LIST OF PROGRAMME-SPECIFIC COURSES AND UNITS FOR M.AgSE

M.AgSE

Programme is designed to provide the postgraduate students ability to manage Agro - industrial enterprises sustainably. Courses taken must be passed at 50% or higher grade before graduation.

The courses are as follow:

First Semester Year 1

Course Code	Title	Unit	Status of the course
APL 801	Biostatistics	3	C
APL 803	Poultry Farming Systems and Sustainable Environment	2	C
APL 805	Environmental Physiology of farm Animals	2	C
APL 809	Sheep and Goat Production Enterprise	2	C
APL 815	Livestock Science Research Techniques	2	C
ACE801	Climate Change and Agriculture	3	C
GES801	Short English Language Course	2	C
	OR		
GES803	Short French Language Course	2	C
	Elective	2	E
	TOTAL	**18**	
	Elective Courses		
APL 807	Quantitative Genetics	2	E
APL 811	Animal Behavior and Welfare Dynamics	2	E
APL 813	Nutrigenomics	2	E

Second Semester Year 1

Course Code	Title	Unit	Status of the course
APL 802	Tropical Livestock Feed Resources and Commercial Feed Milling	3	C
APL 804	Ruminant Livestock Production Systems and Environmental Sustainability	2	C
APL 806	Animal Biotechnology	2	C
APL 810	Sustainable Integrated Livestock Farming Systems	2	C
ACE 802	Information Systems and Agricultural Knowledge Management	3	C
ACE 804	International Trade and Commercial Policy	3	C
	Elective	2	E
	TOTAL	19	
	Elective Courses		
APL 808	Poultry Nutrition and Organic Animal Agriculture	2	E

First Semester Year 2

Course Code	Title	Unit	Status of the course
APL 893	Internship I	2	C
APL 895	Seminar I	1	C
	TOTAL	3	

Second Semester Year 2

Course Code	Title	Unit	Status of the course
APL 894	Internship II	2	C
APL 896	Seminar II	1	
APL 899	Dissertations	6	C
	TOTAL	9	

ACE 893, ACE 894, ACE 895, ACE 896) will be defended before CEADESE Board and students at the Centre, while the final dissertation (ACE 899) shall be defended before a Board of External and Internal Examiners in the Postgraduate School.

All M.AgSE students are encouraged to follow the following schematic guide in the presentation of the various seminars and Dissertation defense.
First Semester of Year 1: Submission of Research Concept Note. This should be done within 6 weeks of resumption to enable the Programme Leader appoint appropriate supervisory committee for the student.

Second Semester of Year 1: Presentation of Proposal Seminar. Dissertation proposal should ideally be prepared by the students and should present Background Information or Justification for the study Research Objectives in Chapter 1. A comprehensive Review of Literature should be in Chapter 2, while Chapter 3 should present the detailed methodology. Generally all student must proceed on internships after the year one for problem identification, forming the core of the research proposal.

First Semester of Year 2: Discussion on outcome of what the student finds out will form the core of internship II and Presentation of the Post-data Seminar will follow afterwards. Thereafter in the Second Semester of Year 2: Dissertation Defense at the postgraduate school.

PhD. AgSE

First Semester

Course Code	Title	Unit	Status of the course
APL 901	Advances in Research Methodology	3	C
APL 905	Adances in Cabohydrates and Lipids Metabolism	3	C
ACE 801	Climate Change and Agriculture	3	C
GES 801	Short English Language Course	1	C
	OR		
GES 803	Short French Language Course	1	C
	Elective	2	
	TOTAL	**12**	
	Special Elective Course		
APL 903	Advances in Biotechnology Techniques	2	E
APL 907	Vitamin and Minerals Nutrition and Metabolism in Livestock	2	E
APL 909	Issues in Feed Safety and Quality control	2	E

Note: Centre Core Courses (ACE 801 GES 801/GES 803) are compulsory for non ACE students in the first semester

