

# **BACHELOR OF SCIENCE IN FOOD SECURITY**

## **1.0 INTRODUCTION**

The curriculum for Bachelor of Science degree in Food Security and Biodiversity is designed to train students to acquire skills and knowledge in preparation to contribute towards conservation and management of food resources to meet the growing world food demands. The concept of sustainability of food resources and effective management of the environment is given special attention. The curriculum is designed to incorporate and use multidisciplinary approach to teaching. It facilitates studying courses that have immediate bearing on world food resources. The program is relevant for a wide range of job opportunities in food production, processing, storage and distribution sectors. Such sectors have been shown to have significant impacts on food security in many communities. The ultimate goal of the curriculum is to produce personnel that will be able to manage the current limited food resources to reduce hunger and poverty and hopefully promote wealth creation.

## **2.0 OBJECTIVES**

The overall objective of the course is to train graduates who are skilled, knowledgeable and motivated to manage community and global food resources to help reduce hunger and poverty and create wealth. The specific objectives are:

- a) To equip students with necessary knowledge in identifying, conserving and managing community and world food resources to increase food security for the increasing world population.
- b) To produce students with relevant skills in managing available community and global food resources for wealth creation.
- c) To train motivated students with relevant attitudes towards multidisciplinary approach to managing world food resources to control community hunger and poverty.

### **3.0 ADMISSION REQUIREMENTS**

- a) Candidates must satisfy the minimum university requirements of mean grade of C+.
  - ) In addition to (a) above, candidates should offer passes at C+ or above in Biology, Physics, Chemistry and Mathematics; and satisfy the Joint Admission Board's subject cluster requirements.

**OR**

- b) Holders of KACE with two principal passes in science subjects and at least a credit in mathematics at Ordinary level.

**OR**

- c) Holders of diploma in agricultural or business related subjects from a recognized institution.

**OR**

- d) Holders of a related degree from a recognized university.

**OR**

- e) Holders of a Higher National Diploma from a recognized institution.

### **4.0 COURSE STRUCTURE AND DURATION**

- a) The degree shall normally take four academic years of 8 semesters.
- b) Courses shall be offered in units. A course unit is defined as that part of a subject described by a coherent syllabus and taught normally over a period of a semester. It is designated as a total of 42 hours of study in a semester. For this purpose one 1-hour lecture is equivalent to one 2-hour tutorial or 3-hour practical or any combination as may be approved by the Board of the School of Agriculture, Food Security and Biodiversity.
- c) Part-time students shall be allowed to take not less than 50% of the courses prescribed for the year.
- d) All courses will be taught for a total of 42 contact hours, including examinations except industrial attachment which will take 480 hours of practical work in a relevant industry.
- e) Students shall be required to undergo an Industrial Attachment of three (3) months at the end of 2<sup>nd</sup> semester of the third year of study.

### **5.0 EXEMPTION FROM COURSES**

Students may be exempted from some courses as approved by Senate on recommendation of the School Board.

## 6.0 EXAMINATION REGULATIONS

University Examination rules and regulations shall apply.

## 7.0 COURSE DISTRIBUTION

### YEAR 1: SEMESTER 1

COURSE CODE	COURSE TITLE	Contact Hours			Weight (Units)
		Lectures	Practical	Total	
AFB 3111	Introduction to Food Security	42	0	42	1C
AFB 3112	Principles of Human Nutrition	42	0	42	1C
AAE3122	Sociology and Development	42	0	42	1R
APT 3114	Introduction to Agriculture	42	0	42	1C
SBI 3114	HIV and AIDS	42	0	42	1R
EEL 3113	Communication Skills	42	0	42	1R
SMA3111	Mathematics I	42	0	42	1R
SCS 3111	Computer Organization and Applications	28	14	42	1R
	<b>Total</b>	<b>322</b>	<b>14</b>	<b>336</b>	<b>8</b>

**YEAR 1: SEMESTER 2**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>Contact Hours</b>			<b>Weight (Units)</b>
		<b>Lectures</b>	<b>Practical</b>	<b>Total</b>	
AFB 3121	Human Physiology	28	14	42	1C
AFB 3122	Introduction to Food Industry	42	0	42	1C
AFB 3123	Ecology	28	14	42	1C
AAE 3123	Farming Systems and Rural Livelihood	42	0	42	1C
ESD 3121	Social Ethics and Integrity	42	0	42	1R
SMA3122	Mathematics II	42	0	42	1R
SLB 3121	Development Studies	42	0	42	1R
AAE3128	Environmental and Social Impact Assessment	42	0	42	1R
	<b>Total</b>	<b>308</b>	<b>28</b>	<b>336</b>	<b>8</b>

**YEAR 2: SEMESTER 1**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>Contact Hours</b>			<b>Weight (Units)</b>
		<b>Lectures</b>	<b>Practical</b>	<b>Total</b>	
ALS 3216	Soils and Civilization	42	0	42	1C
AFB 3211	Food Security and Community Nutrition	42	0	42	1C
AFB 3212	Food Security and World Development	42	0	42	1C
AFB 3213	Climate Change and Food Security	42	0	42	1C
APT 3214	Plant Genetic Resources	28	14	42	1C
AFB3212	Biodiversity and Agricultural	42	0	42	1R

