

FACULTY OF AGRICULTURE

B. AGRICULTURE

100 Level

First Semester		Credits
1.	Communication in English I	2
2.	Logic Philosophy & Human Existence	2
3.	Physical Chemistry	2
4.	General Biology I (Botany/Zoology)	2
5.	Practical Biology	2
6.	General Physics	2
7.	Mathematics	2
8.	Organic Chemistry I	2
9.	Practical Chemistry	2
Sub-Total		18 Credits

Second Semester		Credits
10.	Communication in English II	2
11.	Nigerian People and Culture	2
12.	Social Sciences	2
13.	Organic Chemistry	2
14.	Biology II	2
15.	Organic Chemistry II	2
16.	Mathematics	2
17.	Practical Physics	2
18.	Use of Library	1
Sub-Total		17 Credits

200 Level

First Semester		Credits
1.	Climatology and Biogeography	3
2.	General Agriculture	3
3.	Anatomy and Physiology of Farm Animals	2
4.	Crop Anatomy, Taxonomy and Physiology	2
5.	Principles of Soil Science	2
6.	Principles of Agricultural Economics	2
7.	Introduction to Forestry Resource Management	2
8.	Introduction to Biotechnology	2
Sub-Total		18 Credits

Second Semester		Credits
8.	Principles of Animal Production	2
9.	Principles of Crop Production	2
10.	Principles of Food Science and Technology	2
11.	Introductory Biochemistry	2
12.	Introduction to Computers	3
13.	Introduction to Fisheries & Wildlife	2
14.	Introductory Statistics	2
15.	Entrepreneurial Studies I	2
16.	Introduction to Home Economics	2
Sub-Total		19 Credits

Total = 37 Credits

All courses are core-courses for Agriculture, Fisheries and Forestry.

300 Level		
	First Semester	Credits
1.	Non-ruminant Animal Production	2
2.	Arable Crop Production	2
3.	Introduction to Soil Pedology and Physics	2
4.	Introduction to Agricultural Extension and Rural Sociology	2
5.	Introduction to Farm Machinery	2
6.	Applications of Computer to Agricultural Production	3
7.	Crop Genetics and Breeding	2
8.	Introduction to Farm Management and Production Economics	2
	Sub-Total	17 Credits
	Second Semester	Credits
9.	Ruminant Animal Production	2
10.	Permanent Crop Production	2
11.	Principles of Crop Protection	2
12.	Animal Genetics and Breeding	2
13.	Soil Chemistry and Micro-Biology	2
14.	Extension Teaching, Learning Process & Methods	2
15.	Agricultural Biochemistry and Methods	2
16.	Statistics and Data Processing	2
17.	Entrepreneur StudiesII	2
	Sub-Total	18 Credits

Total = 35 Credits

All courses are core courses for students in Agriculture

The Farm Practical Year

The fourth year should be basically left for practical farm training. This training should be for a duration of 12 months of which not less than 80% should be devoted to practical training on a farm and related industries. There should be no classroom lectures during the practical year. The practical farm training should normally not commence before the fourth year (in a 5-year programme) in order to make it meaningful since the students are expected to put into practical use the knowledge they have learned in the classroom and laboratory. The year would involve practical training in the following areas.

400 Level (Practical Year)		Credits
Agriculture		
1.	Crop Production Techniques (Ppermanent, Arable and Horticultural Crops etc.)	4
2.	Animal Husbandry Techniques (cattle, sheep, goats, poultry, pigs and rabbits)	3
3.	Agricultural Products Processing and Storage	2
4.	Crop Protection and Pests and Disease Control	2
5.	Animal Health Management	2
6.	Soil Fertility, Soil and Water Management	2
7.	Farm Design, Farm Survey and Land Use Planning	2
8.	Farm Management, Farm Records and Farm Accounts	2
9.	Extension Practices	2
10.	Workshop Practices	2
11.	Farm Mechanization Practices	2
12.	Agricultural Meteorology	2
13.	Report Writing	3
Total		30 Credits

Student performance in all of the above areas should be assessed and awarded grades. Furthermore, the Farm practical training should carry a minimum of 30 Credit units provided this minimum is not less than the minimum number of credits required by the status of the University.

The Final Year

During the first four years all students pursue a common programme. In the fifth year they would be allowed to choose options.

In addition to prescribed academic courses in the option area students must carry out a research-oriented project. The project and the course work for the final year should carry a minimum of 30 credit units with the project work accounting for at least 4 units.

The major areas in which a student can choose an option include: Agricultural Economics and Extension, Animal Science, and Crops/Soil Science, Horticulture.

The prescribed course work in the option year should be made up of 80% of courses from the option area and 20% from other major areas of Agriculture.

The approved course to be offered in the various options are as follows:

500 Level

Agricultural Economics And Farm Management/ Agricultural Extension Option

	First Semester	Credits
1.	Statistics and Research Methods	2
2.	Production Economics, Farm Management and Accounting	2
3.	Econometrics	2
4.	Diffusion of Innovations	2
5.	Administration and Programme Planning in Extension	2
6.	Extension Organization, Management and Supervision	2
7.	Crop Production	2
8.	Seminar	1
9.	Project	2
	Sub-Total	17 Credits

	Second Semester	Credits
10.	Agri-business Management and Finance	2
11.	Agric. Policy and Development	2 Elective
12.	Agric. Project Appraisal, Management and Evaluation	2
13.	Rural Community Development	2
14.	Advanced Rural Sociology	2
15.	Technological and Social Change in Agriculture	2 Elective
16.	Animal Production (500 Level)	2
17.	Project	2
	Sub-Total	16 Credits

Animal Production Option

	First Semester	Credits
1.	Poultry, Swine and Rabbit Production	2 Core
2.	Cattle, Sheep and Goat Production	2 "
3.	Applied Animal Breeding	2 "
4.	Reproductive Physiology and Artificial Insemination	2 "
5.	Animal Experimentation & Research Techniques	2 "
6.	Nigerian Feeds and Feeding Stuffs	2 "
7.	Agri-business Management and Finance	2 "
8.	Adm. & Programme Planning in Extension	2 Elective
9.	Seminar	1
10.	Project	2
	Sub-Total	19 Credits

Second Semester	Credits
11. Monogastric Nutrition	2 Core
12. Ruminant Nutrition	2 "
13. Animal Products and Handling	2 "
14. Pasture and Range Management	2 "
15. Animal Health and Diseases	2 Core
16. Livestock Economics	2 "
17. Game Production and Utilization	2 Elective
18. Project	2 Core
19. Principles of Co-operative Practice	2

Sub-Total 18 Credits

Choose minimum of 32 Credits.

