New University of Ghana Collegiate System

College of Health Sciences

- School of Medicine and Dentistry
- School of Public Health
- School of Nursing
- School of Pharmacy
- School of Biomedical and Allied Health Sciences
- Noguchi Memorial Institute for Medical Research
- Centre for Tropical, Clinical Pharmacology & Therapeutics

College of Basic and Applied Sciences

- School of Physical and Mathematical Sciences
- School of Biological Sciences
- School of Agriculture
    - Livestock and Poultry Research Centre (LIPREC), Legon
    - Soil and Irrigation Research Centre (SIREC),Kpong
    - Forest and Horticultural Crops Research Centre (FOHCREC), Kade
- School of Engineering Sciences
- School of Veterinary Medicine
- Institute for Environment and Sanitation Studies
- Institute of Applied Science and Technology
- Biotechnology Research Centre
- West Africa Centre for Crop Improvement
- West African Center for Cell Biology of Infectious Pathogens

College of Humanities

- Business School
- School of Law
- School of Arts
- School of Languages
- School of Social Sciences
- School of Performing Arts
- Institute of Statistical, Social and Economic Research
- Institute of African Studies
- Regional Institute for Population Studies
- Centre for Social Policy Studies
- Centre for Migration Studies
- Legon Centre for International Affairs and Diplomacy
- Centre for Gender Studies and Advocacy
- Language Centre
- University of Ghana Accra City Campus

College of Education

- School of Information and Communication Studies
- School of Education and Leadership
- School of Continuing and Distance Education

COLLEGE OF BASIC & APPLIED SCIENCES

SCHOOL OF AGRICULTURE

❖ DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS

LEVEL 100 SEM 1

SAMP 101: Sample Course 1

Objective: The course is intended to introduce students to the importance of this sample course.

LEVEL 100 SEM 2

AGEC 102: Introduction to Economics 2 credits

The objective of the course is to provide beginning students with the basic economic tools that will enable them appreciate the economic systems of the world and how an economy works.

Microeconomics

What is Economics? Scarcity and Choice, Economic Systems of the World, Micro and Macro Economics, Positive and Normative economics, Economics and Agricultural Economics, Techniques of Economics Analysis: Inductive and deductive reasoning, Scientific method of enquiry, theory and hypothesis, use of graphs, Analysis of consumer behavior: Consumer choice, concept of utility, indifference curves, budget lines, consumer equilibrium, Demand Analysis:

Demand Schedule, Demand curve, Demand function, change in quantity demanded versus change in demand, Factors affecting the demand of a commodity, Supply Analysis: Supply Schedule, Supply curve, Supply function, change in quantity supplied versus change in supply, Factors affecting the supply of a commodity, Elasticity of Demand and Supply: Concept of elasticity, price elasticity of demand and supply, income elasticity, cross price elasticity, Markets: types of markets, characteristics of markets, equilibrium of competitive markets, Theory of the firm (production economics): concept of short-run and long-run, fixed and variable inputs. Concept of cost, fixed and variable costs.

Macroeconomics

Nominal and real values in economics: Consumer Price Index (CPI), GDP deflator, purchasing power, National Income Determination: Gross Domestic Product (GDP), Gross National Product (GNP), consumption function, savings function, the multiplier measurement problems, Inflation: Level of Inflation, rate of inflation, effects of inflation, Unemployment: rate of unemployment, labour force.

LEVEL 200 SEM 1

AGEC 211: Microeconomics (Principles and Applications to Households and Firms) Credits: 2

Overview of Economics. The Economic Problem. Branches of Economics. Overview of Microeconomics: Nature, Use and Limitations. Concept of a Final Good. Concept of an Intermediate Good. Concept of a Market. The Market Mechanism. Shortage and Surplus in a Market. Effects of Demand and Supply Shift Factors on Equilibrium Quantity and Equilibrium Price. Final Goods Markets. Intermediate Goods Markets. Concept of Elasticity. Supply and Demand Elasticities for Final Goods Markets and Intermediate Goods Markets. Consumer Choice: Utility Curve, Utility Surface, Indifference Curve and Indifference Surface. Rate of Commodity Substitution. Budget Line. Consumer Equilibrium and Derivation of Consumer Demand Curve for Final Goods. Income and Substitution Effects. Producer Choice: Concept of a Production Function. Well-behaved Production Curves and Surfaces. Isoquant Curves and Surfaces. Marginal Rate of Technical Substitution. Production Elasticities. Isocost Curves and Surfaces. Objectives of Producers: Output Maximisation, Cost Minimisation, Profit Maximisation. Equilibrium of the Producer and Factor Demand Curves. Product Supply Curves and Surfaces. The Structure of Markets: Competition, Monopoly, Oligopoly and Monopsony. Agricultural Economics as an

Applied Discipline. The Structure of Agriculture in Ghana. Government Policy and Agriculture in Ghana.

LEVEL 200 SEM 2

AGEC 212: Macroeconomics (Principles and Applications to Economy of Ghana) Credits:3

Concept of an Economy, Definition of Macroeconomic Theory. National Income Accounting. Aggregate Output Function. Aggregate Labor Demand and Supply Functions. Consumption, Savings and Investment Functions. Money Demand and Supply Functions. Fundamentals of National Income Determination. Aggregate Demand and Supply Curves. Business Cycles. Fundamentals of Exchange Rate Determination. Fundamentals of the Causes of Inflation. Applications to the Economy of Ghana.

LEVEL 300 SEM 1

AGEC 311: Farm Management Credits: 3

The Field of Management, Factors Affecting Managerial Effectiveness, Basic Management Concepts, Farm Management Information, Preparation of Financial Accounts, Analysis of Financial Accounts, Management Accounts, Farm Budgets, Control, Risk and Uncertainty.

AGEC 313: Microeconomic and Macroeconomic Theory Credits: 3

This course builds on courses AGEC 201 and AGEC 202. It presents the theoretical underpinings of both macroeconomic and microeconomic phenomena. At the end of the course, candidates should be able to understand and explain economic phenomena using geometry, calculus and difference equations. Candidates are also required to apply the theories learnt to the economy of Ghana.

I. ***Introduction*:** Overview of the Nature of Scientific Theory. The Scientific Method of Enquiry. Methodology of Economics. Nature and Purpose of Economic Theory. Concept of an Economy. Definition of Macroeconomic Theory. Definition of Microeconomic Theory. Concept of a Market.

II . ***Microeconomic theory*:** Theory of Production. Theory of Cost. Theory of Factor Demand. Theory of Product Supply. Theory of Consumer Demand. Consumer Surplus. Producer Surplus. Economic Welfare.

III. ***Macroeconomic theory*:** The Classical Theory of Employment and Aggregate Output. The Classical Theory of Inflation. The Complete Classical System. The Keynesian Theory of Employment and Aggregate Output. IS/LM Framework. Monetary and Fiscal Policy. The Keynesian Theory of Inflation. The Inflation-Unemployment Relationship. Structuralist Theory of Inflation. The Complete Keynesian System. The New Classical Macroeconomics: Rational Expectations Theory. Theory of Business Cycles.

LEVEL 300 SEM 2

AGEC 312: Project Analysis Credits: 3

The Project Concept, The Project Cycle, Aspects of Project Preparation and Analysis, Identification of Project Costs and Benefits, Measures of Project Worth, Steps in Agricultural Project Preparation, Guidelines for Project Report Writing, Mutually Exclusive Projects, and Presentation of Group Reports.