	Biotechnology				
ALS 3211	Agriculture and Environmental Quality	42	0	42	1R
SCS 3231	Data Communications and Networking	28	14	42	1R
	<b>Total</b>	<b>294</b>	<b>28</b>	<b>336</b>	<b>8</b>

## YEAR 2: SEMESTER 2

COURSE CODE	COURSE TITLE	Contact Hours			Weight (Units)
		Lectures	Practical	Total	
AFB 3221	Nutritional Deficiencies and Related Diseases	42	0	42	1C
AFB 3222	Household Food Distribution	42	0	42	1C
AFB 3223	Nutritional Anthropology I	42	0	42	1C
AFB 3224	World Food Distribution	42	0	42	1C
AAE 3225	Principles of Economics	42	0	42	1R
APT3226	Principles of Crop Production	28	14	42	1C
AAS 3221	Principles of Animal Production	28	14	42	1C
AAS 3223	Animals Genetic Resources	28	14	42	1C
	<b>Total</b>	<b>294</b>	<b>42</b>	<b>336</b>	<b>8</b>

**YEAR 3: SEMESTER 1**

COURSE CODE	COURSE TITLE	Contact Hours			Weight (Units)
		Lectures	Practical	Total	
AFB 3311	Consumer Behavior I	42	0	42	1C
AFB 3312	Research Methods in Food Security	42	0	42	1C
AFB 3313	World Food Issues and Human Development	42	0	42	1C
ALS 3314	Land Use and Food Security	42	0	42	1C
APT 3315	Entomology and Food Production	42	0	42	1C
APT 3316	Post Harvest Technology	42	0	42	1C
AFB 3317	Nutritional Anthropology II	42	0	42	1C
PWE3313	Water, Health and Sanitation	42	0	42	1C
	<b>Total</b>	<b>336</b>	<b>0</b>	<b>336</b>	<b>8</b>

**YEAR 3: SEMESTER 2**

COURSE CODE	COURSE TITLE	Contact Hours			Weight (Units)
		Lectures	Practical	Total	
APT 3321	Fruits and Vegetable Production	28	14	42	1C
AFB 3322	Program Planning and Evaluation	42	0	42	1C
AFB 3323	Consumer Behavior II	42	0	42	1C
AFB 3324	Basic Quantitative Methods	28	14	42	1R
AFB 3325	Entrepreneurship in Food Distribution	42	0	42	1C

PEW3321	Soil and Water Conservation Management	42	0	42	1R
AFB 3326	Gender, Nutrition and Food Security	42	0	42	1C
AAS 3327	Apiculture and Sericulture	28	14	42	1C
	<b>Total</b>	<b>294</b>	<b>42</b>	<b>336</b>	<b>8</b>

### YEAR 3: SEMESTER 2

**AFB 3327: Industrial Attachment**

**480 hours**

### YEAR 4: SEMESTER 1

COURSE CODE	COURSE TITLE	Contact Hours			Weight (Units)
		Lectures	Practical	Total	
AFB 3411	Mechanization and World Food Situation	42	0	42	1C
AFB 3412	Global Programs on Food Security	42	0	42	1R
AFB 3413	Monitoring and Evaluating Food Security	42	0	42	1R
AFB 3414	Research Project I and II	14	28	42	1C
AAE 3411	Agricultural Marketing Strategies	42	0	42	1R
SBI 3417	Biodiversity Conservation and Utilization	42	0	42	1R
PES 3416	Environmental Laws and Policy	42	0	42	1R
	<b>Total</b>	<b>266</b>	<b>28</b>	<b>294</b>	<b>7</b>

## YEAR 4: SEMESTER 2

COURSE CODE	COURSE TITLE	Contact Hours			Weight (Units)
		Lectures	Practical	Total	
AFB 3414	Research Project I and II	14	28	42	1C
AFB 3422	Food Quality Assurance and Control	28	14	42	1C
AAE 3423	Extension Methods and Community Outreach	42	0	42	1R
AFB 3424	Food Packaging, Storage, and Distribution	28	14	42	1C
AAE 3425	Agricultural Laws and Food Policy	42	0	42	1R
AFB 3426	Biotechnology in Agriculture	28	14	42	1R
AAS 3427	Aquaculture and Apiculture	28	14	45	
	<b>Total</b>	<b>210</b>	<b>84</b>	<b>294</b>	<b>7</b>

## 8.0 COURSE DESCRIPTIONS

### 8.1: YEAR 1 SEMESTER 1

#### **AFB 3111: Introduction to Food Security**

**42 Hours**

An introduction to the food industry in Kenya, Africa and the world with respect to consumer and industrial perspective; Human nutritional requirements; Sources of food; Attributes of food quality; Principles of handling, processing and preservation of food; Traditional foods and diets; Influence of culture and civilization on food consumption in Kenya; Implications of population growth to the food industry.

