. Describe at least three Tissue culture techniques applied in agriculture

### **Course Contents**

Conceptual definition of Biotechnology. Tissue culture and Genetic engineering. Molecular structure of genes. DNA replication. Concept of transcription. Translation and protein synthesis. Mutation and application in agriculture. Scope of Biotechnology. Gene cloning and development of GMOs. Gene editing using CRISPR. Gene Isolation. Application of PCR in DNA amplification. Interpretation of PCR results. Molecular markers in agriculture. Tissue culture and its application in agriculture. Tissue culture techniques in agriculture. Somatic embryogenesis. Meristem culture. Embryo rescue

## **BU-CPS 511 (512) Automation in Crop Production (2 Units; Core; LH=15; PH=45)**

### **Senate-approved relevance**

Automation in crop production brings in efficiency in crop production and enhance greater yield and higher output in agriculture. This course enhances deep understanding of the principles of automation in crop production. Students will learn how to design and implement automation systems to improve crop production efficiency, quality, and sustainability. It will promote critical thinking ability in agriculture student concerning identification of challenges in crop production and development of automation solutions, which ensures overall crop production efficiency and food security. As part of her mission, BU contributes to the facilitation of crop production in Nigeria. Thus, in accordance with BU senate for development of new courses and Babcock mission, this course is very germane.

### **Overview**

Automation in Crop Production is an interdisciplinary course that focuses on the use of technology to optimize crop production. This course provides students with information on how automation is revolutionizing the agricultural sector, and its impact on sustainability and efficiency of production. This should improve the profitability in crop production.

This course covers the principles and designs of automated system in agriculture. Students taking this course will in particular understand the automation systems in crop production. This course will further expose students to the understanding of robotics and machine learning in crop production and Develop automation systems solutions. BU continues to make significant

contributions to the development of the agricultural industry through training in application of modern technologies, such as automation, to crop production.

### **Objectives**

The objectives of this course are to:

1. Appraise the role of automation in crop production
2. Evaluate the impact of automation on agricultural sustainability and profitability
3. Analyze at least five technologies used in automation for crop production
4. Describe the application of automation technology in agriculture
5. Evaluate develop hands-on skills in using automated tools and systems for crop production

### **Learning Outcomes**

Upon completion of this course, the students will be able to:

1. Explain at least 5 roles of automation in crop production
2. Describe at least 5 importance of using technology to optimize agricultural practices
3. Analyze the impact of automation on sustainability, profitability, and food security in crop production
4. Describe three (3) technologies used in automation for crop production, including robotics, artificial intelligence, and the internet of things (IoT)
5. Evaluate at least 5 potential risks associated with their use
6. Use three (3) automated tools and systems for crop production

### **Course Contents**

Automated technologies in crop production. Principles of automation systems. Design and development of automation systems. Application of automation systems. Impact of automated systems on crop production efficiency. Impact of automated systems on crop quality. Impact of automated systems on crop sustainability. Types of Automated systems. Use of Sensors in crop production. Use of control systems in crop production. Use of robotics in crop production. Application of Machine learning in crop production. Implementation of automation solutions. Risks associated with use of automated technologies. Internet of things (IoT). Artificial intelligence. Practical hands-on application of automated tools.

## **BU-CPS 513 (514) Seed Production and Certification (2 Units; Core; LH=30; PH=45)**

### **Senate-approved relevance**

The efficiency in food production in agriculture is dependent on the acquisition and planting of quality and certified seeds. The confidence of a farmer that their seeds will germinate and evenly grow vigorously is partly a function of planting certified seed. Seed production and certification are highly relevant to a university in several ways: A university can offer courses and programs in seed production and certification to educate students on the principles and practices of producing high-quality seeds. Students can learn about the selection, breeding, production, and testing of seeds, as well as the regulations and standards that govern the certification of seeds. Seed production and certification can provide economic benefits to a university and its surrounding community. By providing seed certification services, a university can support local seed producers, help to create new seed businesses, and provide employment opportunities. Seed production and certification are highly relevant to a university because they provide opportunities for education, research, outreach, economic development, and environmental stewardship. In accordance with meeting the food demand in communities surrounding Babcock University, the Senate welcomes the development of the course seed production and certification (BU-CPS 502). This course will train agriculturists to acquire skill in seed production and certification.