Crops/Soil Science/Horticulture Options

First Semester	Credits
1. Vegetable and Fruit Crop Production)	2
2. Crop Husbandry (Field Crops)	2
3. Field Experimentation	2
4. Plant Protection	2
5. Soil Survey and Land Use Planning	2
6. Soil Physics	2
7. Soil and Plant Analysis	2
8. Soil Chemistry	2 Elective
9. Seminars	2
10. Soil and Water Conservation	2
11. Floriculture	2
12. Landscape Design	2
13. Micropropagation	2
14. Park Design and Management	2
15. Project	2

Sub-Total 22 Credits

Second Semester	Credits
16. Crop Husbandry (Plantation Crops)	2
17. Forage and Fodder Crop Production	2
18. Plant Breeding (Including Seed Production)	2
19. Weed Science	2
20. Post Harvest Physiology & Product Storage	2
21. Soil Fertility and Plant Nutrition	2
22. Principles of Irrigation	2
23. Project	2
24. Seminar	1

Sub-Total 17 Credits

COURSE DESCRIPTIONS

100 Level First Semester

Mathematics (2 Credits)

Algebra and trigonometry: Real number system; real sequences and series; set and subsets; unit interaction, complements; empty and universal sets; Venn diagram; one way correspondence between sets; quadratic function and equations; solution of linear equations; simple properties of determinants; indices and binomial theorem; transformations; e.g. log transformation; equations of straight line and application to simple regression equations; permutations and combinations; circular measure, trigonometric functions of angles; addition and factor formulae; complex numbers; moments and couples; relative velocity; calculus; elementary functions of simple real variable; graphs of simple functions, the differentiation of simple algebraic: exponential and log functions; the differentiation of a sum; product, quotient, function of function rules; implicit differentiation : definite and indefinite integrations of functions; application of definite and indefinite integrals to areas and volumes.

General Chemistry: Physical Chemistry (2 Credits)

Atoms; Sub-atomic particles, Isotopes, Avogadro's number; The Mole Concept; Chemical Formulae; The laws of Chemical Combinations; Equations and Calculations; State of Matter; Gases, Liquids and Solids; Chemical Thermodynamics; Energetics and Thermochemistry; Buffers, Chemical Equilibrium and Equilibrium Constants; Solubility Products; Chemical kinetics; Electrochemistry; Nuclear Binding Energy, Fission and Fusion.

Organic Chemistry I (2 Credits)

Definition, nomenclature; functional groups; homologous series; families of organic compounds – composition, structure, formulae, synthesis, isolation and purification; isomerism; electronic theory in organic chemistry; alkanes, alkenes and alkynes; Benzene ring and aromatic compounds.

(Biology I): Cell Biology and Lower Plants (2 Credits)

Cellular basis of life; general structure and functions of plant cells and cellular organelles; plant cell division; heredity; diversity in plant cells and habitats; Morphology general characteristics, life cycles and range of forms of bacteria, viruses, fungi, algae, bryophytes, Lichens and pteridophytes.

(Biology I): Cell Biology and Invertebrate Zoology (2 Credits)

General structure of animal cell. Functions of animal cells and cellular organelles; animal cell types and division. Forms, Functions and life history of invertebrates using selected examples from classes of invertebrates such as protozoa, coelenterates, Arthropods, Plantyhelminthes, Aschelminthes, Annelida and Mollusca.

General Physics (2 Credits)

Relevance of physics to agriculture. Selected topics and application to agriculture in mechanics, properties of matter, waves and sound, vibrations, electromagnetism, heat, optics, light, thermal physics, atomic and nuclear physics.

Second Semester

Social Science (2 Units)

Classification of Social Systems. Interpersonal Relationships, Personality Traits and Leadership Qualities. The Role of the Media. Meaning, Scope and Indices of Development: Historical Perspectives, Ideological Bases, Economic, Political and Social Factors of Development, Self Reliance and National Development. Growth and Spatial

Distribution of Population, Delivery of Public goods through public enterprises and agencies, Peaceful co-existence among nations.

Mathematics (2 Credits)

Types of vectors and their application; matrices; simple linear equations; loci; integration; differential equations; first and second-order chemical equations; straight lines and planes; angle between lines and planes; distance of point from a plane; distance between 2 skew lines; circles. Introduction to statistics; diagrammatic representation of descriptive data; measures of location and dispersion for grouped data; curves and graphs; histograms; scatter diagram; theory of probability; binomial distribution; collection, tabulation and representation of agricultural data; mean; mode and median; analysis of variance; linear regression and correlation.

General Chemistry: Inorganic Chemistry (2 Credits)

Water; acids, bases and salts; chemical equilibrium, precipitation and complexometric reactions; oxidation-reduction reactions; Gravimetric analysis; the periodic table and periodicity of the elements; ionic, covalent and metallic bonds; oxidation numbers; chemistry of selected groups; IA, IB, IIA, IIB and VIIA. Qualitative inorganic analysis theory and practice of volumetric analysis.

Organic Chemistry II (2 Credits)

The Chemistry of alcohols, phenols, aldehydes, ketones, carbocyclic acids and amines. The basic chemistry and importance of lipids, proteins and carbohydrates and other natural products.

Botany – Higher Plants (2 Credits)

Morphology, anatomy, histology and physiology of angiosperms and gymnosperms flowering plants; seed and fruit structure, dispersal and germination; plant development; photosynthesis, respiration, transpiration, translocation; storage organs; flower structure and diversity.

Zoology – Vertebrate Zoology (2 Credits)

Form and structure of vertebrates, protochordates (Amphioxus), amphibia, fish, reptiles, birds, and mammals. The morphology and anatomy of various systems; skin, skeletal, muscular, alimentary, respiratory, circulatory, excretory, nervous, endocrine and reproductive systems of vertebrates. Introduction to histology and embryology. Introductory animal physiology.

Practical Physics (2 Credits)

Use of measuring instruments; surface tension, inertia, viscosity, refractive index, optical instruments, tension, energy, heat capacity, temperature, heat and work; obscure expansions, latent heat waves, current flow.

200 Level

First Semester

General Agriculture (3 Credits)

The definition of agriculture. World population and food supply. History, scope and importance of agriculture to man. Agriculture and natural environment, Characteristic features of tropical agriculture and how they affect production. Land use and tenure. Trends in the production, distribution and utilization of agricultural products. Measures of improving Nigerian Agriculture. Climatic, edaphic and social factors in relation to crop production and distributions in Nigeria. Systems of crop farming. Types, distribution and significance of farm animals; basic principles of animal farming. Place of forestry, fish farming and wildlife in Agriculture.

Climatology and Biogeography (3 Credits)

The principles, aims and scope of climatology and biogeography. The elements and controls of climate and weather and the dynamics of the earth's atmosphere. Radiation and heating of the atmospheric systems, atmospheric moisture, the dynamics of pressure and wind systems. Condensation and precipitation processes. Seasonal variations in temperature, day length, radiation, rainfall and evapotranspiration. Equipment and maintenance of standard meteorological stations. The tropical climate; relation between agriculture and climate with reference to crops, livestock, irrigation, pests and diseases.

Anatomy and Physiology of Farm Animals (2 Credits)

Parts of the beef and dairy cattle, sheep, goats, pigs, rabbits and poultry. Fundamentals of cell biology. Anatomy and physiology of the cell, cell types. Anatomy and physiology of animal tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses and other systems of farm animals. Physiological functions of animals – homeostatic, nutrition and digestion, respiration. Temperature regulation, excretion and reproduction. Endocrinology. The blood and circulation. Lactation, milk let down and egg production. Water balance.