AGEC 314: Research Methods, Statistics & Mathematics for Economists & Business
Credits: 3

The scientific method of Enquiry in Business & Economics research; Basic and Applied Research; the Scientific Research Process; from proposal writing to dissemination of results; Data/Information Gathering; Methods of Data Collection; Sampling Techniques; Organizing Data for Analysis: Coding, Cleaning, Summary Statistics; Farming Systems Research; Economic Analysis of Agronomic Data. Nature of Statistics, Uses of Statistics in Economic and Business Research Models; Concept of a Random Variable; Probability Distribution Functions; Measures of Central Tendency; Measures of Dispersion; Moments of a Distribution: 3rd and 4th Moments (Skewness & Kurtosis); Concept of a model/Use of Economic models; Classical normal regression assumptions and estimation procedures of the Ordinary Least squares; Desirable Properties of estimators & Hypothesis Testing. Role of Mathematics in Economic and Business Research; Variables and Parameters, Domain of Variable; Concept of a Function:

Explicit and Implicit Functions, Inverse Functions; Functional Forms: Linear, Quadratic, Cubic, Polynomial, Logarithmic, Exponential, Inverse, Semi-Logarithmic, Double Logarithmic (Log-Log) Functions; Equations: Solution of Linear, Quadratic and Cubic Equations; Matrix Algebra; Differential Calculus; Optimization Problems: Unconstrained and Constrained Optimization Problems; Integral Calculus

LEVEL 400 SEM 1

AGEC 400: Research Project Credits: 3

Students are expected to choose a subject of scientific inquiry and follow all relevant protocols to investigate the problem. Guided by a lecturer supervisor, they will produce a report, which will be assessed on the basis of its scientific rigour, depth of analysis and flow of thought among other things. The course is run in both first and second semester.

ECON 301: Microeconomic Theory I (See Economics Department)
ECON 303: Macroeconomic Theory I (See Economics Department)
ECON 302: Microeconomic Theory II (See Economics Department)
ECON 304: Macroeconomic Theory II) (See Economics Department)
ECON 403: Econometrics I (See Economics Department)
ECON 404: Econometrics II (See Economics Department)

AGEC 401: Agricultural Marketing & Research Credits: 3

Overview (Definitions, importance of marketing and trade, the role of marketing in Ghana's poverty reduction strategy); business, marketing and trade; problems in agricultural marketing and trade, the concept of market, market structure and trade (the static theory of perfect competition, the static theory of monopoly, the trade theory); marketing research (purpose, uses, procedure and applications in key agribusinesses in Ghana.); Group behavior and pricing (Non-collusive oligopoly models, collusive oligopoly concepts); non-price competition (theory of product differentiation, useful tools of product differentiation, improving production quality and efficiency); Critical issues in international trade (the FOREIGN EXCHANGE MARKET, tariffs, balance of payments, economic integration); Welfare issues in agricultural marketing (social choice mechanisms, market failure and government intervention, pricing public goods and bads; the Ghana National Trade Policy and institutions).

AGEC 403: Agribusiness Management Credits: 3

Overview of Managerial and Business Economics; Micro-economic Concepts and their Application to Business; Business Behaviour in Different Market Structures; Production and Costs; The Firm and Its Environment; Demand Estimation: Regression Analysis; Decision Making Under Uncertainty; Product Pricing; Types of agribusiness ownership, such as Sole Ownership, Partnership, Corporate Structure, etc. Managing the agricultural business, including strategic management, comparative advantage and competitive advantage, value-chain analysis. Business analysis and control – financial Statements, profit and loss statement, financial ratio analysis, and performance and activity analysis. Managerial Economics and Public Policy – how and why market regulation. Globalization – of markets and production; drivers of globalization. Economics of Human Resource Management. Case Studies.

AGEC 405: Quantitative Methods & Operations Research Credits: 3

Introduction, Probability and Decision Making, Index Numbers, Time Series Analysis, Correlation and Regression Analysis, Forecasting, Network Analysis and Scheduling, Inventory Control, Simulation Analysis, Waiting Lines Analysis (Queuing Theory), Linear Programming- Simplex Method and Advanced Methods, Transportation and Assignment Problem.

AGEC 407: Management Accounting Credits: 3

Overview of Management Accounting, Basic Cost Classifications and Concepts, Materials Control, Ledger Accounting, Marginal and Absorption Costing, Product Costing Systems, Cost-Volume-Profit (CVP) Analysis, Budgetary Control, Standard Costing, Performance Measurement.

LEVEL 400 SEM 2

AGEC 400: Research Project Credits: 3

Students are expected to choose a subject of scientific inquiry and follow all relevant protocols to investigate the problem. Guided by a lecturer supervisor, they will produce a report, which will be assessed on the basis of its scientific rigour, depth of analysis and flow of thought among other things. The course is run in both first and second semester.

ECON 301: Microeconomic Theory I (See Economics Department)
ECON 303: Macroeconomic Theory I (See Economics Department)
ECON 302: Microeconomic Theory II (See Economics Department)
ECON 304: Macroeconomic Theory II) (See Economics Department)
ECON 403: Econometrics I (See Economics Department)
ECON 404: Econometrics II (See Economics Department)

AGEC 402: Agrifood Business and Agroprocessing Credits:3

Introduction: the agricultural modernisation goal and agro industrial development. The current situation of agro industry in Ghana. A Systems Approach to Agro industrial Analysis: production chain linkages, macro-micro policy linkages, institutional linkages, international linkages. Alternative analytical methodologies: Porter's value chain approach. Options in Agri food Business Organisation: basic concepts in organisational development, integration, differentiation, the co-operative system, outgrower schemes. Principles of Agro processing: the basic component activities of agro processing (Procurement, processing and marketing). The governance structure: Food safety and environment issues, laws and institutions in Ghana. Case Studies:- The management marketing and financing strategies in the: Egg Production Business, Chicken meat processing business, Palm Oil Processing business, Fruit Processing business, Grain processing business.

AGEC 404: Fundamentals of Business Planning & Policy Credits: 3

The nature and Importance of Business Policy and Planning; Policy and levels of planning (global, national, community and firm). The business Planning Process: Feasibility study, the route to market entry; and the business plan. Strategic planning: Choosing the strategy, implementing the strategy, evaluating the strategy. Annual plans; action plans (the logical framework). Contingency planning; Information systems for planning; Policy implementation.

AGEC 406: Managerial and Business Economics Credits: 3

The purpose of the course is to introduce students to the economic environment in which businesses operate, and provide an understanding of how economic principles are applied in management and business. Course content: The scope and nature of managerial and business Economics; Internal organization of firms; The firm and its Environment; Alternative Business objectives; Markets and industries; Demand estimation and forecasting; Production and costs; Linear Programming and production Structures; Pricing practices; Decision making under uncertainty; Capital budgeting; The economics of Human Resource Management; Business information; Forms of business organization; The role of government in the market economy..

AGEC 409: Agricultural Price Analysis &Marketing Credits: 3

The role of prices; demand analysis (theory), focusing on review of consumer behavior, utility maximization, elasticity, substitution & income effects of price changes, Engel curves. Demand analysis (empirical consideration), demand for a typical farm product, formulating demand equations, demand for agricultural inputs. Supply analysis, supply relation in agriculture, estimating supply functions (direct & indirect approaches). Estimation problems, model specification, using cross-section and time-series data, interpreting estimated parameters,statistical tests, and forecasts. Introduction to FUTURES MARKET. General overview of Agricultural pricing policies in Ghana.

Overview; business, marketing and trade; problems in agricultural marketing and trade, the concept of market, market structure and trade; Group behavior and pricing (Non-collusive oligopoly models, collusive oligopoly concepts); non-price competition; Critical issues in international trade (the foreign exchange market, tariffs, balance of payments, economic integration)

❖ DEPARTMENT OF AGRICULTURAL EXTENSION

LEVEL 100 SEM 1

SAMP 101: Sample Course 1
Objective: The course is intended to introduce students to the importance of this sample course.