#### **AFB 3112: Principles of Human Nutrition**

**42 Hours**

Nutrition and food intake in the health and well being of the individuals; Biochemistry and structure of carbohydrates, lipids, and proteins; Metabolism of food and non-foods including



digestion, absorption, transport; Role of food nutrients in human body; Functions of foods and food additives in human nutrition.

**AAE 3122: Sociology and Development**

**42 Hours**

Historical background of sociology; Social groups and culture; Origins, growth and current state of rural sociology; Importance of rural sociology on extension and community/rural development; The community and its theoretical conceptions; Planned and unplanned development; Importance of change agencies and agents; Rural organizations and leaderships; Indicators and concepts of development; Drivers of growth and development; District focus for rapid rural development; Rural poverty and nutritional problems; Rural unemployment; Rural industrialization and employment creation.

**APT 3114: Introduction to Agriculture**

**42 Hours**

Agricultural industry; Agriculture and its contribution to development; Opportunities for agro-industries; Employment opportunities in agriculture; Land resource: climate and agriculture, soils and agriculture; Cropping systems; Biotechnology in agriculture: Tissue culture and genetic engineering; Harvesting and post-harvesting handling; Agricultural marketing; Classification of animal genetic resources (AnGR); Livestock production systems; Animal breeding, nutrition and management; Non-conventional species; Fish farming and production; Farm power and machinery; Processing and storage of agricultural products; Introduction to agricultural product value chains.

**SBI 3114: HIV and AIDS**

**42 Hours**

Introduction; Historical background and magnitude of HIV/AIDS; General organization of the human body, reproduction, immune system (human physiology) and other factors; Sex and sexuality; The biology of the human immunodeficiency virus and viral transmission; Stages of infection and the development of HIV/AIDS; Opportunistic infections; HIV/AIDS prevention and infection control; Peer education for HIV; Treatment options and vaccine development; blood transfusion and HIV/AIDS; Management of HIV and related infections; Legal and ethical issues in HIV/AIDS; Factors that influence the spread of HIV/AIDS in Africa; Case studies in

selected countries in Africa; HIV/AIDS as a national disaster; Impacts; myths, and emerging issues on HIV/AIDS.

**EEL 3113: Communication Skills**

**42 Hours**

Study skills; Planning study time, making references, filing notes; Preparing for examinations. Library skills: organization, classification, and shelving; Using reference books, listening in lectures, speeches, instructions, understanding lectures, note taking; Speaking skills, asking and answering questions in lectures and seminars, making and defending arguments, agreeing and disagreeing, explaining points clearly; Academic reading skills, skimming and scanning; Understanding footnotes and bibliographical references.

**SMA 3111: Mathematics I**

**42 Hours**

Elementary set theory; Mappings and functions: Definitions, domains, co-domains, range and inverses and composition of functions; Trigonometry; Functions: Their graphs, inverses, degree and radian measure, sine and cosine formulae, trigonometric identities and equations. Algebra: Quadratic equations. Surds, logarithms and indices. Series: Arithmetic and geometric progressions, Permutation and combinations. Binomial theorem and applications such as approximations, simple and compound interest. Remainder theorem applications to solutions of factorizable polynomials. Statistics: Collection and representation of data. Measures of central tendencies and variability. Graphical and axiomatic approaches to probabilities. Tree diagrams. Probability: Definition, axioms, tree diagram.

**SCS 3111: Computer Organization and Applications**

**42 Hours**

Organization: Introduction to the computer and the notion of a programmable machine. The basic organization based on the von Neumann model. Functional components (CPU, memory, I/O) and their logical organization. Number systems and internal data representation. Concept software and types of software. Components of contemporary personal computer systems from end-user perspective; Application: Classical and contemporary applications of computers. Proficiency in basic computer usage and productivity/office automation applications including word-processing, spreadsheets, e-mail, web, etc. Basic first year security and maintenance issues. Ethical and societal issues.

## **YEAR 1 SEMESTER 2**

### **AFB 3121: Human Physiology**

**42 Hours**

Human physiology at cellular and organ system levels: neurophysiology, muscle physiology, cardiovascular physiology, respiration; Digestive system and kidney functions; Hormone function and reproduction system; Relationship between the environment and human physiology.

### **AFB 3122: Introduction to Food Industry**

**42 Hours**

Description of the food industries in Kenya including the status of cereals, proteins, fruits and vegetables; The food industry in Kenya and their role in economic development; Processed food industry and food consumption patterns in the world; The nature and opportunity costs of food crops and industrial crops in food security.

### **APT 3123: Ecology**

**42 Hours**

Introduction: definition and scope of ecology; relation of ecology to other branches of biology; the biological spectrum; subdivision of ecology; theory of integrative levels; ecology and man today; Autecology: definition, factors affecting distribution and abundance of species (temperature, moisture, humidity, pH). Endotherms and ectotherms mechanisms of temperature regulation; temperature and ectothermic metabolism; the day-degree concept; acclimatization; factor compensation; resources and resource classification; Liebig's law of the minimum; Shelford's law of tolerance; factor compensation; habitat; ecological niche; ecological equivalents; Population: definition; numerical and structural characteristics; genetic characteristics; density and density estimation. Population dynamics; average and instantaneous change; natality, mortality; age distribution; growth models; population regulation. Community: definition and concept; ecological dominance; species diversity; species-area curves; ecotones; introduction to ecosystem concept; energy flow in ecosystems; food chains and trophic levels; ecological pyramids.