Crop Anatomy, Taxonomy and Physiology (2 Credits)

Parts of the crop cell types. Introduction to plant taxonomy. Characteristics, distribution, economic importance and local examples of leguminosae, gramineae, compositae, Dioscoreaceae, Rutaceae, Development of cells and tissues; use of plant keys. Cell biology, cell and cell types.

Comparative anatomy of major plant organs. Enzymes. Photosynthesis and translocation; Pollination, respiration and energy utilization; seed dormancy and germination, development; mineral nutrition, growth regulation.

Principles of Soil Science (2 Credits)

Soils, their origin and formation. Physical properties of soils. Soil moisture, air and temperature, soil classification and survey. Soil colloids; soil reactions. Soil organic matter and soil organisms; soil and water conservation; Nutrient requirements and mineral nutrition of plants. Introduction to fertilizer (organic and Inorganic).

Principles of Agricultural Economics (2 Credits)

The nature of economics and economic problems; scope and method; price theory and functions of the market with particular reference to agriculture. The concept of opportunity cost; Supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. price theory and some applications. Theory of distribution; the components of agriculture in National income. Recourse allocation on farms. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking.

Principles of Forestry (2 Credits)

Renewable natural resources, availability, distribution and potential. The important forest trees and wildlife (with emphasis on Nigerian species). Classification, morphology and distribution of important forest trees. Forest and game reserves in Nigeria. Silviculture; afforestation, characteristics of major timber and their uses. Felling and log transportation.

Second Semester

Principles of Animal Production (2 Credits)

Animal Production and its development. The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry and rabbits. Systems of livestock production, Feeding habit of Farm animals. Principles of breeding and livestock judging. General principles of management of the different types of farm animals.

Principles of Crop Production (2 Credits)

Crop production and its development. The principles, problems and prospects of crop production. Importance of crop rotation, cultural practices; water and soil conservation; irrigation and drainage. General types and characteristics of arthropods, micro-organisms and other pests affecting crops. Weeds and their effects on crop production, pests, diseases and weed control. Basic Mendelian genetics. Principles of crop production, harvesting, processing and storage.

Principles of Food Science and Technology (2 Credits)

Definition and Scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma and flavour of food. Cost; traditional and ethnic influence of food preparation and consumption pattern.

Introductory Agricultural Biochemistry (2 Credits)

Basic Pathways Chemistry of carbohydrates, lipids, proteins and nucleic acids Vitamins and their coenzyme functions. Minerals. The nature, classification and function of enzymes and hormones Bioenergetics

Introduction to Computer Science (3 Credits)

History of Computers, functional components of computer, characteristics of a computer; problem solving; flow charts, algorithms, computer programming; statements; symbolic names; arrays, subscripts expressions and control statements. Introduction to BASIC Programming computer applications. Hands-on experience.

Introduction to Fisheries and Wildlife (2 Credits)

The important fishes and wildlife of West Africa with emphasis on Nigerian species. Classification, evolution, morphology and basic structure of fishes. The adaptation of fish to aquatic life. Life cycle of principal species of fishes and wildlife. Significance of fishes and wildlife in the diet of Nigerians. The fish and wildlife industries in Nigeria. Fundamental Principles of fish and wildlife management and production.

Introduction to Home Economics (2 Credits)

Philosophy, Scope, objectives and historical development of Home Economics. Examination of basic human needs with respect to food, clothing, shelter and health, Programme approaches in Home Economics which will help meet these needs. Preparation for careers in a variety of occupations.

Introduction to Biotechnology (2 Units)

Also see pages 33-35 of this document.

**300 Level
First Semester**

Non-Ruminant Animal Production (2 Credits)

Management of breeding stock, growing and young animals. Housing, equipment and feeding principles of poultry, rabbits and pigs. Production and management practices; Livestock Economics; Health management of stock; processing and marketing of poultry, pigs and rabbits.

Arable Crop Production (2 Credits)

Origin, distribution, soil and climatic requirements of cereals, legumes, root crops, fibre crops, vegetables and other important arable crops in Nigeria. Improved varieties. Production practices, harvesting, utilization, processing, storage and economic aspects of some selected arable crops.

Introductory Soil Pedology and Physics (2 Credits)

Soils, its origin and formation. Soil morphological characteristics, Soil components, soil forming rocks and minerals, weathering of rocks and minerals. Profile description, soil survey, soil mapping. Soil classification, properties and management of Nigerian soils.

Classification of soil separates; solid texture, surface area of particles; aggregation soil structure and stability; porosity, soil water relations, soil and water the hydrological cycle, soil temperature and conduction, Soil erosion.

Introduction to Agricultural Extension and Rural Sociology (2 Credits)

The need for agricultural extension. Agricultural extension in the world and in Nigeria, Basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology to an understanding of rural situation. Importance of rural communities and institutions, social stratification, social processes and social changes in rural areas. Leadership in rural communities; role and functions of rural leaders. Development of rural community leaders. The extension agent and the rural community. Communication techniques and strategies of change. Various agricultural extension teaching methods, aids and their use.

Introduction to Farm Machinery (3 Credits)

Aims and objectives of agricultural mechanization. Basic mechanics, Workshop tools. Principles of internal combustion engines and electric motor. Study of farm machinery used for tillage; ploughs, harrows, cultivators, farm power transmission system. Harvesting and processing equipment (sprayers and dusters): Equipment for livestock (automatic feed conveyors, automatic drinkers for poultry, feeding and watering equipment; milking and milk handling equipment, meat processing equipment). Water lifting and irrigation equipment. Surveying instruments used on the farm. Operating principles, selection and maintenance procedures of farm machinery. Farm machinery costings and records. Workshop and building materials used on the farm.

Application of Computers to Agricultural Production (3 Credits)

Introduction to problem solving with the computer; Data entry and editing with the computer. Data analysis using different statistical packages.

Principles of Crop Protection (2 Credits)

The major pests, insect, fungi, bacteria, viruses and nematodes, weeds and other diseases of tropical crops and stored products. Definition of pests. Study of insect pests of major local crops, their significance and principles of control. Study of the effects of diseases caused by Virus, bacteria, fungi and nematodes. Control of these diseases. Effect of weeds on crops and livestock and the principles and methods of control of

weeds. Brief outline, shortcomings and advantages of different pest assessment and pest control methods. Strategies of integrated pest control and pest management.

Introduction to Farm Management and Production Economics (2 Credits)

Theory of Production. Principles of agricultural production and resource use; factor-factor, factor-product and product-product relationship. Consumption and resource allocation in agriculture. Farm costs and revenue theories. Elements of time, risk and uncertainty in agricultural production. Types of farm records and their uses. Farm budgeting, gross and net margin analysis and farm planning.

Second Semester

Ruminant Animal Production (2 Credits)

Management of breeding stock, growing and young animal, Housing, equipment and feeding principles of cattle, sheep and goats. Production and management practices. Health management of ruminant animals.