Second Semester

Course	Title	Unit	Status of the course
APL 902	Metabolism of Protein and Nucleic Acid in Livestock Science	3	C
APL 904	Livestock Science and Sustainability	2	C
APL 906	Research and Academic Integrity	2	C
ACE 802	Information System and Agricultural Knowledge Management	3	C
ACE 804	International Trade and Commercial Policy	3	C
	Elective	2	C
	TOTAL	**15**	
	Special Elective Course		
APL 908	Molecular Nutrition	2	E
*APL 910	Topical Research Problems	2	E
APL 912	Stock improvement	2	E

Note: Centre Core Courses (ACE 802, ACE 804) are compulsory for non ACE students
* would be taken under each PhD student's major supervisor with focus on the candidate's desired specialty area

PhD AgSE Year II and III First semester

ACE 993	Internship I	2	
ACE 995	Seminar I	1	
	Total	**3**	

PhD AgSE Year II and III Second Semester

APL 994	Internship II	2	
APL 996	Seminar II	1	
APL 999	Thesis	10	
	Total	**13**	

All PhD.AgSE students are encouraged to follow the following schematic guide in the presentation of the various seminars and Thesis defense.
First Semester of Year 1: Submission of Research Concept Note. This should be done within 6 weeks of resumption to enable the Programme Leader appoint appropriate supervisory committee for the student

Second Semester of Year 1: **Second Semester of Year 1:** Presentation of Proposal Seminar. Dissertation proposal should ideally be prepared by the students and should present Background Information or Justification for the study Research Objectives in Chapter 1. A comprehensive Review of Literature should be in Chapter 2, while Chapter 3 should present the detailed methodology. Generally all student must proceed on internships after the year one for problem identification, forming the core of the research proposal.

First Semester of Year 2: Second Semester of Year 1: Presentation of Proposal Seminar. Dissertation proposal should ideally be prepared by the students and should present Background Information or Justification for the study Research Objectives in Chapter 1. A comprehensive Review of Literature should be in Chapter 2, while Chapter 3 should present the detailed methodology. Generally all student must proceed on internships after the year one for problem identification, forming the core of the research proposal.

Second Semester of Year 2: Data collection, analysis, report writing and presentation of progress report

First Semester of Year 3: Presentation of the Post-Data Seminar.
Second Semester of Year 3: Thesis Defense

Students can take more electives to gain knowledge and experience in their areas of interest

Total Option Units = 43 Units

For Non –FUNAAB Graduates: Courses to be audited will be determined by the Programme Leader based on transcript provided. Also, candidates from Anglophone Countries are to offer GES 801 (French Language) and those from Francophone Countries are to offer GES 803 (English Language).

Total Units for PhD. AgSE = 43 Units minimum in addition to the Centre's Courses

SYNOPSIS OF COURSES

APL 801 Biostatistics 3 (2-1 Units)

Planning of experiments. Ways of increasing accuracy of experiments. Regression and correlation. Mixed models, completely randomized designs, randomized complete block, Latin squares, factorial experiments, confounding variables, split plots designs. Lattice designs, lattice squares, missing data, and analysis of results of a series of experiments. Analysis of data arising from animal production/breeding. Use of package programmes for analysis of data arising from animal experimentation.

APL 802 Tropical Livestock Feed Resource and Commercial Feed Milling 3 (2-1 Units)

Conventional, alternative and new feed resources. Tropical feedstuffs type, availability and extent of utilization, feed microscopy, and feedstuff standardisation and quality assessment. Feedmill operation and design. General aspects of livestock feed formulation for various classes of livestock. Computer in feed formulation and least cost diets. Recycling of waste and their nutritional potentials.

Seminars: Two topics per student

Practicals: Feedmill operations.