### **AAE 3123: Farming Systems and Rural Livelihoods**

**42 Hours**

Processes of environmental, economic and social change from the global, regional and local perspectives; Emergence of new forms of production, exchange, consumption, and governance;

Impacts of global and regional production and consumption trends and changes on food and agriculture; Structure and dynamics of agricultural food systems; Trade liberalization; Deregulation of foreign investment; Government divesture in the agricultural sector; Privatization and globalization of agricultural commodity chains; Ascendance of regional and global retailers in poor economies; Governance restrictions and operation of agri-business supplies; Agricultural commodity value chains; Consolidation of food processing and manufacturing; Farming system determinants; Pro-poor farming systems approaches and methodologies.

**ESD 3121: Social Ethics and Integrity**

**42 Hours**

Introduction: Concepts of ethics and its relationship with sociology and psychology; Ethics as a philosophical discipline; Categories of ethics; National cohesion; Unity; Structural injustices; Ethnicity; Positive ethnicity; Peace: Peacemaking, peace building, peace transformation; Stakeholders in National Cohesion; Natural law; Norms of African societies; Customary law; Basic principles of morality; The human person as the author of behavior; The morality of human acts, human conscience, freedom and choice; The problem of evil. Application of ethics and integrity at work.

**SMA 3122: Mathematics II**

**42 Hours**

Coordinate geometry and equations of straight lines. Matrices: Definitions, matrix algebra, determinants, transpose adjoints, inverses and solutions of systems of linear equations using matrix method. Limit continuity; Differentiation and integration of algebraic, trigonometric, exponential functions; Applications of differentiation and integration to rates of change, maxima, minima. Area under curve; First order D.E and their application.

**SLB 3121: Development Studies**

**42Hours**

Development Studies as an autonomous discipline; The concept of development; An overview of the theories and paradigms of development; The relationship between economic growth and development; Science and technology in development; Developed and developing countries; Issues in development: Social, economic and political; Actors in development: The state,

national and international NGOs, bilateral and multilateral institutions, multinational corporations (MNCs), and social movements.

### **AAE 3128: Environmental and Social Impact Assessment**

Physical, social, cultural, political and biological aspects; contemporary environmental planning issues at international, national, regional and local level (population, land, shelter, land use, infrastructure); analysis of environmental problems, data acquisition, sources of data and analysis for environmental planning, urban, regional and rural environmental planning and management; decision support systems and decision making, environmental law, concept of sustainable development; land reform, environmental impact of development actions on the environment Management of the air, water and land resources to minimize environmental degradation.

## **8.2: YEAR 2 SEMESTER 1**

### **ALS 3216: Soils and Civilization**

**42 Hours**

Effects of soil physical, chemical, and biological properties on civilization throughout history. Influence of soils on settlement patterns, land use/management, and civilization decline. Case studies focus on current soil and land use issues in Kenya.

### **AFB 3211: Food Security and Community Nutrition**

**42 Hours**

Community food sources, nutritional deficiencies and related diseases; Community food production patterns, nutrition problems and nutritionally vulnerable individual groups including mother-child; Food deficiency coping strategies in marginal areas; Discussion of multidimensional community nutrition programs designed for mitigation.

### **AFB 3212: Food Security and World Development**

**42 Hours**

Definition of food security, concept, evidence, and components in different countries; Definition of food insecurity, types, occurrence, causes and household situational analysis; Analysis of national governance and food economy in different model countries; Role of food security in economic and social world order; FAO food security policies and essential statistics.

**AFB 3213: Climate Change and Food Security****42 Hours**

Defining climate change and global warming; The climate systems: atmosphere, hydrosphere, cryosphere, lithosphere and biosphere; Mitigating factors of climate change; Climate change and the food security systems: food availability, accessibility, utilization and system stability; Adaptive responses of food security systems to climate change; Climate impact assessment tools; Designing strategies to implement adaptation options. Strengthening community resilience and managing climate change; Sequestering carbon and the global response indicators.

**APT 3214: Plant Genetic Resources****42 Hours**

Definition and importance of plant genetic resources and biological diversity; Centres of biological diversity; Conservation of plant genetic resources (PGR): ex-situ, in-situ, contemporary and participatory approaches; Gene bank practices, the role of gene banks in conservation of PGR; Germ plasm management: collection, maintenance, characterization and evaluation; The role of PGR in food security in the past, present and future; Indigenous PGR in Kenya and Africa: underutilized and neglected crops, use in genetic enhancement and climate change mitigation; Policy framework on PGR.

**AFB 3212: Biodiversity and Agricultural Biotechnology****42 Hours**

Ecosystem structure and functions; Definitions of biodiversity and biotechnology; Importance of biodiversity in Africa; Biodiversity and bio-prospecting; Conservation of biodiversity; Agro-biodiversity; Importance of biotechnology; Industrial and environmental biotechnology; Agricultural and food biotechnology; Health-related biotechnology; Food and nutrition related biotechnology; Emerging trends in biotechnology; Case studies in North America; Implications of agricultural bio technology for developing countries; Biosafety and Intellectual Property Rights (IPRs); Product development, quality control and legislation.