Permanent Crop Production (2 Credits)

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

Crop Genetics and Breeding (2 Credits)

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

Animal Genetics and Breeding (2 Credits)

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

Soil Chemistry and Microbiology (2 Credits)

Chemical composition of soils. Soil fertility conversion units and calculations; soil fertility evaluation, silicate mineral chemistry; cation and anion exchange phenomena and base saturation. Soil reaction (active and reserve acidity, alkalinity, buffering capacity). Soil acidity and liming. Survey of micro-organisms in soils and their role in soils. The dynamics of N, P and S pools. Association between microbes and plants.

Extension Teaching, Learning process and Methods (2 Credits)

Nature and elements of communication process. Principles of analyzing communication problems in extension. The meaning of the concepts of teaching, learning and motivation, Steps and principles of teaching and learning. Extension teaching methods. Preparation and use of teaching materials and aids.

Agricultural Biochemistry (2 Credits)

Metabolism of carbohydrates, lipids, proteins and nucleic acid. Chemistry and mode of action of enzymes and hormones. Chemistry and analysis of selected agricultural products.

Statistics and Data Processing (3 Credits)

Basic concepts of statistics. Frequency distribution, measures of location, measures of variation. Probability distribution, normal and binomial distribution. Histograms, means, mode and median, sampling, data collection, data processing techniques, statistical inference, tests of significance. F-Test, t-Tests, Chi-square, analysis of variance, analysis of co-variance; correlation and regression analysis. Goodness of fit. Research objectives, Research design, field experimentation, collection and processing of data.

500 Level

Agricultural Economics And Farm Management/Agric. Extension Options

First Semester

Statistics and Research Methods (3 Credits)

Defining a research problem; developing hypothesis and objectives; principles of research design; questionnaire preparation and collection of data; measurement and data collection; statistical theory; different statistical methods for handling data; presentation of research findings in narrative, tabular and graphical forms.

Production Economics, Farm Management and Accounting (2 Credits)

Theory and principles of agricultural production with respect to resources use, resource allocation, resource and product/enterprise combination; forms of production functions and their characteristics; response analysis; measurement of resource productivity. The decision making process; depreciation techniques asset fixity; kinds and functions of farm records and accounts; basic principles of accounting; nature of simple farm accounts; farm planning and analysis; farm budgeting, farm records and inventory, the balance sheet, journal and ledger. Profit and loss statement preparation, adjusting entries. Problems of organizing and managing farms, linear programming, 2 hours of lecture and 1 hour of practicals per week.

Econometrics (2 Credits)

Econometric theory in production, simple regression, violation of basic assumption; estimation with bad or deficient data; multiple regression; statistical demand analysis; statistical production and cost analysis. Methods and application of econometrics to agricultural problems.

Diffusion of Innovations (2 Credits)

Definition and elements of diffusion; processes of adoption and diffusion of innovation; the innovation decision process; characteristics of innovation; adoption rates and adopter categories;; opinion leadership; change agents; theoretical formulations on the diffusion of innovation; sectors related to differential rates of adoption of new agricultural technology; implication of these processes and factors of effective agricultural extension in rural areas: 2 hours of lectures per week.

Administration and Programme Planning in Extension (2 Credits)

Concepts. Theories, principles and guidelines of administration, organization, supervision as applied to extension. Administrative function and responsibility in agricultural extension; staff recruitment, selection placement and supervision; Budget development and fiscal control; Importance of programme planning in agricultural extension need, educative objective, learning experience, clientele participation, plan of work, and calendar of work; The role of good public relations, good leadership and co-

operation for an extension worker; Association and Co-operatives; Concept of evaluation applied to agricultural extension programmes.

Extension Organization, Management and Supervision (2 Credits)

Concepts, theories, guidelines and principles of extension organization, management and supervision, roles and responsibilities of various levels of extension and other relevant staff; staff recruitment, selection, placement and supervision; principles of morale and motivation; implications for extension staff development and promotion; creating conducive working environment; discipline; assessment of extension work accomplishments; improving Nigerian extension services.

Second Semester

Agric-Business Management and Finance (2 Credits)

The scope of agricultural business and management; types of agricultural business management and organizations; enterprise selection; production planning; public policies affecting agricultural business; farm growth; organization of large scale farms; legal organization and tax strategies; Economics of Agricultural Processing; marketing management; principles of agricultural finance; principles of farm credit; capital needs of agricultural industries; sources of loan, funds and collateral security for loans; credit agencies and government credit policy and approaches to efficient credit management; Farm accounting; inventory, balance sheet, cash book, cash book analysis.

Agricultural Policy and Development (2 Credits)

Historical and analytical treatment of government agricultural policies and programmes in Nigeria and developing countries in general; theories and policies of agricultural development; the role of agriculture in the economy; interrelationship between agricultural and individual development, sectoral planning of agriculture. Problems of agricultural development and planning. Integrated rural development planning.

Agric. Project Appraisal, Management and Evaluation (2 Credits)

Introduction to project appraisal. Theory, procedure and data requirements for appraisal and evaluation of agricultural projects and programmes; project identification; tools of project analysis. The arithmetic of project appraisal cost-benefit analysis; rate of return calculations, cash flow procedures. Farm and other resource valuation. Case studies and practical problems of project evaluation in developing countries.

Rural Community Development (2 Credits)

Sociological economic and related policy perspective as they relate to rural development. The theories of community; community as a unit of social change; the micro and macro approaches to social change; dimensions of innovations; approaches to community development; community development and other developments. Model of rural/agricultural development and their relevance to Nigerian situation. Problems of institutions and infrastructural community. Case studies on community development in Nigeria and other developing countries. The future of communities in Nigeria.

Rural Sociology (2 Credits)

General Sociology theory, analysis of social structure of rural agrarian system and societies. Selected theories of social change and their potential for modernization of rural societies; social change and attitude change; measurement of change in rural societies; resistant and conducive forces to change in rural societies. Economic aspects of social change; group dynamics; traditional institution and their transformation, leadership patterns. Involvement of local people in directed change. Problems of rural societies, their causes and solutions. Special topics in rural sociology. Selected case studies.

Technological and Social Change in Agriculture (2 Credits)

Understanding technological change; basic sociological concepts, technological change and societies; general principles in introducing technological change; technological change in Nigerian agricultural development, agricultural extension; ethnical consideration in introducing technological change; agricultural engineers and public extension system.

Crop Production (2 Credits)

Horticultural, field and plantation crops management, processing and storage.

Animal Production (2 Credits)

Principles of Management, feeding and production of poultry, pigs, rabbits, cattle, goats and sheep.

Project (4 Credits)

Each student in the final year is expected to carry out a research project under supervision.

Animal Production Option

First Semester

Poultry, Swine and Rabbit Production (2 Credits)

Building and equipment; incubation and hatchery management of poultry eggs; turkey, geese, duck and guinea fowl production. The application of the principles of feeding, housing, care, breeding and management as basis for successful production. Carcass cuts in swine and measures of carcass quality. Marketing. (1 hour of lecture and 2 hours of practical/week).