## **Overview**

This course focuses on seed production and certification. It involves a combination of education, research, outreach, and service activities that support the development and promotion of high-quality certified seeds. The development of seed production plan using up to date models is also important. Regulations and standards governing seed certification are also succinctly highlighted in this course.

Students taking this course will be exposed to research opportunities in seed production and certification. This course will also enhance students' skill in the development of new varieties that adapt better to local growing conditions and resistant to pest and diseases. This knowledge is expected to facilitate ability of students in planning seed certification programmes and advocating production of certified seed to local and regional seed producers. The course will also broaden students' knowledge in promoting the use of certified seeds in farming activities as well as conducting periodic trainings and workshops on seed production and certification.

## **Objectives**

The objectives of this course are to:

1. Discuss principles and practices of seed production and certification.
2. Develop a seed production plan
3. Develop the knowledge and skills required to produce high-quality certified seeds.
4. Promote the use of certified seeds for sustainable agriculture practices.
5. Evaluate seed production systems

## **Learning Outcomes**

Upon completion of this course, the students should be able to:

1. Explain three (3) principles and practices of seed production and certification, including the genetic, physical, and physiological characteristics of seeds.
2. Evaluate four (4) seed production systems and select appropriate methods to produce high-quality seeds.
3. Discuss regulations and standards governing seed certification and apply them to ensure compliance.
4. Develop a seed production plan that meets the standards for certification and incorporates sustainable agriculture practices.
5. Perform seed quality testing to assess seed viability, germination, and purity.
6. Analyze the economic benefits of using certified seeds in agriculture and recommend appropriate strategies for seed distribution.
7. Develop a research project related to seed production and certification, apply the scientific method, and report the results.

## **Course Contents**

Concepts of seed production. Seed certification. Principles and practices of producing high-quality seeds. Breeding of quality seeds. Production and testing of seeds. Seed certification. Regulations governing seed certification. Standards that govern seed certification. Seed anatomy. Physiology of seed development. Seed propagation. Seed quality control. Economic benefits of using certified seeds in agriculture. Seed production systems. Seed production planning. Seed storage. Seed distribution. Seed viability and purity.

**BU-CPS 515 Contemporary Practices in Landscape Design (2 Units; Core; LH=30; PH=Nil)**  
**Senate-approved relevance**

Landscape design is a constantly evolving field and staying up-to-date with the latest trends and techniques is crucial for success. A course in Contemporary Practices in Landscape Design can help students learn about the latest technologies, materials, and design strategies that are shaping the industry today. Contemporary Practices in Landscape Design involve hands-on projects that allow students to apply the knowledge they have learned in a real-world setting. These projects can help students develop practical skills and build a portfolio of work that can be used to demonstrate their abilities to potential employers. Contemporary Practices in Landscape Design can be an excellent way to prepare for the field. The course can provide a solid foundation of knowledge and skills that can be built upon through additional education and experience. This course aligns with the Babcock University philosophy of education that encourages the training of the head, hand and heart as well as the promotion of aesthetic environment.

### **Overview**

This course focuses on contemporary practices in landscape design, which enable learners appreciate the role of sustainable designs. Sustainable design is becoming increasingly important in landscape design to protect the environment. The course will further help in appreciating the role of sustainable design and how it can be incorporated into sustainable agriculture and environmental management. This course will provide students with adequate knowledge of the contemporary practices in landscape design. It will also expose methods of setting out the planting in a proper landscape plan. Furthermore, the course will provide the step-by-step procedure in developing a landscape design.

### **Objectives**

The objectives of the course are to:

1. Explain the steps involved in landscape site clearing and shaping.
2. Highlight the principles of landscaping.
3. describe landscape materials
4. Discuss factors influencing the choices of materials.
5. Discuss the methods of setting out and planting in landscape plan.
6. Differentiate between the soft and hard components of the landscape
7. Explain the steps involved in developing a landscape design

### **Learning Outcomes**

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

1. Explain 3 principles of landscape design.
2. Identify 5 types of Landscape design
3. Develop a landscape design
4. Discuss at least 5 components of a landscape
5. Discuss 2 methods of draining and irrigating construction site.
6. Outline 4 factors influencing the choice of landscape materials

### **Course Contents**

Methods of site clearing. Site shaping prior to landscaping. Principles of selecting construction materials. Types of landscape material. Factors influencing choices of construction material. Advantages of construction material. Disadvantages of construction material. Costing of landscape material. Methods of draining construction site. Irrigating construction site. Methods of setting out and planting in landscaping. Methods of constructing land features. Landscape Design process. Materials in Landscape design. Equipment in Landscape design. Cost in landscape design. Practical skills in Landscape design.