**ALS 3211: Agriculture and Environmental Quality****42 Hours**

Effect of agriculture on environmental quality; Agricultural practices, treatment and utilization of organic wastes. Minimization of agricultural pollution. Sustainable food production and soil quality.

**SCS 3231: Data Communication and Networking****42 Hours**

Introduction to data communication; Data transmission system components; Modulation and modulation methods; Transmission media and their characteristics; Communications interfacing standards; Bandwidth, data rates, capacity; Data communications equipment; Data encoding; Synchronization; Error control: detection and correction; Data compression; Multiplexing; Layered Protocol Architecture; International Standards Organization/Open Systems Interconnection(ISO/OSI) reference model, Medium access protocols; Network topologies.

Computer Networks. Classification: Local Area Networks (LANs), Metropolitan Area Networks (MANs), Wide Area Networks (WANs); Switching technology: circuit switching, packet switching; Routing and bridging; Internetworking, Transmission Control Protocol/Internet Protocol (TCP/IP), addresses, data units, address resolution, sub-networking.

**YEAR 2 SEMESTER 2****AFB 3221: Nutritional Deficiencies and Related Diseases****42 Hours**

Background of nutritional deficiencies and diseases; Child nutritional deficiencies of importance in Africa; Other risk group nutritional problems; Diseases related to protein, carbohydrate, mineral and vitamin deficiencies; diseases related to excessive nutrient intake; Opportunistic diseases related to malnutrition and their management at household levels.

**AFB 3222: Household Food Distribution****42 Hours**

Defining community, household, and family units; Tripartite of the family and how it affects distribution of resources in the household; Altruism, division of labor in the household and how it affects food production and distribution in the household among different communities; Culture and challenges of food distribution and its consequences in the community; Analysis of community, household and family food insecurity coping strategies.

**AFB 3223: Nutritional Anthropology I****42 Hours**

Definition and scope of nutritional anthropology; Socio-cultural values affecting nutrition; Cross cultural concepts of food; Food gathering culture and its influence on household food production

and consumption; Cross cultural approach to methods of food operations: production, preparation, preservation and serving at community and household levels.

**AFB 3224: World Food Distribution**

**42 Hours**

Analysis of the distribution patterns of world food resources; North-South food production, availability, and access; Concepts of strategic food reserve, distribution and access by various population categories; National food reserve data and FAO information systems; Early warning and emergency food monitoring and management systems of the world.

**AAE 3225: Principles of Economics**

**42 Hours**

The scope of economics and nature of economic systems; Definitions and differences in macro and microeconomic; Theory of production, demand and supply; The consumer and behavior; Allocation of resources, markets and market structures, competition, monopoly, monopsony and imperfect competitions; Distribution of resources and current issues in Kenyan economy. Basic concepts and scope of macroeconomics; National income and the income theory; The theory of consumption and investment; Recessions, inflations and the labor force; The fiscal policy and tax system in Kenya.

**APT 3226: Principles of Crop Production**

**42 Hours**

Concepts of crop production; Cropping systems; Environmental factors determining crop performance; Plant diseases and resistance of plants to crop pests; Cultural practices: seedbed preparation, planting practices and seed rates, plant population, weed control. Maintenance of soil fertility; Fertilizers, fertilizer rates and application practices; Organic manures; Crop rotation; Soil and water conservation practices; Harvesting and storage; Environmental issues of fertilizer and pesticide residues.

**AAS 3221: Principles of Animal Production**

**42 Hours**

Animal industries in Kenya; animal production and its contribution to the economy; Animal production systems as affected by ecological factors; Ecological definitions and concepts in relation to animal production systems and their management; Structure, function and ecology of animal production systems; Basic principles of the management of agricultural ecosystems; The



Kenya environment; Major characteristics of the ecological zones of Kenya and effects on animal production; Animal environment and livestock structures; Aspects of livestock design; Economics of controlled environment; Animal growth and development of various organs; Tissues and fibers; Variation of growth and development of the body.

**AAS 3223: Animal Genetic Resources**

**42 Hours**

Biological diversity and its importance; Animal genetic resources (AnGR) of Kenya and diversity: origins, global, regional and national perspectives, their roles, links to environmental sustainability, food security and poverty alleviation; Inventory and characterization of (AnGR); Threats to AnGR diversity and counter initiatives: global, regional and national; value enhancement; sustainable use including conservation; Conservation methods: policies, legal and institutional frameworks for access to and use of AnGR and materials, including equity and ownership issues; global, regional and national collaboration, including trans-boundary and cross-boarder arrangements, conventions.

**8.3: YEAR 3 SEMESTER 1**

**AFB 3311: Consumer Behavior I**

**42 Hours**

Introduction to the consumer behavior; Values, satisfaction and social responsibility of a consumer; Motivation theory of a consumer; Consumer attitude formation and change; Structural models of attitudes: tri-component attitude, multi-attribute attitude models and how they influence consumer behavior; Consumer decision making models: input, process and output; Family decision making and consumption related roles; Demand responsiveness and family consumption pattern; The family life cycle and food security in households.