- Common types of potentially problematic ingredients
- Livestock Feed Formulation
- Poultry Feed Compounding
- Identification and use of agro-industrial by-products

APL 803 Poultry Farming Systems and Sustainable Environment 2 (2-0 Units)

This course aimed at different poultry production systems and the attendant effects of climate change on the efficiency of production. Students are expected to understand the problems of and opportunities available in systems of poultry production as well coordinate livestock issues with other agricultural disciplines. Students will therefore have a practical knowledge and appreciation of the contribution of poultry production systems to the agricultural industry worldwide.

Past and present scenario of poultry industry

1. Domestication of poultry

Genetic classification of chickens and other species of poultry- layers, broilers,[day old chicks, breeder egg, broilers] and other class of poultry- Hybrids available[turkey]

2. Terms used in poultry farming
3. Growth of poultry industry in Nigeria
   Poultry population and other poultry related statistics, per capita meat and egg availability
4. Poultry systems: small and large scale
5. Systems of rearing: free-range, free-to-range, semi-intensive, intensive rearing (deep litter, cage and slate floors), etc.
6. Nutrition and management of poultry species in the different rearing systems
7. Introduction to rearing of Turkeys, Ducks, Japanese Quails, Guinea fowls and Geese for meat production
8. Poultry integration, Contract farming and linkages
9. Scavenge-able Feed Resource Base

Poultry Housing

1. Layout
2. Orientation
3. Water source
4. Different house designs
5. Roof and roof material
   Selection of poultry farm site and ideal location
6. Future expansion facility- electricity – farm equipment – clearing methods
7. Housing and different growing programs; All in and all out systems, batch system etc.

Environment

Macro Environment

1. Poultry house temperature
2. Humidity, cross ventilation, radiation, ammonia concentration, air flow, environmentally controlled house

Micro Environment

1. Heat and moisture production from poultry house, cooling/ heating of poultry houses- movement of air, system of ventilation, lighting management, critical temperature
2. Seasonal management

Climate Change

1. Observed climate change
2. Complex interactions of temperature and precipitation
3. Impact of climate change on poultry production and food safety
4. Adaptation and best management practices

PRACTICALS

Basic training and experience in hatching operation: setters, hatchers, egg grading, branding, processing of egg to egg powder

APL 804 Ruminant Livestock Production Systems and Environmental Sustainability 2 (2-0 Units)

1. Land and livestock resources
2. Characteristics of ruminant production systems
3. Classification of ruminant production systems

a. Traditional ruminant production systems

i. Pastoral and agro-pastoral systems

ii. Mixed system in the semi-arid, sub-humid and humid zones

b. Non-traditional production systems

i. Ranching systems

ii. Smallholder beef and dairy systems

iii. Production parameters of ruminant in non-traditional systems- Beef and Dairy systems

iv. Feed resources in ruminant production systems

4. Ruminant production and climate change
   Future impacts of climate change on the ruminant livestock industry
5. Greenhouse gas emissions and their role in ruminant production systems
   Key features of livestock farming that relate to greenhouse gas emissions
   Dairy, Beef, Goats and Sheep sectors
6. Research measures to reduce net greenhouse gas emissions and the potential for further adoption by the industry
   Measures for reduction of greenhouse gas emissions, removals and measures that avoid or displace greenhouse gas emissions
   Carbon sensitive farming
7. Organic ruminant production and climate change
   Management-related differences in greenhouse gas emissions and differences in relation to farming system, such as organic versus conventional farming
8. Definitions of farming systems. Roles of legumes in crop-livestock systems. Integration of pastures in plantation and annual crops intensive feed garden fodder bank. Enhancing dry season feeding in farming systems. Fast growing nitrogen fixing trees and browse plants. Pastures and animal production systems.

APL 805 Environmental Physiology of Farm Animals 2(2-0 Units)

Climate and livestock production. Influence of climatic factors on animal productivity. Acclimatization and adaptation. Physiological basis of adaptation, heat stress, physiological responses to heat stress; determination of heat stress index; modification of the microclimate to enhance animal productivity; management of exotic breeds in tropical environment.