LEVEL 100 SEM 2

AGEX 102: Development Communication and Extension Methods Credits: 2
Definitions and key concepts in Communication; Approaches and models of communication; Models of Development; The concept of Extension Methods. Types of Extension Methods; Use of different Extension Methods; Role of Communication in community development; Communication channels and forms; Indigenous Communication; Information Organization; Distortion and loss; Non-verbal Communication; Communication strategies and skills; Public relations. Visual Aids; Classification of Visual Aids; Importance of Visual Aids; Development and use of Visual Aids; Selection of Visual Aids for specific learning situations; The use of field Demonstrations.

LEVEL 200 SEM 1

SAMP 201: Sample Course Title Credits: 3
Objective: The course is intended to introduce students to the importance of this sample course.

LEVEL 200 SEM 2

AGEX 206: Approaches to Extension Credits: 3
Concepts and relationships between extension, technological and institutional innovation; objectives and importance of extension services. History of development of extension worldwide. Contribution of extension to agricultural and rural development / potential of agricultural extension in developing countries; Major problems and constraints to extension's effectiveness and challenges in agricultural extension and agricultural development. Approaches to agricultural extension delivery - the general agricultural extension approach, Training and Visit approach, farming systems research approach. Cost sharing / cost recovery approach, Commodity Specific approach, Farmer Field Schools, Convergence of Sciences and Innovation Systems approaches; Evolution of extension approaches in Ghana (including the current state and future of extension services in Ghana).

LEVEL 300 SEM 2

AGEX 302: Extension Programme Planning and Evaluation Credits: 3
Functions of Programmes in Extension work; Concept of Extension Programmes; Importance of an extension programme; Stages of an Extension Programme; Measures for enhancing effectiveness of Extension Programmes; Extension Programme Cycle; Concept of Planning; Planning Levels; Approaches to Planning; Activities involved in planning Extension Programmes; Professional abilities needed in Planning; Implementation of extension programme; Responsibilities of Extension Managers and Agents during Implementation; Events that may disrupt implementation of Extension Programmes; Monitoring of Extension Programmes; Evaluating Extension Programes during Implementation; Post-implementation stage of Extension Programmes; Terminal Evaluation.

LEVEL 400 SEM 2

AGEX 402: Management of Development Organisations Credits: 3
The concepts of management and dimensions of management jobs. Understanding of organizational structure. Management roles, leadership theories and management in extension organizations. Motivation and delegation in management. Human resource development in extension organizations. Sources of power and the application of power in organizations. The concepts of education and training. Principles of

adult learning. Formal, informal, and non-formal agricultural training and education in Ghana. Types of Training and Education in Extension organizations.

❖ DEPARTMENT OF ANIMAL SCIENCE

LEVEL 100 SEM 1

ANIM 111: Biology of Farm Animals Credits: 2

Blood and circulation: - composition of blood, functions of blood, heart and blood vessels; the respiratory system: - structure of the respiratory system of mammalian and avian species, gaseous exchange in the lungs and tissues, transport of oxygen and carbon dioxide; the excretory system: - structure of the kidneys, the functional unit of the kidneys and formation of urine; the reproductive system: - reproductive organs of livestock and avian species, spermatogenesis and cogenesis, endocrine functions of the testes and ovaries; skeletal system of livestock and avian species; the digestive system: - structure and functions of the different sections of the digestive systems of livestock and avian species.

LEVEL 200 SEM 1

SAMP 201: Sample Course Title Credits: 3

Objective: The course is intended to introduce students to the importance of this sample course.

ANIM 211: Introduction to Monogastric Production Credits: 2

Origin, distribution and characteristics of breeds of poultry in Ghana and Africa; definitions of terms used in poultry production; systems of poultry production; adaptation of poultry to the tropics; the poultry industry in Ghana – opportunities and challenges. Introduction to Broiler & Layer production. Origin and classification of swine. Distribution of Pigs. Anatomical characteristics. Definition of technical terms and terminology. Importance of swine to man. Swine behaviour. Breeds and their physical characteristics. Adaptive physiology/mechanism of adaptation. Growth and development in pigs. Stress syndrome in pigs. Nutrient requirements in swine life cycle.

LEVEL 200 SEM 2

ANIM 212: Elements of Microbiology and Immunology Credits: 3

Distinguishing characteristics of microbes – bacteria fungi, viruses, viroids, protozoa and prions. Morphology, growth and nutrition of common microbes: Microbial culture. Virus replication, infection of cells and disease induction. Classification of microbes and infectious agents. Control of growth of microorganisms. Nature of microbial-host association. Germ Theory of Disease. Fundamentals of Immunology: Innate immunity, Antigen and Antigen and Antibody; Immunity; principles of vaccination and immunoprophylaxis. Hypersensitivity. Food Microbiology: Food spoilage and preservation; microbiology of fermented foods; Microorganisms as source of food.

LEVEL 300 SEM 1

ANIM 311: Principles of Animal Nutrition Credits: 3

The study of the processes that deal with feed consumption and assimilation to promote maintenance and production; Classification and functions of nutrients; Feed classification and quality evaluation; Interrelationships between nutrition and animal health.

LEVEL 300 SEM 2

ANIM 312: Introduction to Ruminant Production Credits: 3

Definitions, points of the animal and strategic importance of ruminants to human needs. Origin and distribution of sheep, goats and cattle in Africa. Systematic classification and feeding behaviour of small ruminants and cattle. Characteristics of specialized beef breeds of cattle. Ghanaian cattle breed and

characteristics. Factors affecting small ruminant and beef production and constraints to enhanced productivity. Increasing the efficiency of ruminant production-issues to consider. Selection of site, housing and environmental control. Selection and care of foundation, breeding and replacement stock and herd. Systems of husbandry practices in feeding, breeding, record keeping and marketing.

ANIM 314: Principles of Animal Breeding Credits: 3

Genes and gene action; The nature and control of gene function; Phenotypic expression of genes; Types and consequences of mutations and chromosome aberrations; Detrimental and lethal genes in farm animals; The concept of gene frequencies; Economic traits of farm animals; Components of phenotypic variance; Heritability and repeatability; Inbreeding and relationships; Introduction to the principles of selection – theory and practice.

LEVEL 400 SEM 1

ANIM 415: Applied Animal Nutrition Credits: 3

The digestion of starch and protein in the pig and cattle – glands, organs, digestive juices, enzymes and end products. Bioenergetics and partition of energy within the animal. Evaluation of feeds; in vivo, invitro and in Sacco. Use of metabolizable Energy concept in Animal Feeding. Proteins in feeds – measures of protein quality for monogastrics and Ruminants. Ration formulation and Nutrient Requirements for body functions.

ANIM 417: Monogastric Animal Production Credits: 3

Avian biology and its importance in management. Hatchery set up and management. Rearing of broiler breeders. Management of various species of poultry. Processing and marketing of poultry. The importance of swine farming. Housing and equipment. Breeding. Puberty in pigs. Pregnancy and farrowing management. Requirements and management of suckling pigs. Feeding strategies. Feed/diet formulation for sows and growing/finishing pigs. Health, marketing and record keeping.

ANIM 419: Meat Science and Technology Credits: 3

Definitions; Anatomy of Livestock/Poultry; Conversion of muscle to meat; Carcass/meat grading and evaluation; By-products of Meat Industry; Storage and Preservation of meat; Microbial flora of meat and meat products; Factors influencing quality of Cured meats; Marketing of meat and meat products.

ANIM 421: Principles of Range And Forage Science Credits: 3

Definition of ecological terms. Ecosystem concept and function. Types of biological relationships. Succession and range condition. Ecology and range management. Economic importance and types of grasslands. Factors affecting development of grasslands. Aims and techniques of forage conservation. Criteria for choice of species for forage production. Pasture establishment process and methods. Factors influencing pasture establishment. Factors limiting forage production to Ghana.