Cattle, Sheep and Goat Production (2 Credits)

The beef and dairy industry; Feeding and Management of Cattle, Sheep and Goats; Housing and equipment; Calf-rearing; growing and finishing operations; Milk production, handling and processing. Animal judging; herd recording, castration and dehorning. Production and lactation in Sheep and Goats; Marketing Milk, Beef, Goat and Sheep products. (1 hour of lecture and 3 hours of practicals/week).

Applied Animal Breeding (2 Credits)

Characters of economic importance in farm animals; statistical tools for studying inheritance; partitioning phenotypic variance and covariance; Estimation of genetic parameters (heritability, repeatability, genetic correlations); selection principles and methods; breeding (mating) systems; breeding plans for different farm animal species; foundation stock development.

Reproductive Physiology and Artificial Insemination (AI) (2 Credits)

The reproductive systems in male and female animals; Physiology of sperm and ovum; endocrinology; reproduction; Egg production; pregnancy and foetal development; fertility and sterility of farm animals. Role of AI in livestock production. Cloning, embryo transfer. Management of male donors; semen collection, evaluation, preservation and storage; artificial insemination techniques. (1 hour of lecture and 3 hours of practicals per week).

Animal Experimentation and Research Techniques (2 Credits)

Techniques and procedures in animal experimentation. Basic Statistical designs in animal science research problems.

Nigerian Foods and Feeding Stuff (2Credits)

Classification of foods, feeding stuffs and feed supplements; Chemistry and nutritive values of succulent feeding stuffs, Concentrate feeds, cereals, legumes and oil seeds. Chemistry and nutritive values of some Nigerian grasses and legume species. Storage and quality control of feeding stuffs and feeds.

Agric-Business Management and Finance (2 Credits)

The scope of agricultural business and management; types of agricultural business management and organization; enterprise selection; production planning; public policies affecting agricultural business; farm growth; organisation of large scale farm; legal organisation and tax strategies; Economics of Agricultural Processing; marketing management; principles of agricultural Finance; Principles of Farm Credit; Capital needs of Agricultural Industries; sources of loan, funds and collateral security for loans; credit agencies and government credit policy and approaches to efficient credit management; Farm Accounting, Inventory, Balance Sheet, Cash Book, Cash Book Analysis.

Administration and Programme Planning in Extension (2 Credits)

Concepts, theories, principles and guidelines of administration, organisation, supervision as applied to extension. Administrative function and responsibility in agricultural extension; staff recruitment, selection, placement and supervision, budget development and fiscal control; importance of programme planning in extension; principles and concepts of programme planning in agricultural extension need, educative objective, learning experience, clientele participation, plan of work, and calendar of work; the role of good public relations, good leadership and co-operation for an extension worker; Associations and co-operatives. Concepts of evaluation applied to agricultural extension programmes.

Seminar (1 Credit)

Presentation and discussion of various topics in Animal Science; the student is also expected to prepare and participate in all seminars and present a seminar in the final year.

Second Semester**Monogastric Nutrition (2 Credits)**

Principles of monogastric nutrition, Elements of human nutrition; Dietary allowance, food surveys, food balance sheets; feeding standards; nutrient requirements for the various classes of animals, feed additives. Water in relation to nutrition. Water metabolic computation and ration formulation. Feed evaluation. Feed mixing and feed manufacture on large scale. The feed industry. (1 hour of lectures and 3 hours of practicals per week).

Ruminant Nutrition (2 Credits)

Microbiology of rumen; physiology of rumen action; Metabolic processes and pathways; Non-protein nitrogen utilization; Determination of digestion coefficients, balance trials; systems for energy evaluation, scheme for protein values; water in relation to nutrition and water metabolism; requirements and their inter-relationship in nutrition; Feed additives, proximate analysis; ration formulation, nutritional disorders. (1 hour of lecture and 3 hours of practicals per week).

Animal Products and Handling (2 Credits)

Preparation for slaughtering, evisceration and dressing percentages; care of carcass and its cuts; processing and care of hides, skin and wool; processing and storage of meat; milk processing and microbiology; and poultry products. Milk hygiene; Effect of cooking on meat and milk flavour. Post-harvest physiology of animal products; egg quality and grading chemistry and nutritive value of meat and eggs. Poultry products; milk by-products-butter, cheese and whey; preparation and storage of beef products – bacon,

sausage and ham; food additives; flavours and aroma. Marketing and distribution of animal products. (1 hour of lectures and 3 hours of practicals per week).

Pasture and Range Management (2 Credits)

Adaptation and botany of indigenous and introduced pastures and forage plants. Characteristics of grasses, legumes and shrubs. Establishment, production and seed production of pasture plants; the utilization and maintenance in permanent and temporary pastures. Range Management; Grazing Systems; Forage conservation, dry season feeds. (1 hour of lectures and 3 hours of practicals per week).

Animal Health and Diseases (2 Credits)

The Economic impact of diseases on livestock; Environmental factors in relation to animal major livestock diseases. Infection and immunity. Helminth and protozoan parasites of livestock and poultry. Bacterial, fungal and viral infections of domestic livestock; the classification, diagnosis, epidemiology, prevention, treatment and control of different livestock diseases. Notifiable disease. Principles of immunity and disease resistance and their practical application; Animal handling and drug administration, vaccination programmes.

Livestock Economics (2 Credits)

The place of livestock in the Nigerian Economy; Consumer and Consumption pattern of livestock product; Micro and Macro-economics in animal production; Agricultural production functions including data collection and analysis; Marketing theory in relation to livestock production; Application of economic theory and quantitative analysis. Capital investment and depreciation of capital; the economics of egg, meat and milk production. Livestock feed economics, input/return relationship in livestock production.

Game Production and Utilization (2 Credits)

Game production; harvesting strategies and problems of game cropping; "bush meat" processing methods, traditional uses of game and game products; hunting techniques; game ranching and domestication; growth behaviour and reproduction of animals in captivity; habit and food preferences. Design of paddocks, animal houses and cages. Husbandry techniques and health care in captivity.

Principles of Co-operative Practices (2 Credits)

Evaluation of co-operatives – especially farmer, marketing and purchasing cooperatives. Co-operative as a form of business; purpose and advantage of co-operatives to agriculture; comparison of other businesses with cooperative business; principles and operating techniques essential for successful cooperation activity; limitations and possibilities for cooperatives in Nigeria; management of cooperatives.

Project (4 Credits)

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

Crop/Soil Science/Horticulture Options

First Semester

Vegetable and Fruit Crop Production (2 Credits)

History, definition, classification and importance of vegetable crops. Ecological distribution of vegetables and fruits in Nigeria. Varieties and adaptation of exotic vegetables and fruits to the Nigerian environment. Types and systems of vegetable and fruit production. Production practices, harvesting, handling, processing, storage, marketing and utilization of vegetables and tropical fruit crops. Methods of plant propagation. Nursery systems, diseases and pests of vegetables and fruit crops.

Horticultural machines and equipment. Principles of producing, planting, maintaining ornamental trees, shrubs, perennials and fruits in the nursery, home and parks.

Field and Plantation Crops (2 Credits)

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

Field Experimentation (2 Credits)

Principles of field experimentation in crop and soil sciences. Research methodology; experimental layout, field survey; normal distribution and sampling; measurements and data analysis.