Seminar: Four topics per student.

Practicals:

- Factors of the environment that affect animal production processes and a description of the regulator mechanisms within the animals. Methods of monitoring these processes and practical methods of alleviating environmental stress in commercial farm animals.

APL 806 Animal Biotechnology 2 (2 -0 Units)

Animal cell and tissue culture, maturation of oocytes, *in vitro* oocytes fusion, cloning, species hybridization, inter-species embryo transfer and artificial insemination, DNA sequences, blood group analysis and genetic polymorphism, electrophoretic techniques, genes and genetic markers. Linkage mapping by recombination. Mapping and map distances, chi-square test, mitotic segregation and recombination, analysis of single meiosis, sex chromosomes and sex linkages. Extensive practical sessions on relevant sections to be carried out.

Practicals:

Artificial Insemination: Semen collection using AV, analysis, dilution, and preservation procedures [cryopreservation]. Insemination techniques in farm animals and poultry.

APL 898 Internships Reports 2 (2 -0 Units)

APL 899 Research Projects Seminars and Dissertations (6 Units)

<u>Electives</u>

APL 807 Quantitative Genetics 2 (2 Units)

Genetics and phenotype variations. Genetic basis of qualitative traits, heritability and repeatability, correlation among traits. Selection in long and short term. Cross breeding and selection for crossing ability. Inbreeding depression and heterosis, genetic conservation.

APL 808 Poultry Nutrition and Organic Animal Agriculture 2 (2-0 Units)

Feed resources and nutrient quality of ingredients for poultry feeding standards/NRC requirement vs requirements in tropics for all classes of and/specie of poultry. Methods for metabolic studies and determination of protein utilization and quality of proteins utilized by poultry. Importance of vitamins and minerals for poultry and associated deficiency symptoms.

- Definitions and general principles of Organic Livestock Nutrition
- Nutritional management standards in organic farm
- General principles of conversion from conventional to organic livestock nutrition
- Prospects and challenges of organic livestock nutrition
- Nutrition: feeding standards and characteristics of feed resources for organic farm animal
- Organic feed formulation and compounding, feed preservation and storage

- Housing: housing standards and materials, adaptation and ecosystem, perimeter fencing and predator control
- Organic livestock nutrition system and health management
- Manure and waste management composting, ensilage
- Management of mitigating environmental greenhouse gases in organic farming systems

Practicals:
Rendering of organic manure production from litters

APL 809 **Sheep and Goat Production Enterprises 2 (2-0 units)**

Some considerations in raising sheep and goats. Breeds of sheep and goats. Production records. Determining the age of sheep and goats. Housing and equipment, fences, plans etc. sheep and goat feeding. Functions of vitamins and minerals. Feeding the dry and lactating ewe/doe. Management practices. Managing the kids/lambs, doe/ewe, tethering, dehorning, hoof trimming, castration. Identification practices. Goat/sheep disease: internal parasites, brucellosis, mastitis, foot rot, mange, bloat, poisonous plants etc.
Feeding habits of small ruminants. Conventional and non-conventional feed resources for sheep and goats. Feed conservation and improvement techniques. Nutrient requirements of sheep and goats for various productive purposes. Feed production for small-holder small ruminant feeding in crop-livestock integrations. Recent advances in sheep and goat nutrition.