ANIM 423: Micro-Livestock Production Credits: 3

The concept of microlivestock production. Bio-geographical and ecological factors in the use of microlivestock. The concept and consequences of domestication. Transportation and housing of new domesticates. Rabbit production. Grasscutter production. Apiculture. Snail production

LEVEL 400 SEM 2

ANIM 414: Applied Animal Breeding Credits: 3

Principles of selection; genetic effect of selection; selection for different kinds of gene action. Basis for selection. Methods of selection, Response to selection and factors affecting it. Systems of mating; Systems of breeding and selection for the genetic improvement of various species of livestock. Special problems of implementing genetic improvement of livestock programmes in the tropics (with particular reference to Ghana); Open nucleus breeding schemes.

ANIM 416: Ruminant Animal Production Credits: 3

Small Ruminant Production

The millennium development Goals and the Livestock revolution – the role of the Animal Scientist. The bane of the small ruminant production on the coastal savanna of Ghana; sustainable dry season feeding

strategies; Improving the reproductive efficiency of breeding ewes and rams. Other management practices – Flushing, creep feeding, weaning and calendar of activities on a small ruminant farm.

Dairy Cattle Production

Importance of milk and dairy products. Breeds of dairy cattle – characteristics and production. Status of the dairy industry in Ghana. Constraints to milk production in Ghana. Essentials of a profitable dairy operation. Milk yield and composition and factors affecting them. Management and milking of the dairy herd. Managing dairy cattle for high fertility.

Forage Production, Management and Conservation

Types of pastures; natural, cultivated. Management and improvement practices of grasslands; reseeding, fertilization, water supply, weed control, burning, supplementary feeding. Concepts of grazing; stocking rate, carrying capacity, grazing capacity, overgrazing. Grazing management systems; continuous, rotational, zero, deferred. Forage conservation; aims, techniques, socio-economic and technical considerations, haymaking, silage making.

ANIM 418: Animal Health and Physiology Credits: 3

Physiology (7 weeks) Comparative anatomy of the reproductive organs of the different livestock species. Oestrous cycles and synchronization of estrus. Fertilization and maintenance of pregnancy; structure of the mammary glands, initiation and maintenance of lactation. Reproductive organs of the hen and egg laying. Artificial insemination. Response of farm animals to high and low ambient temperatures. effects of high ambient temperatures on the productivity of farm animals. Alleviation of heat stress through management practices. **Health (6 weeks):** intensive production and reproductive problems in farm animals. Common general pathologic and inflammatory conditions affecting the male and female genitalia of food animals. Classical health problems associated with pregnancy, gestation and the puerperal period in livestock. Abortions and other post-parturient conditions in farm animals. Intensive production and management health problems in poultry. Reproductive failure in farm animals - sterility, infertility and their management and control signs, diagnosis and production significance of pregnancy in food animals. Problems of parturition- dystocia, retained placenta, management of uterine prolapses, ruptures and abnormal presentations in farm animals.

ANIM 422: Anatomy of Digestive Physiology Credits: 3

Signs and factors affecting health in farm animals. Deficiency diseases of farm animals (mineral and vitamin deficiencies in cattle, sheep, goats and poultry) selected major diseases of farm animals in Ghana. Incidence, aetiology, transmission, epizootioloy, pathogenesis, clinical symptoms, pathology, diagnosis, treatment and control of bacterial viral protozoan and parasitic diseases of ruminants, pigs and poultry. Notifiable and zoonotic diseases, responsibilities of stockowners and in relation to requirements of the Veterinary Services Department of Ghana.

❖ DEPARTMENT OF CROP SCIENCE

LEVEL 100 SEM 1

CROP 111: Introduction to Agricultural Botany Credits: 2

Hierarchical organization of plant life, from single cells to flowering plants: algae, fungi, bryophytes, pteridophytes, gymnosperms, angiosperms; structure of plant cells, tissues, organs. Fine cell structures and their functions. Mitosis, meiosis, molecular basis of inheritance, protein synthesis. Root modification of roots, arrangement of tissues in monocotyledonous (monocot) and dicotyledonous (dicot) roots. Stem: modification of stems, arrangement of tissues in monocot and dicot stems. Leaf: simple, compound, venation, shapes, arrangement and modification of leaves; arrangement of tissues in monocot and dicot leaves. Reproduction in plants. Flower: parts, types, floral arrangements (inflorescence), and floral diagrams. Fruit and seed: structure, types germination and dormancy. Principles of classification

including concepts of species, genus, family, order, division and kingdom, binomial system of nomenclature.

LEVEL 200 SEM 1

CROP 221: Introduction to Crop Production Credits: 2

The physical environment and crop production. Adapting crops and management practices to the environment. Soil and water conservation. Farming, cropping and agro-forestry systems. Plant propagation, crop establishment and management. Weed control strategies. Pest and disease control. Integrated crop nutrient management.

LEVEL 200 SEM 2

Insect biology and Plant Microbes Credits: 3

Insects as arthropods and their inter-relationship with other members of the phylum Arthropoda. Characteristics of insects, features of insects that have enhanced their success. Importance of insects to agriculture. Morphology of insects; Anatomy and physiology of organ systems. Locomotion in insects, and some aspects of insect behaviour. Entomological techniques. Classification of insects, with emphasis on the recognition of representation of all the insect orders. History of Microbiology: role of discovery and spontaneous generation of microbes and germ theory of diseases. Characteristics of plant microbes (fungi, bacteria, viruses, viroids, mollicutes, nematodes, algae and protozoa): morphology, structure and function, growth, reproduction, dispersal and classification of the microbes. Importance of plant microbes in agriculture: including soil fertility involving rhizobia, mycorrhiza and algae.

LEVEL 300 SEM 1

CROP 311: Crop Protection Credits: 3

Concept of pests. Classification of pests. Economic importance of pests. Effects of pest presence. Methods of pest control. Merits and demerits of different methods, with emphasis on pesticides. Current trends in pest control. Meaning, scope and history of plant pathology; concept of diseases in plants; Importance, classification, causes, symptoms and general control of plant diseases.

CROP 315: Principles of Horticulture Credits: 3

An introduction to plant propagation techniques, career opportunities in ornamental horticulture, as well as a look at the ornamental crop industry in Ghana. Methods of propagation, environmental factors affecting production and control of flowering will be treated. Production systems for flower, foliage and turf crops, particularly floral designs, nursery management, house plant care, specialized crop production, postharvest handling and marketing will also be discussed.

LEVEL 300 SEM 2

CROP 322: Crop Physiology Credits: 3

Major physiological processes in plants including seed germination, plant-water relations, mineral nutrition, photosynthesis, biological nitrogen fixation and respiration. Introductory environmental physiology including photoperiodism, vernalization and temperature stress as well as air, soil and water pollution stresses on plants. Plant growth substances and growth regulation. Crop growth analysis, especially, leaf area index, leaf area duration, crop growth rate and net assimilation rate.

LEVEL 400 SEM 1

CROP 423: Plant Pathology Credits: 3

Review of the major characteristics of the major pathogen groups; Introductory plant pathology, Development of disease in individual plants and plant population, plant disease triangle, disease cycle and relationship between disease cycle and epidermics in plants; pathogenic attack of plants-role of enzymes, toxins, growth regulators etc. in plant disease; effect of disease on plant metabolism; defence of plants

against pathogens – the concept and basis of resistance; genetics of plant diseases, Diagnosis and assessment of plant disease. Some selected plant diseases and their control in Ghana – importance, symptomalogy, aetiology and control

CROP 425: Statistics for Agriculturists Credits: 3

Introduction to planning and execution of agricultural experiments. Principles of scientific experimentation. Statistical methods commonly used in agricultural research and experimental biology. Descriptive statistics. Normal 'T' and 'F' distributions and their uses. Experimental designs, analysis of variance, chi-square tests, simple correlation and regression. Factorial experiments. Introduction to multiple regression and non-parametric statistics. Emphasis will be on applications of these methods rather than on mathematical derivations.