**AFB 3312: Research Methods in Food Security**

**42 Hours**

Overview of research activities in food security, meaning and purpose of; Basic research terms and their applications in food security; Qualitative and quantitative research designs; Instrumentation: techniques for developing measurement tools and equipment; Sampling methods, data collection and managing primary and secondary data; Measuring food availability, accessibility, utilization and system stability in a community; Data analysis and presentations techniques; Writing fundable research proposals and projects; Students to be introduced to

FAO/WHO data bank and instructed on analysis and usage; Ethical issues in research and publication.

**AFB 3313: World Food Issues and Human Development**

**42 Hours**

Third world economic development and historical injustice in modern civilization; Current world food situation; Population trends and socioeconomic policies governing disparities and trans-regional development; Political debates in food production, agro-fuels production, and nutritional deficiencies in key areas of the developing world. World political dispensation order that influence food security; Population growth and geographic mapping of human traffic and settlement in Africa.

**ALS 3314: Land Use and Food Security**

**42 Hours**

Demography, agricultural activities and environmental degradation; Land use planning and productivity; Principles of wetland management; Land use activities: planning, managing and agricultural production at given economic status of households.

**APT 3315: Entomology and Food Production**

**42 Hours**

Important insects and insect pests management; Insect vectors, Pollinators with emphasis on their role under greenhouse culture; Rearing beneficial insects; Principles of pest control in horticulture; Cultural, chemical, biological and integrated pest management and safety precautions; Nutritional value of edible insects and the role of entomophagy in food security; Future of insects as food and potential for rearing.

**APT 3316: Post Harvest Technology**

**42 Hours**

Physiological processes influencing senescence and spoilage of harvested food products; Post harvest compositional changes; Role of plant hormones in post harvest life; Principles and practices of agricultural post harvest techniques: handling, grading, packaging, transportation and storage; Quality indices and standards, quality maintenance and storage shelf life; Assessment of post harvest losses; Importance of food processing industry in distribution and utilization of food; Food preservation methods: freezing, fermentation, dehydration and chemical methods of processing for storage.

**AFB 3317: Nutritional Anthropology II**

**42 Hours**

Typology of African traditional foods and food cultures in different communities in Africa; Food proscriptions and their influence on health; Advances in ethno-botany in health and nutritional management; Assessment of nutritional status of various members of the family. Students to write term papers on any area of anthropology, ethno-botany or related topical issues in Africa touching on biodiversity, health and nutrition.

**PWE 3313: Water, Health and Sanitation****42 Hours**

Structure of water; The state, physical and chemical properties of water that make it suitable for life; Occurrence and distribution of trace elements in natural water systems and the relationship to human, animal and plant health. Water supply and sanitation; Self cleaning capacity of water; Water pollution and water quality standards; Monitoring and detection of changes in water quality; Water resources.

**YEAR 3 SEMESTER 2****APT 3321: Fruits and Vegetable Production****42 Hours**

Fruits and vegetable classification; Propagation and cropping systems; Types of vegetable and fruit growing: backyard gardening, market gardening, truck gardening; Vegetable and fruits production for processing; Production of tropical and sub-tropical fruits; The fruits and vegetable industry in Kenya; Plant and cultural factors; Fruits and vegetable plant manipulation for yield, quality, and management; Use of plant hormones for fruit set and fruit thinning; Orchards establishment and management; Cultural practices, crop protection, harvesting, post-harvest handling and marketing; Case studies: introduction to microclimate modification in vegetables and fruits ecosystems; Local fruits and vegetables industry in Kenya.

**AFB 3322: Program Planning and Evaluation****42 Hours**

Defining needs, and need assessment tools; Review of need assessment tools and techniques for food security; Conducting need assessment for development programs; Logic models for program planning: interactive models, classical and naturalistic view of program planning and evaluation. Students undertake case study of models for need assessment, program planning and evaluation, plan logic frameworks for program implementations.

**AFB 3323: Consumer Behaviour II****42 Hours**

Economic models of consumer behaviour: demand, utility, budget constraints and how they influence food procurement in Africa. Interactions of production and consumption decisions in households; Production, consumption and aggregate effect of household response to food demands. Determinants of savings and saving index in Kenya and how they influences food consumption behaviour; Discussion on influence of culture, consumption and food security in

different communities in Africa. Students to compare rural and urban statistics from different countries.

**AFB 3324: Basic Quantitative Methods**

**42 Hours**

Defining measurement and measurement scales in research; Measurement of central tendency; Simple and multiple regression analyses; Central limit theory and estimating population mean; Testing hypotheses, Chi-square test and analysis of variance and covariance using various food security data. Students will be introduced to data analysis by computer, interpretation of data, and the use of qualitative value to describe output. Appropriate computer packages shall be identified and used as necessary.