Crop Protection (2 Credits)

Quarantine regulations and phytosanitary measures. Fundamentals of plant resistance to diseases, principles and methods of disease control and management; principles, techniques and equipment for applying crop protection chemicals in the control of field and storage pest, diseases and weeds. Equipment maintenance and repair. Storage of pesticides.

Soil Survey and Land Use Planning (2 Credits)

Basic principles of soil classification; soil profile, study and description, soil survey methodology; assemblage of maps, photo; use of aerial photographs, topographic maps; field survey versus grid survey; field mapping; soil morphological investigations; laboratory determinations; soil correlation; soil survey report writing; interpretive reports; Management properties of some tropical soils, soil and land capability classification for various purposes. The use and misuse of land in the tropics. Land potential assessment.

Soil Physics (2 Credits)

The physical and physio-chemical properties of soils. Colloidal behaviour. Soil structure, soil texture and the surface area of soil particles; soil consistency and After Begg's limits. Soil moisture and its categories and measurements; hysteresis; field water cycle; soil, air and temperature; gas and heat transportation in soils; soil-plant atmosphere-continuum; laboratory determination of the physical properties of soils.

Soil and Plant Analysis (2 Credits)

Soil and plant sampling and sample preparation. Theories and procedures for chemical analysis of soil and plant materials. Analysis of soil and plant for major elements and the interpretation of data; determination of pH; principles of instrumentation. Maintenance and operations of major analytical instruments; flame photometers, calorimeters, spectrophotometers; photometers, amino acid analyzers; IRV; UVR; pH meters; conductivity bridge; gas systems for monitoring analytical procedures; feature and functions of a soil testing laboratory.

Soil Microbiology and Chemistry (2 Credits)

Microbiological activities in soils; organic matter and organic matter decomposition; the nitrogen cycle to include the biochemistry and microbiology of nitrification; symbiotic and non-symbiotic N-fixation; the phosphorus cycle, microbial transformations of sulphur, iron and other minerals; transmission of hydrocarbons and pesticides, microbial factors of soil aggregate production and destruction; ecological interrelations; soil reaction-acidity, alkalinity and salinity. Soil chemistry and plant nutrition. The micro-elements; properties, chemistry and utilization of water-logged soils; redox potentials.

Second Semester

Seed Production Technology (2 Credits)

Structure and nature of seed, functions of parts of seed, seed viability, vigour, dormancy and deterioration. Methods of breaking seed dormancy, production, processing, drying, treatment, packaging, storage and distribution of improved seed, seed certification. Procedures for field inspections; seed legislation and control. Seed testing procedures. Seed programmes in Nigeria. Seed Marketing.

Forage and Fodder Crop Production (2 Credits)

Adaptation and botany of indigenous and introduced forage plants. Characteristics of topical grasses, legumes and shrubs. Establishment, production and seed production of forage plants; the utilization and maintenance in permanent and temporary pastures. Forage conservation, dry season feeds.

Plant Breeding (2 Credits)

Significance of reproductive system in cultivated plants; sexual and asexual reproduction. Techniques and principles of crop germ-plasm bank; role of plant breeding in pest and disease control in crops; selection methods in breeding programmes; maintenance of breeding stock; multiplication and distribution of improved crop varieties.

Weed Science (2 Credits)

Characteristics, classification and biology of weeds. Losses due to weeds. Weed control methods and problems associated with them. Classification, chemistry, selectivity, formulation, application, storage and mode of action of herbicides. Herbicides and environmental interaction. Safety factors in the use of herbicides; basis for herbicidal selectivity. Application equipment and techniques, practical methods of controlling weeds in Nigeria.

Post Harvest Physiology and Product Storage (2 Credits)

Storage life and harvested fruits, seeds, vegetables and flowers, tropical environment in relation to maturity, ripeness and senescence. Physical and chemical indices of quality in fruits, seeds, vegetables, flowers and other crop products. Storage of crop materials. Traditional methods of vegetable processing and storage. Fundamentals and principles of crop storage and transportation. Storage and shelf life problems; ideal atmosphere for storing fruits, seeds, vegetables, flowers and other crop products. Controlled environment for transit and long term storage; protective treatment, design and operation of equipment for storage and preservation.

Soil Fertility and Crop Nutrition (2 Credits)

Fertility in tropical soils. Soil organic matter; its properties and maintenance, liming and its soil-plant relationships; nitrogen, potassium, phosphorus and sulphur contents of soil. The soil as a plant nutrient medium; fertilizers and fertilizer management – their manufacture, sources, applications, methods, rates and timing; handling and storage of fertilizers. Crop growth and response to soil nutrients; major, secondary and trace elements in crop nutrition; nutrient absorption, maintenance and loss in soil fertility in extensive and intensive agriculture. Role of legumes in soils.

Principles of Irrigation (2 Credits)

Forms of irrigation; costs and profitability of irrigation; application of irrigation to different crops. Soil-water-plant-atmosphere relationship; assessment of water requirements for crops including meteorological approach and critical growth stages for water of different field crops; scheduling irrigation for the major crops; time of irrigation; agronomic management of irrigated crops; crop rotations and sequence under irrigated conditions, evaporation losses of irrigation water; maintenance of irrigation equipments.

Agronomic practices of crops in problem soils; soil erosion and soil drainage under irrigation or under natural rainfall.

Soil Water Conservation (2 Units)

Soil degradation: causes, chemical and physical. Soil fertility conservation: role of organic matter, crop residues, legume cover crops, agroforestry.

Soil tillage: objectives, effects on soils and crop. Conservation tillage techniques; minimum tillage, Zero tillage. Soil erosion by water and wind: estimation and prediction. The universal soil loss equation. Extent of soil erosion problems in Nigeria, principles of control measures.

Gully erosion control. Soil water conservation, rainfall conservation, evaporation control. Use of mulches.

Project (4 Credits)

Each student is expected to choose and execute a special project under the supervision of staff. Duration of the project is two semesters.

B. FISHERIES AND AQUACULTURE

100 Level

First Semester		Credits
1.	Use of English I	2
2.	Philosophy & Logic	2
3.	Physical Chemistry	2
4.	General Biology I (Botany/Zoo)	2
5.	Practical Biology	2
6.	General Physics	2
7.	Organic Chemistry I	2
8.	Mathematics	2
9.	Practical Chemistry	2
Sub-Total		18 Credits
Second Semester		Credits
10.	Use of English II	2
11.	Nigerian People and Culture	2
12.	Social Sciences	2
13.	Inorganic Chemistry	2
14.	Organic Chemistry II	2
15.	Biology II	2
16.	Use of Library	1
17.	Mathematics	2
18.	Practical Physics	2
Sub-Total		17 Credits

200 Level

First Semester		Credits
1.	Climatology and Biogeography	3
2.	General Agriculture	3
3.	Anatomy and Physiology of Farm Animals	2
4.	Crop Anatomy, Taxonomy and Physiology	2
5.	Principles of Soil Science	2
6.	Principles of Agricultural Economics	2
7.	Introduction to Forestry Resource Management	2
8.	Introduction to Biotechnology	2
Sub-Total		18 Credits
Second Semester		Credits
8.	Principles of Animal Production	2
9.	Principles of Crop Production	2
10.	Principles of Food Science and Technology	2
11.	Introductory Agricultural Biochemistry	2
12.	Introduction to Computers	3
13.	Introduction to Fisheries and Wildlife	2
14.	Introduction to Home Economics	2
15.	Entrepreneurial Studies II	2
Sub-Total		17 Credits

Total = 35 Credits.