CROP 427: Seed Science and Technology Credits: 3

Biology of seeds – ontogeny, structure, storage, germination and storage behaviour. Principles and practices involved in the production, harvesting, processing, conditioning, storage, testing, quality management and use of agricultural seeds. Seed improvement, national seed laws, international seed institutions and regulations, seed industry policy and germplasm policy for Ghana. Developments in the international seed arena including patenting. Establishment and management of seed production as a business.

CROP 433: Molecular Biology Credits: 3

The nature of DNA nucleic acids. Replication of double stranded DNA. The Genetic code, Gene and Gene expression. Production of Recombinant DNA. The Polymerase Reaction. Cloning of prokaryotic and eukaryotic genomes. Genome...

CROP 435: Environmental Horticulture Credits: 3

Landscape Design: History of garden and landscape design. Contemporary trends, types and elements of the landscapes. Objectives of landscaping. Conduction of a landscape survey and analysis of landscape survey data. Materials of design. Principles of design and Principles of landscape design. The functions and design of beds and borders, home gardens, open space, public parks and public gardens. Road, street and industrial landscaping. Landscape graphic techniques. Preparation of plans. The sequence of operation for Landscape, projects. Preparation of costs and estimates. Landscape Horticulture: Importance of landscape plants in the environment. Selection of plants for landscaping. Establishment and maintenance of landscape trees, shrubs, climbing plants, hedges and shelter belts, bedding plants, lawns in garden and parks, and aquatic plants in water garden. Problems of landscape horticulture in Ghana. Establishment of landscape maintenance program.

CROP 437: Pests and Diseases of Horticultural Crops Credits: 3

Overview of the concept of pests and diseases and development of pest and disease in plants. Disease diagnosis, assessment and general control of plant diseases. Study of the identification, damage, economic importance, symptoms and management of major insect pests and diseases of the following crops: (a) Vegetables: Tomato, Cabbage, Garden egg, Baby aubergines, Okra, Pepper, Onion, Water melon, Cucumber etc. (b) Fruit crops e.g. pineapple, mango, citrus, pawpaw, cashew. (c) Ornamental plants.

LEVEL 400 SEM 2

CROP 424: Plant Virology Credits:3

History, classification and terminologies in virology. Virus structure, components of viruses. Isolation and characterization of viruses. Transmission of viruses. Life cycle of virus- synthesis and Genome replication of viruses. Virus entry, movement and assemble. Plant virus pathogenesis, cell damage and Host contribution to pathogenesis. Virus evolution, origin and divergence. Prevention and control of viral disease including plant defense agents. Practical sessions should include: Detection and assaying of plant viruses using host plants, serology and nucleic acid based techniques. Transmission of virus to test plants, symptomatology and Electron microscopy.

CROP 426: Genetics and Plant Breeding Credits: 3
Introduction to evolutionary, population and quantitative genetics. Plant genetic resources. Reproductive systems in crop plants. The genetics basis and methods for breeding self-and cross-pollinated crops. Mutation breeding. Polyploidy. Inter-and intra-specific hybridization. Introduction to techniques of biotechnology utilized or with potential to be utilized in crop improvement.

CROP 434: Fruit and Vegetable Crops Credits: 3
The fruit industry. Classification of fruit crops. Factors affecting fruit production. Establishment of an orchard: propagation and nursery practices and fruit crop management; fruit quality and marketing. Detailed knowledge of the botany. Physiology and production practices for citrus, banana, mango, avocado pear, cashew and pineapple. Minor fruit crops of Ghana. Importance of vegetables enterprises. Classification of vegetables. Factors affecting vegetables production in Ghana. The vegetable production process: site selection and soil preparation; fertilizers and plant nutrition; water sources; propagation practices; weed, pest and disease control. Vegetable cropping systems. General principles of harvesting, postharvest handling, marketing and storage of vegetables. Cultural practices involved in the production of major vegetable crops in Ghana. Research needs.

CROP 440: Research Project Credits: 3
In the final year, a B.Sc. student in Crop Science must choose a topic for a research investigation directed at solving a specific plant science-related problem in consultation with a lecturer who becomes the student's supervisor. A bound dissertation describing this investigation must be presented to the Department before the final examinations begin. Although the research project is basically for training students in scientific research, it must be done conscientiously and the dissertation must contain all the elements of a publishable scientific paper. The course is spread over the first and second semesters.

❖ DEPARTMENT OF FAMILY AND CONSUMER SCIENCES

LEVEL 100 SEM 1

FCOS 101:Introduction to Foods and Nutrition Credits: 3
Fundamental knowledge of food preparation methods, cookery terms and basic measuring techniques; Introduction to kitchen and laboratory appliances and their uses. Safety measures in the laboratory and kitchen; basic cooking methods, modes of heat transfer, the food groups and their functions in the body: Recommended dietary allowance and planning daily meals.

FCOS 103:Introduction to Textile Fibres & Fabrics Credits: 3
Production, classification, physical and chemical properties of fibres; subjective and objective methods of fibre identification; fibre morphology and its effect on fibre properties; yarn type and structure; methods of fabric construction; fabric type/names, fabric finishes; the effect of fibre properties, yarn and fabric structure and fabric finishes on performance; the selection, use and maintenance of fabrics based on specific end uses; the impact of textile production, use and disposal on the environment. At the end of the course each student will produce a scrap book of different fabrics.

LEVEL 100 SEM 2

FCOS 102: Scope & Philosophy of Family & Consumer Sciences Credits: 2
Philosophy, scope and historical developments of Home Science (Now Family and Consumer Sciences); examination of basic human needs; the impact of local and global issues on the needs; overview of programme approaches in Family and Consumer Sciences which help to meet the needs for good quality of life for the family - the focus of the Family and Consumer Sciences programme; objectives for the establishment of Family and Consumer Sciences programmes and Associations/ Organisations; historical development of names of the discipline and core subjects; the need for the Social and Natural Sciences, Humanities and Fine Arts Subjects; socio- economic and cultural issues on family food security; clothing, housing, education, health needs and maintenance culture; career opportunities.

FCOS 104:Introduction to Family Resource Management Credits: 3
Fundamental knowledge in Family Resource Management and overview of the family, its types, stages of the family life cycle and managerial functions of families; Meaning, scope and significance of

management and its application in the home; Analogies between management in the home and management in other establishments; Introduction to basic concepts such as values, goals, standards, needs and wants; Identification of family resources, classification, characteristics and the role resources play in management.

LEVEL 200 SEM 1

FCOS 201: Child & Adolescent Development Credits: 2
Physical, intellectual and socio-emotional development of children; progression of pregnancy and prenatal development, birth and the newborn, types of growth and development, stages of growth and development, needs of children and adolescents, factors influencing the behavior of children, health and safety of children, the effects of technology on child development, and careers related to the area of child development.

FCOS 203: Task Performance Management Credits: 3
The purpose of simplifying home related-work. Application of principles of body mechanics relating to the work place, work methods, time and motion. Disabilities and home-related work life; Housing and Maslow's notion of human needs.

LEVEL 200 SEM 2

FCOS 202: Introduction to Fashion Design Credits: 2
Concepts and practices for garment production, Selection, use, care and storage of tools and equipment used in apparel production; Body measurements/ reference points with their names and symbols; Figure types; Basic stitches, methods of obtaining patterns, pattern markings, processes in garment construction - seams, edge finishes, pockets, collars, sleeves and closures. At the end of the course students will produce a clothing item.