**AFB 3325: Entrepreneurship in Food Distribution**

**42 Hours**

Defining entrepreneurship and food vending in the region; Theories and functional models of entrepreneurship; Perspectives of small and corporate entrepreneurship in the food industry; Human side of entrepreneurship and innovativeness to meet needs in food distribution; Organizing and financing new ventures in food industry; Marketing and franchising products and services; Marketing research for new ventures in food production, operations and distribution; Role of women in food vending industry; Food operation acts and policies, social ethics and responsibility in food distribution; Environmental issues in food vending and distribution.

**PWE 3321: Soil and Water Conservation Management**

**42 Hours**

Overview of Kenyan soils, landscapes and precipitation patterns; Soil erosion by water and wind: processes, mechanics, factors influencing assessment, measurement and modelling. Methods of soil and water conservation: control of erosion and sedimentation. Designing and construction of soil and water conservation structures. Soil and water conservation strategies in different eco-regions and in irrigation schemes. Effects of land management on stream flow, storm flow, water quality, quantity and timing of flows. Role of vegetation in erosion control. Environmental impact analysis of deforestation. Reducing erosion impacts of roads and other development. Strategies, approaches and systems in integrated watershed management. Soils, forests, land management, wetlands and their relationship with floods.

**AFB 3326: Gender, Nutrition and Food Security****42 Hours**

Defining gender concepts and gender mainstreaming; Theoretical gender concepts and gender relations in development; Impact of gender inequality on nutritional outcome of family especially on maternal/child nutrition; The face of gender and poverty on household food production; Short term/long term nutritional challenges of gender disparity in African communities; Millennium Development Goal 3 (on gender) and its role on world food security; Global burden of gender disparities; Gender policy interventions for food security in Kenya; Case studies on empowerment of women and food production and security from developing nations.

**AAS 3327: Apiculture and Sericulture****42 Hours**

The role of bees in agriculture. Biology of the honeybee. Breeding, diseases and pests. The management of a bee colony with respect to flowering vegetation, foraging behaviour and feeding. Swam control. Types of hives. Harvesting, handling, processing, grading and marketing of honey wax. The honey and wax industry. Includes a visit to a honey processing plant. Y4 S2

**YEAR 3: SEMESTER 3****AFB 3327: Industrial Attachment****480 Hours**

Students to be attached to any foods industry of interest, NGOs, and relevant institutions, extension programs, research stations or other relevant institutions for a period of 12 weeks. During the industrial attachment the students will be expected to acquire first hand impression and experience of practical food and nutrition activities through personal participation and involvement. Each student is evaluated at their place of attachment at least once on-the spot. Student will submit a report on his/her attachment activities for evaluation within the first 2 weeks of reporting back to campus. The Bondo University College rules and regulations for industrial attachments shall apply.

**8.4: YEAR 4 SEMESTER 1****AFB 3411: Mechanization and World Food Situation****42 Hours**

A discussion class where students review the various mechanization strategies for food production from different parts of the world present the models in class and analyse their impact

on world food production and distribution. Case studies of transfer of technologies such as the green revolution and white revolution in India. Students will identify pros and cons of technology transfers and discuss their potentials for adoption under Kenyan political, social-economical and ecological conditions.

**AFB 3412: Global Programs on Food Security**

**42 Hours**

Defining sustainability and sustainable agricultural production; Concepts of hunger, feminization of poverty and food production in Africa; Models of managing biodiversity and food production in developing countries; Role of indigenous knowledge in food production; Global governance of FAO and other food production programs in Africa, their successes and challenges. Students shall write term papers on selected global program models and how they have influenced food security in particular countries.

**AFB 3413: Monitoring and Evaluating Food Security**

**42 Hours**

Defining monitoring and evaluation; Role of monitoring in program evaluation; Rapid Rural Appraisal methods in research and evaluation projects; Characteristics of monitoring projects; Types, purpose and process of evaluation; Designs of evaluation: participatory surveys and secondary data collection; Comparing monitoring and evaluation approaches in formal research surveys and field appraisals; Managing output and outcome as feedbacks and utilization of the evaluation results; Case studies in monitoring and evaluation in developing countries.

**AFB 3414: Research Project I and II**

**42 Hours**

Each student will undertake empirical research project in any area of food security. The learners will prepare research proposals and continue to conduct a mini study. The project will be conducted under supervision of teaching and technical staff. The student will prepare a research proposal guided by an appointed supervisor and continue to conduct the experiment, write a report and give an oral presentation. The project and the oral presentation will be presented in the second semester of the same year. (Prerequisite AFB 312 and AFB 324).

**AAE 3411: Agricultural Marketing Strategies**

**42 Hours**

Marketing research; The marketing mix with specific reference to food situation; Strengths, weaknesses, constraints cum problem tree analysis; Advertising and sales management of agricultural goods and services; Business information system and forecasting methods; Promotion as a system and the sales force of south-north relationship; Distribution policy as well as physical distribution of agricultural commodities; Short, medium and long term marketing strategies of agricultural goods and services; The market plan: activities, costs, duration; Marketing and food safety standards – domestic and international rules and regulations.