All courses are core courses for Agriculture, Fisheries and Forestry.

300 Level**First Semester**

		Credits
1.	Fish Biology	2
2.	Ichthyology	2
3.	Limnology	2
4.	Fish Ecology	2
5.	Aquaculture	3
6.	Aquatic Flora and Fauna of Hydro-Biology	2
7.	Fish Farming Techniques and Hatchery Management	3
Sub-Total		16 Credits

Second Semester

		Credits
7.	Fish Nutrition	2
8.	Fish Gear Technology	2
9.	Fish Parasites and Diseases	2
10.	Elementary Seamanship and Navigation	2
11.	Oceanography	2
12.	Agricultural Biochemistry	2
13.	Fish Pond Construction and Management	2
14.	Fish Adaptation and Physiology	2
Sub-Total		16 Credits

Total = 32 Credits.

All are core courses.

400 Level (Practical Year)**Aquaculture And Fisheries**

		Credits
1.	Fish Gear Use, Design, Production & Maintenance	3
2.	Fish Processing, Preservation and Marketing	3
3.	Fish Production and Management Techniques	2
4.	Pond Construction and Management	3
5.	Fish Hatchery Management, Fingerling and Fry Production	3
6.	Oceanography Techniques	3
7.	Aquatic Environment Survey	2
8.	Fish Nutrition and Fish Food Technology	3
9.	Fisheries (aquaculture) Engineering	3
10.	Report Writing	3
11.	Integrated Fish Culture	2
Sub-Total		30 Credits

500 Level**First Semester**

		Credits
1.	Fish Production and Management	2 Core
2.	Production of other Marine Products	2 "
3.	Ornamental Fisheries and Aquaria Design	2 "
4.	Nigerian Feeds and Feeding Stuffs	2 "
5.	Fish Population Dynamics	2 "
6.	Fish Farming Engineering	2 "
7.	Administration and Programme Planning in Extension	2 "
8.	Seminar	1 "
9.	Project	2
Sub-Total		17 Credits

Second Semester		Credits
9.	Fishery Technology, Processing and Storage	2 Core
10.	Fish Nutrition	2 "
11.	Fishery Economics	2 "
12.	Water Quality Management and Pollution Control	2 "
13.	Farm Management and Fishery Business	Management
	2 "	
14.	Fisheries Policy and Legislation	2 "
15.	Project	2 "
16.	Electives	2 "
	Sub-Total	16 Credits

Total (Cores) 32 Credits.

Elective 2

Total 34

Each course consists of 3 hours of practical per week.

COURSE DESCRIPTIONS

300 Level

First Semester

Fish Biology (2 Credits)

The gross external and internal anatomy of a typical bony and a typical cartilaginous fish. The different types of anatomical systems and basic functions of each system of organs in the fish. Embryology and life history of a fish with special reference to commercially important fish e.g. tilapia, clarias, catfish and mullet. (1 hour of lectures and 3 hours of practicals per week).

Ichthyology (Systematics of Fish) (2 Credits)

Principles of systematics. Taxonomy and detailed study of principal commercial species of Nigerian fish; inland, estuarian and ocean, water invertebrates and reptiles. Identification of species using keys and monographs. Important world species; sardine, tuna, anchornveta etc. biological attributes of fish populations. Phylogenetic relationship. (1 hour of lectures and 3 hours of practical per week).

Limnology (2 Credits)

Physical and chemical properties of both inland and sea water. Hydrology and water cycles. Properties of natural and man-made lakes. Thermal properties and stratification. (1 hour and 3 hours of practical per week).

Fish Ecology (2 Credits)

Ecology of fishes with special reference to distribution and natural history and application of this knowledge for fisheries management and obtaining maximum returns from fishery resources. Characteristics of the aquatic environment. Organic production in aquatic fauna and flora-algal blooms and eutrophication; plankton, and benthos, biomass assessment. Food and feeding habit of fish, food and habit selection, population, niche concept. Food chains. Reproductive behaviour of and life cycles of some selected species. (1 hour of lectures and 3 hours of practicals/week).

Aquaculture (3 Credits)

Aims and types of aquaculture. History, present organization and status of aquaculture in Nigeria. Principles of aquaculture - liming and pond fertilization; food supply; growth rate and food conversion; selection of culture species, introduction of exotic species and their implications. Water requirements. Stocking, feeding and harvesting practices. Fish farm design. Economic consideration of aquaculture. (2 hours of lectures and 3 hours of practical per week).

Aquatic Flora and Fauna (2 Credits)

Study and identification of the characteristic flora and fauna of importance in the fresh water and coastal swamps of the tropics. The ecology, utilization and management of aquatic flora and fauna. Control of aquatic weeds in ponds – chemical, mechanical and biological. (1 hour of lectures and 3 hours of practical/week).

Fish Farming Techniques and Hatchery Management (3 Credits)

Artisanal and commercial fishing methods and importance in fishing boats, trawlers and gears – hooks, traps and nets – different types of fish culture techniques, monoculture, polyculture, selected breeding, intensive and extensive culture in inland and brackish water, in rice fields, in floating cages and rafts. Gear selectivity; electro fishing. Spawning methods; artificial fertilization; incubation, rearing, harvesting and transportation of fry and fingerlings. Selection and care of breeders; larvae and fingerlings. Control of weeds, parasites and diseases in the hatchery, control of physiochemical properties of water. (2 hours of lectures and 3 hours of practical/week).

Second Semester

Fish Nutrition (2 Credits)

Principles of fish nutrition. Chemistry and Nutritive value of various classes of fish food. Nutrient requirements of fish. Nutrient sources and practical consideration in fish feeding.

Fishing Gear Technology (2 Credits)

Study of types of gear and fishing craft. Properties of the materials used in the construction of fish gears. Construction of hooks, traps and nets. Assessment of efficiency of fishing gear. (1 hour of lectures and 3 hours of practical/week).

Fish Parasites and Diseases (2 Credits)

Identification, morphology, taxonomy, life history of fish parasites. The ecological and pathological effects of parasites and diseases of fish. Epidemiology of parasites populations in water body. Common bacterial, fungal and viral fish diseases and their control. Other enemies of fish. International restriction blinding the transportation of fish across country boundaries. Fish ponds and public health. (1 hour of lectures and 3 hours of practicals/week).

Elementary Seamanship and Navigation (2 Credits)

Important sea terminology; parts of a boat, strength of wind and state of sea. Coast lights and light vessels. Measures for distance, depth, speed etc. launching and boarding of small boats. Life saving and fire fighting equipments and methods. Swimming. (1 hour of lectures and 3 hours of practicals/week).