## **SOS 503 Soil Irrigation and Soil Drainage (2 Units C: LH 15; PH 45)**

### **Learning Outcomes**

At the end of this course, students would have:

1. known, learnt, and understood both the definitions of Soil irrigation and soil Drainage;
2. known the different types of irrigation and drainage of agricultural Lands;
3. learnt the differences between arid lands and soils and semi-arid lands and soils; and
4. learnt and understood the need to improve capacity of practitioners to manage finite resources and increased agricultural productivity requires adequate land resources information, and best practices and approaches for best practices.

### **Course Contents**

Basic definitions of irrigation and irrigation terminologies. Basic principles of irrigation. Reasons for irrigating agricultural soils. Irrigation worldwide and in Africa. Basic soil-water-plant relations; water needs of plants. Irrigation water sources & quality of water for irrigation; irrigation water scheduling evapotranspiration measurement and predictions using different models. Types of irrigation systems; components, advantages, and disadvantages of various irrigation types. Special irrigation techniques. Methods of irrigation water application. Delivery and application of irrigation systems. Systems uniformities and irrigation efficiencies. Water harvesting & storage for irrigation. Fertigation and its application in tropical soils. Basic definitions of drainage systems. Soils that need drainage. Importance of draining waterlogged/submerged soils. Problems of draining waterlogged/submerged soils. Selecting drainage systems. Surface drainage systems. Subsurface drainage systems. Drainage coefficients and porosity; problems of subsurface drainage. Darcy's equation, rational formula for drainage design.

## **SOS 505: Fertilizers, Fertilizer Manufacture and Fertilizer Use (2 Units C: LH 15; PH 45)**

### **Learning Outcomes**

At the end of teaching of this course, the students would be able to:

1. explain that the world's best immediate hope for rapid increases in food, feed, fiber and even wildlife resources is the application and wise use of fertilizers, which can increase yields worldwide by at least 50%;
2. identify "alternatives and options" to the use of fertilizers (animal manures, sewage sludge, composts, etc.); and
3. discuss the 4R Nutrient Stewardship, namely, Right source, Right rate, Right time, and Right place does it!

### **Course Contents**

Fertilizers: Definitions of fertilizers; Purpose of fertilizer use. Fertilizer use: The situation in Nigeria (history and justification, economics of fertilizer use, and efficient use of fertilizers). Fertilizer elements (nitrogen as the keystone of protein; sulphur as essential for protein; phosphorus as key to life; and potassium as the catalyst; and micronutrient fertilizers for healthy plant growth). Use of individual mineral fertilizers, types of mineral fertilizers, use of organic fertilizers, types of organic manures, organic matter, organic manures of plant and animal origin, organic manures of natural solid minerals origin). Multi-nutrient fertilizers. Fertilizer manufacture, sources, handling, and storage of fertilizers. Fertilizer applications (right source, right method, right rate, right time and right place). Fertilizers, farming, and the environment: issues of sustainability of use and of environment integrity.

## **SOS 502: Soil Fertility Management and Plant Nutrition (2 Units C: LH 15, PH 45)**

### **Learning Outcomes**

At the end of the course, students will be able to:

1. define and describe the basic concepts; that even a highly fertile soil gets exhausted of its reserves nutrients as crops are grown and harvested continuously and needs replenishment. Linking of knowledge of soil fertility and soil fertility management to soil productivity, and ultimately to agricultural input and output Management, presents the key to sustainable agriculture and food security worldwide;
2. describe the natural resource endowment of soils in soil organic matter, which at the primary levels of training are referred to as humus; appreciate the role of soil organisms in the processes of organic matter formation and the changes in plant and animal remains due to activities of soil organisms; properties of soil organic matter and factors affecting the rate of organic matter decomposition;
3. describe organic matter of mineral soils and organic manures, The carbon cycle. The C/N ratio; compost and composting and other forms of organic source. Nutrients for plant growth. The pathway of nitrogen, phosphorus and sulphur, potassium, calcium and magnesium. Trace elements;
4. explain the prime importance of soil fertility restoration, improvement, and maintenance of the productive capacity of the soils, but also for a priori diagnosing soil clinical needs for overall productivity capacity of soil-plant relationship;
5. demonstrate the application of integrated soil fertility management to overcome problems of mismanagement of fertilizers (excessive application, inappropriate mixes of organic and inorganic fertilizer elements etc.);
6. discuss the plant-soil interface, as supplemental to their knowledge of soil fertility and soil management course and for their anticipated roles as crop-farm managers of the future; and
7. describe plant mineral nutrition aspects of plant physiology and the diagnostic techniques for plant nutrition which enables these graduates to advise farm owners at all levels, especially for early detection of mineral nutrient element deficiencies and indeed early incidences of toxicities and excessive accumulation.