FCOS 204:Adult Development Credits: 3
Fundamental concepts and empirical research on the development and changes in perception, cognition, emotion, and social functioning over the adult lifespan; Analysis of change from early adulthood through death in the areas of social, cognitive, and physical development; examination of theories, concepts, and research in the area of lifespan development; study of the problems of aging, plasticity of functioning, and ingredients of successful aging.

FCOS 206:Principles of Foods Credits: 3
Basic composition of foods, their physical and chemical properties and their relationship to food preparation; Fruits and Vegetables, Carbohydrate structural constituents, Pigments, Flavours, Changes during cookery; Milk and Milk Products, Components, Processing, Cookery; Fats and Oils, Glycerol and Fatty acids, Structures of fats in foods, Functional roles of fat, Food applications; Eggs, Formation and Structure, Composition, Quality and Safety, Functional properties; Meat, Fish and Poultry, Classification, Structure, Pigments, Factors affecting quality, Identification of Meat Cuts, Meat cookery techniques; Structure and Functional properties of starch, Food applications; Flour and Flour products, Types; Roles of Ingredients, Baking Applications.

FCOS 208:Human Physiology Credits: 3
Composition of blood: Anaemia; blood groups; homeostasis and blood coagulation; conditions that cause excessive bleeding; functions of blood; structure of the heart. Cardiac cycle; Circulatory systems; factors that affects heart rate. Structural organization of the respiratory system; mechanisms of inspiration and expiration; Types of breathings; pulmonary volumes and capacities; transport of oxygen and carbon dioxide; factors that affect respiratory rate; regulation of respiration. Hypoxia and respiratory disorders. Structural organization of the urinary system; the nephron; formation of urine filtration, reabsorption and secretion; Regulation acids-base balance; Effect of kidney malfunction on the body. Basic structure of the digestive system; secretions, functions and regulation of saliva, gastric juice, pancreatic juice, intestinal juice and bile; movements of the small and large intestine; Digestion and absorption of carbohydrates, fats and proteins; Peptic ulcer. Physiologic anatomy of the male reproductive organs; Ogenesis; endocrine functions of the ovaries; the female sexual cycle. Pituitary gland and its hormones; the thyroid gland and its hormones; Hypothyroidism and Hyperthyroidism; Regulation of blood calcium

level; Hormones of the adrenal glands; Hyperadrenalism and Hypoadrenalism; Pancreatic hormones; regulations of blood glucose level.

FCOS 212: Concepts of Family Resource Management Credits: 2
Family Resource Management unlocks the complexity of family decision making; the concepts and the underlying explanations of family behaviors: Understanding of the major management principles and frameworks with emphasis on the managerial processes: decision making; goal setting; maintaining standards and developing values as the cornerstone of a healthy family and society; importance of home management; the management process; motivating factors in management.

FCOS 214:Foundations of Early Childhood Education Credits: 3
Historical and philosophical foundations of Early Childhood Education; Major contributions of renowned theorists and theories to the development of early childhood education; Relevance of early education to the growth of the individual; History of early childhood education in Ghana, the current status, the early childhood care and development policy and the functions of the various stakeholders in the implementation of the policy; Different types and methods of early childhood care in Ghana; Future trends in these fields; Practical exposure of students to early childhood care and education in the child development center.

LEVEL 300 SEM 1

FCOS 315:Textiles and Apparel Product Development Credits: 3
Study of knitting machines, looms and their accessories for textiles and apparel production: emphasis will be on locally produced looms; history of the production of strip - woven textiles in West Africa with special reference to those locally produced; The production of fabrics, garments and household articles on the broad loom and knitting machine; braiding, crocheting and knotting.

FCOS 317: Evolution of Fashion Credits: 3
Historical developments of costume and accessories of past periods; historical dress forms of the Egyptians, Greeks and Romans; evolution of various garment forms from the fifteenth to the 21st century. The course will also draw parallels and diverse details between the past and present fashions and develop ideas and designs for today's fashion.

FCOS 319:Meal Service and Table Etiquette Credits: 3
Knowledge and practice of meal service at both family and institutional level; Formal and informal meal service, table setting and table arrangement, the proper use of cutlery and glassware; and waiting on table; Table etiquette or rules of table courtesy.

LEVEL 300 SEM 2

FCOS 312: Nutritional Assessment Methods Credits: 2
Nutritional assessment systems; anthropometric assessment such as measurement of body size, growth indices, body mass in children, adolescents and adults, measurement of body composition, interpretation and evaluation of anthropometric data, measurement errors; dietary assessment methods including quantitative and qualitative methods, measurement errors and evaluation of nutrient intake data; biochemical assessments including both functional tests and static tests; and clinical assessment methods including physical examination and its limitations, classification and interpretation of physical signs, functional assessment.

FCOS 314: Personal and Family Finance Credits: 2
Understanding the strategic role of money in the daily financial decisions of individuals and families. Relationship of: Attitudes about money to economic success; economic conditions to income and its use; life stage to earning potential; plan of action formulation for family financial management.

FCOS 316: Curriculum Planning for the Young Child Credits: 3
In-depth knowledge of Early Childhood Education Curriculum; Factors that contribute to effective learning with reference to young children; Organization of curriculum including but not limited to units on science, mathematics, art literature and...

FCOS 318: Sensory Evaluation of Food Products Credits: 2

Physiological bases of sensory evaluation - olfactory receptors, taste receptors, visual, etc; Sensory characteristics of food - appearance, aroma, flavour, texture, etc; Sensory Panels, Recruitment, Orientation, Screening, Training, Monitoring, Motivation; Environment for Sensory Evaluation; Sample Preparation and Presentation; Types of Tests, Preference and Acceptability; Errors in Sensory Testing; Designing Scorecards; Planning a sensory experiment.

FCOS 322:Family Food Security Credits: 3

Overview of the world and national food situations; Various definitions of food security; The components of food security at national and household levels; Institutional, economic, social, infrastructural and environmental constraints to achieving family or household food security; The contributions of food security to health of individuals.

FCOS 324:Food Habits Credits: 3

Foundations of human food habits or dietary pattern; the influences of the various factors on food choices and eating patterns; and reasons underlying food likes and dislikes; Cross cultural meal patterns and the influence of food habits on nutritional wellbeing of people; The changing trends in food habits in contemporary society (Ghana in particular), their influences on individuals and family health, impact on national economy; Relevance of food habit knowledge in planning successful nutrition intervention programmes.

FCOS 326:Home Furnishings Credits: 3

The evolution of the furniture industry, from its conception to the present; selection, use and maintenance of materials for furniture, floor, ceiling, window, table and bed coverings; floral arrangement; functions of items used for home furnishings; application of the elements and principles of design to practical furnishing techniques and the manufacture of items used for home furnishing.

LEVEL 400 SEM 1

FCOS 411: Garments and Accessories Technology Credits: 3

The course will examine the development of patterns for men and women's bespoke tailored suits; construction techniques including lining, interfacing, padding, bound pockets and button holes, welt pockets and pressing; different materials and fabrics used for fashion accessories. The design, production and care of accessories with emphasis on millinery, belts, bags, shoes and neck wear will also be handled.

FCOS 413:Child Study Laboratory Experience Credits: 3

Laboratory experience at the Child Study Center which includes observing and recording the growth and behaviour of toddlers and preschool children and working in the classroom with children; understanding principles and techniques for assessing, planning and working with young children through direct experience.