APL 810 **Sustainable Integrated Livestock Farming Systems 2(2-0 Units)**

What is Sustainable Agriculture / Farming system?
Concept and themes of sustainable Agriculture:
Farming and Natural Resources; water, energy, air and soil
Plant Production Practices; selection of site, species and variety, diversity, soil management, Efficient use of inputs, concerns about practitioners' goals and choices.
Animal Production Practices; Management planning, animal selection, animal nutrition, reproduction livability of animals, pasture? Paddock, confinement of animals.
Economic, social and political considerations; food and agric policy, land use, consumers and food value chain.
Integrated farming/Integrated biosystems
Perspectives
Case studies of integrated farming systems

Practicals:
Students to be part of a model sustainable integrated livestock farming system for at least 2 weeks, then write a report of their observations criticisms and lessons learnt

APL 811 Animal Behaviour and Welfare dynamics in a Changing Climate 2 (2-0 Units)

Animal welfare is an integral part of livestock production which is often underestimated especially in a developing economy like Africa which is experiencing a continuous changing climate like the rest of the globe. Animal ethics including the rules and regulations guiding the production of animals in Nigeria and Europe should be taught. This course will deal with issues bothering down on impact of changing climate on the behaviour and welfare of different species of animals in their ecological niche.

Animal law/Ethics

- Comparing rules and regulations guiding the production and handling of animals in Nigeria (Africa) and Europe

Global warming

- Climate change
- Sustainability and probable effect on production of animals

Seasonal changes and effect on the welfare of animals viz a viz the:

- Physical response of different species of animals
- Behavioural response of the animals
- Physiological response of different species of animals
- Nutritional adaptation of animals
- Reproductive capacity of different species of animals
- Hormonal balance

Controlling the environment, insulation and ventilation:

- Energy exchange with the environment
- Thermo-neutral zone
- Air flow
- Air distribution
- Diffused Systems

Freedom: Behaviour of Animals

- What is normal behaviour?
- Do animals have behavioural needs?
- How can behavioural needs be assessed?
- What is environmental enrichment?
- How can it be supplied?
- Does it always improve an animal's welfare?

APL 813: Nutrigenomics 2 (1-1 Units)

Basic understanding of the digestion, absorption and metabolism of nutrients. Responses to nutrients at a molecular level. From molecular nutrition to prevention of disease. Metabolism and hepatic metabolomic profiling Gene expression of nutrient transporters. Nutrition Models in Livestock Science

APL 815: Livestock Science Research Techniques 2 (1-1 Units)

Theories underpinning research methods. Techniques to investigate research questions in the animal sciences. Engagement with literature in their area of interest and develop a suitable methodology for their research. Developing a robust safety and ethical analysis of project and Complying with appropriate guidelines. Data collection procedures and statistical analysis methods and their applications to own research. Development of a practical research project from a range of options. (Students will be allocated a research supervisor with expertise in that subject who will provide supervisory support for the research). Report Writing and scientific poster design skills and seminar presentation

APL 901: Advances in Research Methodology for Livestock Science 2 (2-0)

Basic concepts of research, Planning and organization of experiments for data acquisition and analysis. Type of research methods, experimental designs, equipment and principles underlying their uses. Scientific periodicals and literature related to the subject. Form and style of writing research papers, review articles, research reports and thesis. Selection of research problem and preparation and submission of research projects. Interpretation and evaluation of research data, considerations and requirements for setting up a research laboratory.

APL 902: Metabolism of Protein and Nucleic Acid in Livestock 3 (2-1 units)

Metabolism of protein and nucleic acids, Amino acid precurssors and functions of nucleic acids in protein structure. Recent trends in protein and nucleic acid research. Special techniques for protein and nucleic acid determination and identification.

APL 903: Advances in Biotechnology Techniques 2 (1-1 units)

Advance structure of Animal cell, tissue culture practice and techniques. Maturation of oocytes, oocytes fusion (in vitro), cloning genetic engineering, embryo transfer (intra and inter specie), DNA sequences, polymophism in genes, blood groups dynamics, Gene description, genetic markers. Linkage, mapping and mapping distances. Single cell meiosis, sex chromosomes and sex likages

APL 904: Livestock Science and Sustainability 2 (1-1 units)