### **Course Contents**

Concepts in soil fertility. Soil fertility versus soil productivity. Soil productivity and fertilizer use. Fertility of tropical soils and its management. Origin of soil organic matter. The soil organisms. Changes in plant and animal remains due to activities of soil organisms. Properties of soil organic matter. Factors affecting the rate of organic matter decomposition. Organic matter of mineral soils and organic manures. The carbon cycle. The C/N ratio; compost and composting and other forms of organic source. Nutrients for plant growth, The pathways of nitrogen, phosphorus and sulphur, potassium, calcium and magnesium. Trace elements. Wetland soil fertility and its management. Lime, liming materials and soil fertility management. Practical management of soil nitrogen, sulphur and soil fertility maintenance. Supply and availability of phosphorus and potassium. Micronutrient elements, Micronutrient needs and fertility management. Crop growth response to soil nutrients. Fate of nutrient elements in the soil (crop removal, leaching, erosion, volatilization, denitrification and fixation).Sustaining soil fertility. Principles of mineral nutrition of plants. Plant growth and root development in soils (photosynthesis and nutrient uptake by roots, water use and efficiency). Chlorophyll formation and chlorosis. Range of inorganic mineral elements in plants. Essential and non-essential

elements (major, secondary and trace elements) in crop nutrition. Importance of select-nutrients in plants. Root development and mode of action of the mineral nutrients (nutrient absorption, nutrient balance, maintenance, and loss of nutrients in soil fertility. Soil factors influencing nutrient availability. Plant nutrient status and diagnostic techniques for plant nutrition (visual symptoms of deficiencies, chemical analysis of plant parts or saps, plant tissue tests, measured plant response to added nutrients). Mineral nutrients deficiencies versus toxicities.

### **CPS 599/SOS 599/ HLM 599 – Final Year Project (4 Units; C PH 360)**

Each student is expected to choose and execute a special project under a supervisor. Duration of the project is 2 semesters.

### **HLM 502: Vegetable Crops Production (Olericulture) (2 Unit C LH 15; PH 45)**

#### **Learning Outcomes**

The course will equip the students with entrepreneurial skills in vegetable production through learning of:

1. the scope of the olericulture industry, and the benefits that this industry provides;
2. grouping of vegetable crops for food and economic gains; and
3. the influence of the environment on the growth of vegetable crops.

#### **Course Contents**

Concept of vegetable crops production. Economic importance of vegetable crops. Major types of vegetable crops - indigenous, exotic, and wild vegetables. Principles and practice of vegetable crops production. Factors (climatic and soil requirements) influencing site selection, establishment,

production, and management. Ecological distribution of vegetables and fruits in Nigeria.

#### **Methods**

of propagation. Nursery system and factors affecting it. Varieties and adaptation of exotic vegetables and fruits to the Nigerian environment. Production practices, diseases and pests, harvesting, handling, processing, storage, and marketing opportunities

### **BU-SOS 501 (502) Soil Microbiology (1 Unit; Core; LH=15; PH=Nil)**

#### **Senate-approved relevance**

Microorganisms of different classes inhabit the soil and play crucial roles of facilitating the improvement of soil fertility and enhance sustainable crop production. This course emphasizes the various ways of improving the beneficial microbial population and their mutual association with plants. This will enhance the nutrient and health status of the soil for efficient crop production. The agricultural and environmental impact of this course made BU senate identify it as relevant. The institutional mission of quality food production and conservation of the environment made this course important.

#### **Overview**

This course highlights the classification of microorganism, explores microbial activities and their implications on soil health and fertility. It will demonstrate in detail the process of biological nitrogen fixation. It will also espouse on how the low mobility of phosphorus ion in soil can be fixed through acidic cations of the tropical soil. These soil microbial processes guarantee soil health and productivity. This course will enable student classify soil microorganism. Students taking this course will be exposed to adequate knowledge of the impact of some peculiar

microorganisms on soil health. Students will also be taught how to estimate microbial population and classify the ecological interrelationships among soil microbes.