FCOS 415:Management of Food Service Systems Credits: 3

The course aims at enabling the student to have a comprehensive appraisal of all elements involved in good management of food service systems. Areas to be covered will include food service systems and their development; food service organization and management - This will include discussions on Theories of organization; Types of organizations; Functions of management, Tools of management, Scheduling of employees, and Work improvement; Personnel Management - The employment process involving recruitment and Selection; the worker on the job with emphasis on orientation, training, work standard and productivity, performance, promotion and transfer, routine supervision and decision- making; Cost Control - Factors affecting cost control such as Food costs, Labour costs, Operating and other expenses, Records for control including Procurement and receiving records, Storage and storeroom, control, Production and services, Dining room records, Cash transaction, Operating and maintenance, and Personnel cost control records; Reports as a Management Tool including Budget planning, Financial reports, and Annual reports.

LEVEL 400 SEM 2

FCOS 408:Family Resource Management Practicum Credits: 3
A residential course during the final year when students move from their usual residences on or off campus to live in groups at the Family Resource Management Center "FIDUA" at the University of Ghana, Legon for a specific period to stimulate living. Students put into practice all theories learnt in previous courses in Family and Consumer Science. The course works towards skills development and enhancement. This practicum is also to prepare students for the roles, responsibilities and relationships essential to functional families and to understand the nature, function and significance of human relationships within the individual/family units.

FCOS 412: Policy Perspectives in Child Studies Credits: 3
Analysis of issues, contexts and variables related to children- how these factors impact on families and childcare professionals; examination and discussion of children's rights, global and national perspectives of these issues and barriers to the realization of these ideals. Advocacy issues and how they relate to public policy decision making of children and their families
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FCOS 414: Textiles and Clothing Maintenance. Credits: 3
Historical development of soaps and detergents (surfactants); structure, properties, categories and functions of surfactants, dry cleaning agents, builders, stain/spot removers; types of dirt/soil, detergency, effect of water hardness, temperature, pH and agitation on detergency and soil removal; types of washing machines, rules governing the care of clothing; commercial and home laundering procedures, laundry mishaps; care labeling and labeling symbols; ironing/pressing equipments; storage and repair of clothing; preparation of soap.

FCOS 416:Special Topics In Family Resource Management Credits: 3
The course will examine how gender studies and social class shape the experience of family life in contemporary African Countries. This multi-disciplinary course introduces a broad range of concepts and issues related to contemporary women, men, young people, reproductive health and rights and health communication in African Families. The course incorporates foci on reproductive health (including Adolescents Reproductive Health and rights), Gender Based Violence (with attention to historical responses and prevention efforts, and HIV/AIDS (including global inequities in risk, incidence and treatment).

FCOS 418:Marriage, Family and Intimate Relationships Credits: 3
Topics include romantic love, meaning of marriage, qualities of a successful marriage, sexual patterns, courting and dating, love and mate selection, intimate relationships, happiness and tension and conflict in relationships, separations, divorces, widowhood, remarriages, family systems in other cultures, family system in Ghana, minority family patterns, current changes, and prospects for the future. Presents sociological descriptions and explanations of these topics and also guides students into ways of coping better in their own relationships

FCOS 422:Food Product Development Credits: 3
Designing new products from a market perspective; Driving forces in the market place; Consumer Research; Methods of Idea development and management, Product development sequence; Engineering role in a typical food process; Food packaging industry, Safety and Regulatory Aspects; Agencies responsible for food safety, HACCP system, Nutrition promotion; Standardizing recipes.

FCOS 424: Fashion Production Internship Credits: 3
A semester of intensive practical training in fashion design or accessories under the tutelage of an experienced fashion designer; acquisition of hands on skills in a commercial environment to be able to link classroom experiences to commercial production of apparel design and accessories. Students will choose commercial Production units where a) the designer uses paper pattern/ freehand-cutting method for garment production or b) specializes in the making of accessories, for their internship. At the end of the programme, students will present either i) three (3) different tailored garments or ii) three (3) accessories (two hats and a neck-tie) for grading. In addition, each student will hand in a detailed report on activities covered. There will be occasional supervision by lecturer in charge of the course.

❖ DEPARTMENT OF SOIL SCIENCE

LEVEL 100 SEM 1

SAMP 101: Sample Course 1
Objective: The course is intended to introduce students to the importance of this sample course.

SOIL 101: Introduction to Soil and the Environment Credits: 2
Theory: Pedology (7 weeks): Concepts of soil; composition of the earth-crust and its environment, pedogenic factors and their interactions, major components of soils; introduction to inorganic components of soils (origin and nature of rocks); classification systems; Soil Physics (6 weeks) Soil as a 3-phase dispersed system. The solid phase: bulk density, particle density, specific surface area, soil texture and classification systems, Stoke's law and particle size analysis. The liquid phase: soil water content and methods of determination including gravimetric, neutron scattering, time domain reflectometry; concept of equivalent depth, soil water storage, total soil water potential (matric, pressure, gravitational, and osmotic or solute potentials) and potential diagrams, soil moisture characteristic and its uses.
Practicals: (6 weeks)
Determination of (a) soil water content on (i) mass basis and (ii) volume basis, (b) bulk density, (c) particle density, (d) particle size analysis (e) soil moisture characteristic using the filter paper method.

LEVEL 100 SEM 2

AGRC 108: General Physics Credits: 3
Viscocity, surface tension, buoyancy, fluid pressure, Newton's law, force, momentum types of forces, work power, energy, conservation of mass, momentum of energy, Heat: temperature, heat, work, gas law, specific heat capacities, heat transfer, melting point, relative humidity, Waves: wave phenomenon types of waves, electromagnetic waves. Magnetics: magnetic field, magnetic effect of current, force on current-carrying conductors, and electromagnetic induction, heat effect of magenetism. Electricity: electric field. The coulomb's law, dialectirc, time domain reflectrometry, conductors and insulators, electric current, electromotive force, Ohm's law, power, electric motors and transformers, electric circuits. Nuclear Physics: radioactivity, fusion, fission, application of nuclear physics.

LEVEL 200 SEM 1

SAMP 201: Sample Course Title Credits: 3
Objective: The course is intended to introduce students to the importance of this sample course.

SOIL 203: Soil Genesis and Characterization Credits: 3
Theory: Inorganic components of soils: rocks and minerals, primary minerals, secondary minerals, clay minerals (1:1 and 2:1); weathering of rocks and minerals: types of weathering, types of parent materials; soil formation and 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. Soil properties used in soil characterization; surface and subsurface diagnostic horizons and other diagnostic properties; soil classification: basic principles and purposes of soil classification, soil as a population, pedon and polypedon concepts, categories and classes, single and multiple category systems, technical and natural (taxonomic) classification systems. Essence of soil classification, types of soil classification (natural and technical), basic characteristics of the USDA soil orders and their FAO (WRB) equivalents; profile characteristics of major soil orders in Ghana.
Practicals: (13 weeks): Identification of minerals and rocks; Soil profile description: soil depth, boundary between horizons, texture by feel, soil colour, consistence, structure.

LEVEL 200 SEM 2

SOIL 204: Chemical and Biochemical Properties of Soils Credits: 2
Theory: Chemical Properties (6 weeks): Soil colloids and ion exchange phenomenon; adsorbed cations-basic and acidic cations, cation exchange capacity (CEC); effective cation exchange capacity (ECEC) of soils; cation exchange and availability of nutrients; anion exchange (AEC). Buffering of soils, buffer

capacity of soils. Soil reaction. Biochemical/ Microbiological Properties (7 weeks): The soil as a habitat for organisms. The study of some microorganisms in soil (i.e. bacteria, fungi and actinomycetes and composition of their cell walls). Factors influencing microbial growth, microbial nutrition i.e. autotrophy and heterotrophy. Introduction to microbial genetics (study of DNA structure and replication, transformation, transduction, conjugation and transposon). Methods of studying the soil microbial population. Inter-relationships between soil organisms i.e. symbiosis, protocooperation, commensalism, ammensalism, predation, parasitism and competition. Carbohydrates, organic nitrogen and organic acids in soil, soil enzymes. Organic matter composition and functions in soil.