**SBI 3417: Biodiversity Conservation and Utilization**

**42 Hours**

Introduction to basic concepts of biodiversity, how it is organized in the natural world; Threats on biodiversity, cost and benefits of sustaining ecosystems. Definitions and current status of Kenyan biodiversity; Renewable and non-renewable resources of the earth; Conservation and development aims; Human activities and loss of biodiversity with specific reference to tropical ecosystems and East African communities. Conservation principles and strategies; Biodiversity and gene pool; Preservation value of biodiversity; Human dependence on biodiversity; Domesticated biota: indigenous and exotic; Case studies of the environmental and social consequences of economic development and conservation in the tropical climate.

**PES 3416: Environmental Laws and Policy**

**42 Hours**

Principles of environmental laws; Development of environments laws: international, regional, and national; Environmental laws in Kenya; Introduction to land use laws; Water resource laws; Energy conservation acts and law; Forest reserve laws and acts; wildlife acts and laws; Fisheries law and acts; Public health act. Laws of the working environments; Factories act; The National Environmental Management Authority (NEMA) and the environment act; Impact of laws on the protection of resources and ecosystems.

**YEAR 4 SEMESTER 2**

**AFB 3414: Research Project I and II**

**42 Hours**

Each student will undertake empirical research project in any area of food security. The learners will prepare research proposals and continue to conduct a mini study. The project will be conducted under supervision of teaching and technical staff. The student will prepare a research



proposal guided by an appointed supervisor and continue to conduct the experiment, write a report and give an oral presentation. The project and the oral presentation will be presented in the second semester of the same year. (Prerequisite AFB 312 and AFB 324).

**AAE 3423: International Agricultural Trade**

**42 Hours**

International economics and its main themes; Theory of international trade: Comparative advantage, the Ricardian model (one-factor economy), specific factors and income distribution, resources and trade; The Hechscher-Ohlin model: Economics of scale and imperfect competition and international trade; International trade policies: tariffs, non-tariff instruments; Political economy of trade policy: Cases for and against free trade, trade policy in developing countries; Import substitution; Trade liberalization; Foreign market access and north-south debate; International negotiations and trade: Regional integration agreements; General agreement on Trade and Tariffs (GATT) and World trade Organization; Current state of trade links and obstacles in the greater horn and eastern Africa.

**AFB 3422: Food Quality Assurance and Control**

**42 Hours**

Definition of and characteristics of quality measures; Principles of food quality control and the Deming philosophy in quality leadership; Customer satisfaction, tools and techniques for total quality management and quality management systems in food industry; evaluation of food quality using microbiological, chemical, instrumental and sensory methods; statistical methods in quality control; International Organization for Standards (ISO) series and Food legislations in Kenya.

**AAE 3423: Extension Methods and Community Outreach**

**42Hours**

Extension methods, organization and administration of extension systems in food production; Theories of social change, innovation, diffusion and adoption; Individual and group methods of extension; Channels of reaching out to communities; Government interventions in modernization of food production channels; Review of Kenya's past and present methodologies of farming systems; Challenges in adoption and sustainability of development programs in the country.

**AFB 3424: Food Packaging, Storage and Distribution**

**42 Hours**

Principles of food packaging; Packaging materials and their environmental considerations; Forms, characteristics, applications and effectiveness of packaging materials for food items; Sources of food contamination, management and quality implications of storage and packaging material; Packaging and storage of raw materials relative to processed products for distribution; Transportation, road network and environmental challenges of distribution of raw food materials; Case studies on food marketing, distribution and cost and levels of living in rural Kenya.

**AAE 3425: Agricultural Laws and Food Policy**

**42 Hours**

Analysis of economic, social and agricultural land ownership policies that affect food security and nutrition; National food regulations policies; Legal implication and definition of food and nutrition security; Legal framework for food production, conservation and utilization in Kenya; Agricultural farm employment and protection of farm labor in Kenya; Legal cover of farmer organizations such as groups, co-operatives, food banks and companies, and their role in food supply and distribution; Credit supply and supervision for food production; Taxation and its effects on food production; Case studies on Kenyan food policy documents, challenges including their success and constraints.

**AFB 3426: Biotechnology in Agriculture**

**42 Hours**

Plant cell, tissue, organ culture and its limitations; introduction to molecular genetics (Recombinant DNA, genetic manipulation/purification techniques; DNA cloning and their manipulations; genetic transformation; gene vectors, promoters; marker genes and natural genetic engineering; RAPD, PCR, RFLP; (chromosome walking; DNA foot printing); Cell culture mutants and their uses; Plant somatic cell genetic systems; Protoplast fusion and somatic hybridization; Industrial and agricultural application of Biotechnology; Property rights and patenting issues of plant biotechnology; Ecological bio-safety implications of biotechnology on biodiversity; Current advances in biotechnology.

**SBI 3424: Aquaculture**

**42 Hours**

Pattern of reproduction of fish suitable for culture; Inducement of spawning in fish; Growth of fish under culture; Fish rearing; Pond management; Diseases of fish; Growth and maintenance of fish populations; Food competition and niche; Predator-prey relationships; Fish population

dynamics; Fishing gears; Techniques in location of fish stocks; Fisheries management; Fish forecasting; Fish processing.