### **Objectives**

The objectives of this course are to:

1. Describe the methods of Classification of microorganism.
2. Classify Organic substrate and Inorganic substrate.
3. Identify requirement for molecular oxygen (Aerobes).
4. Describe the similarities and differences in Zymogenous and autochthonous organisms.
5. Describe the Roles of soil organisms on organic matter recycling and mineralization and Biological N<sub>2</sub> fixation, detoxification of pollutants
6. Describe the ecological interrelationships
7. Discuss methods of estimation of microbial population using nutrient Agar.
8. Outline laboratory practical methods to culturing of flora population on various artificial media –for bacteria – nutrient Agar, mannitol yeast extract Agar and for fungi potatoes dextrose Agar

### **Learning Outcomes**

On completion of the course, the students should be able to

1. List 3 different methods of Classification of microorganism.
2. Classify Organic substrate and Inorganic substrate.
3. State 3 requirements for molecular oxygen aerobes.
4. Differentiate the similarities and differences in Zymogenous and autochthonous organisms.
5. Describe at least 5 roles of soil microorganisms on organic matter recycling and mineralization as well as in Biological N<sub>2</sub> fixation, detoxification of pollutants.
6. Describe at least 5 ecological interrelationships.
7. Describe 2 methods of estimation of microbial population
8. Outline 2 laboratory practical methods to culturing of flora population on various artificial media –for bacteria – nutrient Agar, mannitol yeast extract Agar and for fungi potatoes dextrose Agar

### **Course Contents**

Classification of microorganism. Organic substrate. Organic matter heterotrophs. Inorganic substrate. Autotrophs requirement for molecular oxygen (Aerobes). Anaerobes. Poor drainage and facultative organism activities. Zymogenous organism. autochthonous organisms. Soil organisms and organic matter recycling. Mineralization. Biological N<sub>2</sub> fixation. Detoxification of pollutants. Methods of estimation of microbial population. Culturing of flora population. Ecological interrelationships. Symbiosis. Predation. Nematode predating rhizobia.

### **Minimum Academic Standards**

#### **Laboratory Requirements**

##### **Agricultural Economics/ Agricultural Extension Option**

For agricultural economics training, the socioeconomic laboratory is a compulsory facility. The components of the laboratory for a class of 50 students are as follows:

1. Air conditioned computer laboratory with 55 computer tables and chairs;
2. 55units of computer systems;
3. 1 server unit
4. 5 printers
5. 1 unit of scanner

6. Broadband internet connection
7. Licensed copies of SPSS, STATA, e-view, R statistical packages
8. 2 units of projector
9. 2 units of projector screen
10. 2 units of white board
11. 60 sit capacity seminar room (60 Chair with arm rest)
12. Lecture delivery podium

### **Agricultural Extension Studio**

1. Well-equipped computer laboratory with adequate desk top computers for students, including relevant computer software in each degree programme;
2. High speed Internet facilities for both staff and students;
3. A PC for each academic staff in his / her office with Internet facilities;
4. Multimedia Recording Devices (at least 2);
5. A Video recorder;
6. A video player;
7. A wide screen Television;
8. Overhead power-point, multi-media facilities;
9. Vehicle for field trips; and
10. Studio space

### **Animal Science Option**

#### **Laboratory Equipment**

1. Photometers
2. Amino Acid Analyzer
3. Atomic Absorption Spectrophotometers
4. 50 Desktop Computers for teaching purposes
5. Incubator/Hatcher
6. Audio-Visual Aids
7. Centrifuges
8. Colorimeters
9. Spectrometers
10. Bench-top Incubators
11. Transfer chamber
12. Farm equipment (See Livestock Teaching & Research Farm)
13. 5 - 10 Microscopes (for large classes)
14. Weighing Balances as appropriate for the Department
15. Non-refrigerated Centrifuge (table-top) for 15 and 50ml conical
16. Refrigerated Centrifuge (table-top) for 15 and 50ml conicals
17. Moisture Meters
18. Water bath
19. Refrigerators
20. Ovens
21. Autoclave
22. Distillation Unit

23. Gas Chamber
24. Digestion Unit
25. Extraction Unit
26. Ashing Equipment (Furnace)
27. pH meters
28. Electronic calculator
29. Flame photometer
30. Deep freezers

### **Other equipment**

#### **Vehicles in a pool for the Department**

1. Two (no) Lorries
2. Two (no) 4-wheel drive vans
3. Two (no) 50-seater buses
4. Two (no) station wagons
5. Two (no) tractors with complete accessories
6. One saloon car

### **Workshop**

Workshop for training students in the maintenance of farm machine, equipment parts and other Engineering practicals must be provided on the University's Teaching/Research Farm in adequate numbers, based on the user space areas of about 15m<sup>2</sup>/FTE Student to accommodate machinery, equipment, and students.