Practicals: (13 weeks): Soil pH, soil organic carbon/organic matter, total soil nitrogen, total soil phosphorus, available soil phosphorus, cation exchange capacity, exchangeable bases. Safety instructions in the laboratory, aseptic transfer techniques, growth requirements of microorganisms (ascertaining the effect of different growth conditions such as temperature, pH, salt and sugar concentrations on different organisms). Inducing bacterial mutations, Gram staining procedure for typing microbes, plate method for estimating microbial numbers, streaking to obtain pure isolates, microbial determination by the static incubation method.

LEVEL 300 SEM 1

SOIL 307: Environmental Soil Physics I Credits: 3

Theory: Movement of water in soil: saturated water flow in soil, Darcy's law, water infiltration (horizontal and vertical), profile moisture distribution after infiltration, Empirical infiltration equations, Green and Ampt approach; Soil structure: aggregate stability, factors affecting soil structure; Tillage: "clean" and conservation tillage practices, residue management; Physics of rainfall: amount, intensity, kinetic energy, momentum; Surface runoff and water erosion: laminar and turbulent flow, particle transport by running water, sheet, rill and gully erosion, erosivity of rainfall, erodibility of soil. The Universal Soil Loss Equation (USLE); control of soil erosion: agronomic and engineering methods.
Practicals: Field infiltration determination using the double ring infiltrometer, determination of aggregate stability, estimation of rain drop diameter and kinetic energy of rain, estimation of rainfall intensity from rainfall charts and calculation of kinetic energy using an empirical equation; estimation of soil erodibility using soil particle size distribution; estimation of rainfall erosivity index.

SOIL 309: Soil Research Methodology and Laboratory Analyses Credits: 3

Experimental design; Hypothesis formulation; Site selection and sampling techniques; site characterization. Principles of soil, water, air and plant analyses. Instrumentation and methods of analyses – physical, chemical, microbiological and mineralogical. Analytical procedures of stable and radiogenic isotopes. Interpretation of analytical data.

LEVEL 300 SEM 2

SOIL 306: Management of Soil Environment Credits: 3

Theory: Soil Chemistry (7 weeks): Nutrient elements: forms and their availability in soils, functions in plants, deficiency symptoms. Types of fertilizers, manufacture of nitrogen, phosphorus and potash fertilizers; fertilizers and calculations involving rates of application. Fertilizer usage: fertilizer and economic development, cost/benefit of fertilizer use, effect of fertilizer use on the soil environment. Fertilizer application methods: broadcast and band application, side-dressing, top dressing, foliar application; liming and liming materials. Nutrient uptake processes, mass flow, diffusion and contact exchange. Biochemistry/ Microbiology (6 weeks): Crop residue and organic matter decomposition and management (cellulose, hemicellulose, lignin, C/N ratio) microbiology and biochemistry of composting, green manuring

SOIL 308: Soil Degradation and Rehabilitation Credits: 3

Potential problems and management of major soil orders of Ghana. Soil quality and land degradation, basic concepts, resilience and rehabilitation; Soil physical degradation: extent in Ghana and their causes, e.g. deforestation, erosion, mining, water-logging, etc.; Soil chemical degradation: extent in Ghana, depletion of soil nutrients and organic matter, sorption of non-ionic organic contaminant by soil, causes of chemical degradation e.g. leaching, salinity, sodicity, ameliorative measures; Chemical techniques; Soil

biological degradation: extent in Ghana and causes, loss of beneficial micro-organisms, preponderance of harmful micro-organisms; soil macro-organisms: earthworms, termites; Soil restoration and reclamation practices.

LEVEL 400 SEM 1

SOIL 400: Research Project and Seminar Credits: 3

A project to be carried out by the student under the supervision of senior member(s) of the Department. The student will be required to investigate in some depth a selected problem in soil science, environmental science or agronomy and present seminars and a dissertation in partial fulfillment of the requirements of the B.Sc. Agriculture degree.

SOIL 411: Soil Genesis, Quality and Land-Use Planning Credits: 3

Biogeochemical processes in soil formation: weathering and end-products of inorganic and organic fractions. 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. Soil survey: scales and kinds of soil survey, soil mapping units, soil survey operations. Environmental regulations of lands; Assessment of soil productivity rating / judgement; soil quality evaluation. Understanding what we see in terms of soil genesis: concept of benchmark soils, defining soil series - the hypothetical model. Soil survey reports: land evaluation, soil care, land-use planning, introduction to GIS (Geographic Information Systems). Use of soil classification in soil management and extrapolation of agronomic research results.

SOIL 413: Environmental Soil Physics II Credits: 3

Water content and water potential relationship: revision of water content and soil water potential, the water balance of root zone, field capacity, wilting point and plant available water, soil water characteristic, movement of water through two or three soil layers/horizons, steady and non- steady state flow, continuity equation, Darcy-Richards equation, transport of solutes or pollutants in soil, heat movement, Fourier equation; Climatic factors affecting plant growth: saturated vapour pressure, humidity, radiation energy balance, models of water and heat transport in soil

SOIL 415: Clay and Soil Material Science Credits: 3

Review of crystal chemistry and mineral structures: types and properties of bonding; Structural classification of soil minerals; Minerals in soil environments, origin and chemical composition; Clay minerals: low activity and high activity clays, genesis and properties; Mineral separation and identification: fractionation and analytical methods; Applications of clay and soil minerals: functional properties, uses in industry, agriculture and environmental management.

SOIL 419: Introduction to Paleopedology Credits: 3

Conceptual Background; Geological history of the Earth: geological time-scale; geological formations of Ghana. Relative and absolute dating. phytolith analysis: History of Phytolith research, production, deposition and dissolution of phytolith, phytolith morphology, field techniques and research design, interpretation of phytolith assemblages, the role of phytoliths in paleo-environmental reconstruction; Economic importance of phytoliths.

LEVEL 400 SEM 2

SOIL 400: Research Project and Seminar Credits: 3

A project to be carried out by the student under the supervision of senior member(s) of the Department. The student will be required to investigate in some depth a selected problem in soil science, environmental science or agronomy and present seminars and a dissertation in partial fulfillment of the requirements of the B.Sc. Agriculture degree.

SOIL 412: Soil Biochemistry and Microbiology Credits: 3

Decomposition of organic residues in soils. Transformations of sulphur, iron, manganese in soils, decomposition of pesticide. Biological nitrogen fixation: symbiosis (including grain legumes, trees,

Azolla, pasture/forage) and non symbiotic; Biochemistry of nitrogen fixation (symbiotic and non symbiotic), methods of measuring biological nitrogen fixation (BNF), inoculation, mycorrhiza, methods of studying microbial ecology-antibiotic resistance and select-able markers, serology, gene typing and other methods of molecular biology; Biochemistry of nitrification, denitrification and nitrate reduction; Biochemical transformation of phosphorus, sulphur, hydrocarbons and pesticides. Legume bacteriology. Biochemical processes in the rhizosphere.

SOIL 414: Soil Chemistry and Fertility Credits: 3

Solid phase: Origin and distribution of charge on soil colloid surface, point of zero charge, electrical characteristics of soil/water interface, double layer theory; mechanism of cation and anion fixation in soils. Sulphur, aluminium, pyrite in the formation of soil acidity. Liquid phase: composition, concentration, activities and activity coefficients, Debye-Huckle theory; Chemical factors affecting plant growth: growth expressions, Mitscherlich's law of diminishing returns, Liebig's law of the minimum. Methods of evaluating soil fertility; principles of soil fertility management – fertilizer application, liming, lime requirement of soils, reactions of lime in soils. Management of acidic, saline and sodic soils. Soil and plant factors affecting N availability to plants, behavior of P fertilizers and their availability in soils.