Introduction – sustainability and decision making

The three aspects of sustainability (environmental, social, economic). The importance of studying how the three aspects of sustainability are related and impact each other. Decision case studies and the importance of stakeholder roles. Decision making in complex situations, when different aspects of sustainability should be considered

Environmental sustainability: Animal husbandry and interactions with the environment and impacts on the atmospheric, aquatic and terrestrial environment. Technological opportunities for minimizing negative environmental impacts of animal activities. Natural resource and nutrient flows perspectives of international trade with fodder, animal derived food, live animals and other products related to the animal sector. Methods for assessing environmental impacts and sustainability of different animal production systems or uses, with a main focus on Life Cycle Assessment (LCA).

Social sustainability: Social sustainability in a historical perspective and the relation between animal related activities and social sustainability, Mapping: Determining contextually relevant dimensions of social sustainability such as material wellbeing, health, animal welfare, cultural vitality etc., Operationalization: Determination of the level of social sustainability of a given activity at farm, regional or national level, using relevant indicators.

Economic sustainability: Definitions of economic sustainability. The concepts of weak and strong sustainability. Differences between sustainability and economic optimization at farm versus societal levels. Measures to increase sustainability (regulatory and market-based). Economic methods to assess sustainability (marginal trade-off, profit maximization, non-market valuation, cost-benefit)

APL 905: Adances in Cabohydrates and Lipids Metabolism 3 (2-1 units)
Metabolism of carbohydrates as it relates to various livestock sepcies. Recent trends in carbohydrate and lipid research. Special techniques for metabolic study relating to cabohydrates and lipids. Control mechanism of CHO and lipid metabolism.

APL 906: Research and Academic Integrity 2 (2-0 units)
Common terminologies, Outlines of Academic Integrity, ethics infrastructure, code of conduct, code of ethics, Important issues in plagiarism Academic integrity committee, Research ethics committee, data Management. Guideline about Science Research. Guideline about academic writing and publishing. Guideline about academic integrity breaches.

APL 907: Vitamin and Minerals Nutrition and Metabolism in Livestock 3 (2-1 units)
Classification and chemistry of vitamins and minerals. Structural, biochemical and other functions of vitamins and minerals in metabolism and physiology of farm animals. Elucidation of practical defficiency symptoms of vitamns and minerals in farm animals. Interelationships between vitamins and minerals

APL 908: Molecular Nutrition 2 (2-0 units)
Methods in Molecular Nutrition Research, Perspectives in postgenomic nutrition research, Cellular Nutrient Homeostasis, Proliferation, and Apoptosis, Roles for Nutrients in Signal Transduction, Gene Expression, and Proteolysis, Glucose regulation of gene expression in mammals, Amino acid-dependent control of transcription in mammalian cells, Fatty acids and gene expression, Roles of RARs and RXRs in mediating the molecular mechanism of action of vitamin A, Regulation of gene expression by biotin, vitamin B6 and vitamin C, Selenium and vitamin E

APL 909: Current issues in Feed Safety 2 (2-0 units)
Current status of knowledge on the impact of animal feed on food safety and on international trade of feed and food. Safety assessment and detection of hazards in animal feed and feed ingredients related to public health. Prevention and control of risks in animal feed associated with public health. Identification of relevant areas for further work on animal feed in relation to food safety.

APL 910: Topical Research Problems in Livestock Science 2 (2-0 units)
Special study in an identified area of animal science not treated in other courses. Recent advances and new research techniques will be discussed. This should be arranged with individual staff members prior to registration. Requires programme leader approval. Supervised individual research projects. Written reports required. The course will usually be taken in specific area of need so identified as weak area of the student.

APL 911: Stock improvement 2 (1-1 units)
Economically important traits and their intrrelationships in genetic improvement for specific (poultry, cattle, sheep and goats and horses). Objectives of breeding, breeding

plans, practical selection programmes for livestock spcies. Establishment of foundation stock.
Practicals must involve visits to breeding and livestock research enterprises.