### **Silos**

Medium-sized silos are required not only to store grains produced from the Teaching/Research Farm but also to train students on the preservation of farm produce. The number of silos will depend on the level of operations in the farm.

### **Culture Rooms**

Culture rooms would be needed for pathological work.

### **Teaching and Research Farm**

A Teaching and Research Farm is mandatory for the practical acquisition of skills and knowledge by students, for staff research and solving practical problems. The Farm which should have the following units; (i) Poultry and other avian species such as ducks, Turkeys, Guinea fowl, quail, etc., (ii) Beef Cattle (iii) Dairy Cattle (iv) Pigs (v) Micro Livestock (Snails, Grass cutters) (vi) Small Ruminants (Sheep & Goats) (vii) Fishery (viii) Feed mills (ix) Draught power (Donkeys and Camels) should have the following facilities:

### **Pasture and Range Science**

1. Pasture type Museum (2 hectares with a minimum of at least 10 different pastures).
2. Minimum of 50 hectares of pasture land.
3. Farm workshop.
4. On-Farm Processing and Storage Facilities.

5. Green house.
6. Screen house.
7. Sprayers.
8. Girth/Diameter Tapes.
9. Ranging Poles.
10. Dumpy Levels.
11. 2 – 3 Hectares of land mapped out for Soil Exercises.
12. 5 Augers.
13. 3 Munsel Colour Charts Kits.
14. 5 Soil Test Kits.
15. 2 Gunters Chains.
16. 1 Soil Map & Land Use Capability & Suitability Map.
17. G.I.S facilities.
18. Soil Analyzing Laboratory.
19. Ranging Poles.
20. Weather Station.
21. Theodolites.
22. Compasses.
23. Tractors.
24. Trailers.
25. Ploughs.
26. Harrows.
27. Ridgers.
28. Bailers.
29. Sprayers.
30. Processing Equipment (Chopping and Cutting Machine for crop residues).
31. Irrigation Facilities

### **Animals**

1. 2000 birds.
2. 10-sow unit.
3. 2 boars.
4. 50 cattle - 40 cows and 10 bulls.
5. 100 each of sheep and goats.
6. 500 rabbits

### **Livestock equipment**

1. Metabolism cages (12).
2. Poultry cages.
3. Post-Mortem Kit.
4. Electric Beakers (4).
5. Weigh bridge (cattle).
6. Weigh bridge (pig).
7. Dip.
8. Drenching guns (4).
9. Motorized Sprayer.

10. Baler.
11. Quarantine.
12. Rabbit cages for 500 rabbits.
13. Holding Pens (Cattle, Sheep, Goat).
14. Basic Husbandry Equipment (Hoof Trimmer, castrator, Tagging machine, Dehorner, etc.)
15. Poultry processing equipment (Bleeding Cone, Scalding drum, Feather plucker, Hangers on wheel, Wash basins on wheel. Evisceration table, Meat cutting table, Bone saw, Vacuum packing machine, etc)
16. Ambulatory Box/First Aid Box

- **A Hatchery Complex.**
- **Cold Room**
- **Slaughter Slab**

### **Laboratories**

To achieve the minimum academic standard statements for the Animal Science programme, there should be:

A minimum number of identifiable laboratories for each option in the Animal Science programme which should be in accordance with the NUC recommended space requirements and, in addition, be reasonably equipped. These laboratories include:

1. Nutrition and Biochemistry.
2. Animal genetics, breeding and biotechnology.
3. Animal reproductive physiology and Artificial Insemination.
4. Animal physiology and anatomy.
5. Livestock information technology.
6. Forage and Pasture science, Development and Management.
7. Bioclimatology.
8. Animal products.

At least one large and reasonably-equipped central laboratory for major teaching and research equipment.

Laboratory facilities and practical equipment required

1. Photometers
2. Amino Acid analyzer
3. Atomic absorption spectrophotometer
4. 20 desktop computers for teaching purposes
5. Electron microscope
6. Audio visual aids
7. Non-refrigerated centrifuges (tabletop) for 15 and 50 ml Conicals
8. Refrigerated Centrifuges (tabletop) for 15 and 50 ml Conicals
9. Colorimeters
10. Spectrometers
11. Bench-top incubators
12. Transfer chamber
13. Lamina flow chamber

14. Gas chromatography coupled with mass spectrometer (GCMS)
15. Gas chromatography coupled with electroantennogram
16. Leaf area meter
17. Plant samples grinding machine (with stainless metal)
18. Microscopes (for large classes)
19. Weighing balances as appropriate for the department
20. Moisture meters
21. Water baths
22. Deep freezers
23. Refrigerators
24. Desk top computers
25. pH-meter w/articulated arm
26. Fume cupboard
27. Test tube shaker
28. Light meter
29. Large pasture land for grazing and confinement of teaching and research livestock.
30. Large livestock barn for animal handling (with holding pens - for isolation of sick animals and/or calving/birthing).
31. Large life-animal (walk-in) weighing scale
32. Chute
33. Medium scales for weighing goats, sheep, and swine

#### **Crop Science/ Soil Science Option**

1. Ovens dryers
2. Autoclaves
3. Distillation units
4. Gas chamber
5. Digestion units
6. Extraction units
7. Ashing equipment (Furnace)
8. pH meters
9. Flame photometers

#### **The following are considered very mandatory for the Crop Science Programme**

1. Teaching and research farm;
2. Crop type museum (2 hectares with a minimum of at least 10 different crop types);
3. Minimum of 10 hectares of cropping land;
4. Farm workshop;
5. On-farm produce processing and storage facilities;
6. Green and Screen Houses;
7. Irrigation facilities; and
8. Silos - required to store grains produced from the teaching/research farm and for training students on the preservation of farm produce.

### **Minimum Standards for Equipment**

1	pH meter (Table Top)
2	Centrifuge
3	Colony counter
4	Digesting unit
5	Auto burette
6	Auto pipette
7	Water bath incubator
8	Sieve Shaker
9	GISphy units
10	Water distillers
11	Magnet stirrers
12	Soil augers
13	Infiltrometer

### **Staffing**

#### **Academic staff**

The NUC guidelines on staff/students ratio of 1:15 for Departments in Agriculture discipline shall

apply. However, there should be a minimum of six full-time equivalent of Staff in the Department.

There is need to have a reasonable number of Staff with doctoral degrees as well as sufficient industrial/practical experience with a minimum load of 18 units per semester for students and a minimum of six full-time equivalent of staff in each programme. Staff should have a maximum of

15 contact hours per week for lectures, tutorials, practicals and supervision of projects.

In the Department, the academic staff number should be as per the National Universities Commission guidelines. The academic staff pyramid should be composed as follows:

1. Professor/Reader - 20%
2. Senior Lecturer - 35%
3. Lecturer 1 and below - 45%

#### **Technical support personnel**

The services of technical support staff, which are indispensable in the proper running of laboratories and workshops/studios, are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Adequate number of support staff should be available as

1. Administrative Officers
2. Secretaries
3. Laboratory Technologists
4. Workshop and Studio Technicians
5. Farm Officers
6. Farm Technicians

7. Produce Processors

8. Farm Equipment Maintenance Technicians

### **Library**

There must be adequate library facilities to cater for the needs of staff and students in all the programmes in the college/faculty. These include current journals, handbooks, textbooks, manuals, codes of practice, standards and specifications etc. in sufficient numbers. Most importantly, there shall be provision for ICT-based access to electronic resources and the information super highway.

### **Classrooms, Laboratories, Workshops and Offices**

The NUC recommends the following physical space requirements:

Professor's Office	- 18.5 m <sup>2</sup>
Head of department's office	- 18.5 m <sup>2</sup>
Tutorial teaching staff's office	- 13.5 m <sup>2</sup>
Other teaching staff space	- 7.00 m <sup>2</sup>
Technical staff space	- 7.00 m <sup>2</sup>
Secretarial staff space	- 7.00 m <sup>2</sup>
Academic staff research laboratory	- 16.50 m <sup>2</sup>
Seminar space/per student	- 1.85 m <sup>2</sup>
Laboratory space	- 7.50 m <sup>2</sup>