Oceanography (2 Credits)

Study of the temperature and chemistry of sea water. Biological activities and their distribution. Salinity, chlorinity, currents, tides, waves, sound and radiation in the sea, conductivity diffusion, viscosity and dynamics of sea water. Distribution and behaviour of plankton. Brackish water conditions and fauna. Interrelationship of and physiological adaptations of marine organisms. (1 hour of lectures and 3 hours of practicals/week).

Fish Pond Construction and Management (2 Credits)

Principles of fish pond construction. Preparation of ponds for stocking. Management of flora and water quality, maintenance of ponds. Harvesting from ponds. (1 hour of lectures and 3 hours of practicals/week)

Fish Adaptation and Physiology (2 Credits)

The different shapes and adaptive designs in fish in relation to the aquatic environment. Natural environmental adaptation of fish, migration, reproduction, feeding habits, salinity, temperatures and life cycles. Modified environmental behaviour of fish to pressure, light, electrical field and noise. (1 hour of lectures and 3 hours of practicals/week).

500 Level

First Semester

Fish Production and Management (2 Credits)

Practical aspects of handling and care of fish. Breeding of fish. Production of fingerlings and fries; management of breeders; growers and other types of fish and marine products; buildings and equipment needed in a fish farm; procurement of feed and systems of feeding. Harvesting and marketing. Appraisal of management structure and effectiveness of fisheries management policies. Preparation of management plan for fisheries project.

Production of other Marine Products (2 Credits)

Ecology, life histories of crustacea and aquatic mollusk culture of shrimps, oysters; crabs, crayfish, lobster, cockles, periwinkles, marine gastropods, frogs, edible sea weeds and fresh water plants. Deep sea and shore farming of some products. Processing and preservation of marine products. (1 hour of lectures and 3 hours of practical/week).

Ornamental Fisheries and Aquaria Design (2 Credits)

Ornamental fish breeding, management and nutrition; design and maintenance of various aquaria.

Nigerian Feeds and Feeding Stuffs (2 Credits)

Classification of foods, feeding stuffs and feed supplements. An extensive coverage of the chemistry and nutritive values of succulent feeding stuffs, concentrate feeds (cereals and legumes). Chemistry and Nutritive values of some Nigerian grasses and legume species. Consideration of methods of their biological value evaluation.

Fish Population Dynamics (2 Credits)

Fishing effort and catch per unit effort. Population estimation, age and growth; natality and mortality. Computation of yields from given recruitment. Stock assessment.

Fish Farming (2 Credits)

General surveying, site selection: Fresh water and brackish water pond construction. Design and construction of dykes, sluice gates, drainage facilities, tanks, ponds, pens, cages, rafts and other types of fish rearing facilities, design of inland fish farms, pumping stations and fish hatcheries.

Administration and Programme Planning in Extension (2 Credits)

Concepts, theories, principles and guideline of administration, organization, supervision as applied to extension; importance of programme planning in extension. Principles and concepts of programme planning in agricultural extension need, educative objective, learning experience, clientele participation, plan of work, calendar of work. The role of good public relations, good leadership and cooperation for an extension worker. Associations and cooperatives; concepts of evaluation applied to agricultural extension programmes.

Seminar (1 Credit)

Each student will be required to give a seminar in the final year and participation in all departmental seminars.

Second Semester**Fishery Technology, Processing and Storage (2 Credits)**

Post harvest spoilage; principles and methods of preservation, packaging, storage, product evaluation and quality control. Estimation of nutrients in fish flesh. Traditional versus modern preservation techniques.

Fish Nutrition (2 Credits)

Principles of fish nutrition. Requirements for energy, protein, vitamins and minerals, and non-nutrient components; feed computation and formulation methods; the fish feed industry; feed pelleting; fish feed habits; feed evaluation; practical considerations in fish feed. Feed formulation, feed mixing and manufacture of feed on commercial scale.

Fish Economics (2 Credits)

Major economic constraints in fishery development; free access fishery, sustainable yield curve and total revenue curve. Bionomic equilibrium, factor rents, welfare economic theory and its relevance for fisheries; externalities in fisheries; capital investment and

depreciation of equipment; consumer and consumption patterns; fishery resources and right of ownership.

Water Quality Management and Pollution Control (2 Credits)

Physical composition of water bodies; water chemistry and nutrient cycles; sampling methods; management of selected marine, brackish and fresh waters. Chemical, mechanical, and biological methods for maintaining and improving water quality; biological, ecological characteristics of polluted water; effect of pollution on fish planktons, benthic macro invertebrates, algae and water quality.

Farm Management and Fishery Business Management (2 Credits)

Fish farm planning and organization; farm budgeting; farm growth, problems of organizing and managing fish farms under commercial and peasant systems. The scope of fishery business and management, types of business management; types of credit extended to fish farming; sources of credits and loans; marketing arrangement; fish farm record and accounting; financial management.

Fisheries Policy and Legislation (2 Credits)

Fisheries Institution, Conservation strategies. Fisheries Policy and laws of Nigeria. International Laws of the Sea.

Project (4 Credits)

Each student is required to choose and execute a special project under supervision. Duration of the project is two semesters.

B. FORESTRY AND WILDLIFE MANAGEMENT

100 Level

First Semester		Credits
1.	Use of English I	2
2.	Philosophy & Logic	2
3.	Physical Chemistry	2
4.	General Biology I (Botany/Zoo)	2
5.	Practical Biology	2
6.	General Physics	2
7.	Mathematics	2
8.	Organic Chemistry I	2
9.	Practical Chemistry	2
Sub-total		18
Credits		
Second Semester		Credits
10.	Use of English II	2
11.	Nigerian People and Culture	2
12.	Social Sciences	2
13.	Inorganic Chemistry	2
14.	Organic Chemistry II	2
15.	Biology II	2
16.	Use of Library	1
17.	Mathematics	2
18.	Practical Physics	2

Sub-total 17 Credits

200 Level

First Semester		Credits
1.	Climatology and Biogeography	3
2.	General Agriculture	3
3.	Anatomy and Physiology of Farm Animals	2
4.	Crop Anatomy, Taxonomy and Physiology	2
5.	Principles of Soil Science	2
6.	Principles of Agricultural Economics	2
7.	Principles of Forestry (Introduction to Forestry Resources Management)	2
Sub-Total		16 Credits
Second Semester		Credits
8.	Principles of Animal Production	2
9.	Principles of Crop Production	2
10.	Principles of Food Science and Technology	2
11.	Introductory Agricultural Bio-Chemistry	2
12.	Introduction to Computers	3
13.	Introduction to Fisheries & Wildlife	2
14.	Introduction to Home Economics	2
15.	Entrepreneurial Studies I	2
Sub-Total		17 Credits

Total 35 Credits

All courses are core courses for Agriculture, Fisheries and Forestry.

300 Level

	First Semester	Credits
1.	Principles of Silviculture	2
2.	Resource Inventory and Mensuration	3
3.	Natural Eco-Systems	3
4.	Introduction to Forest and Wildlife Management	2
5.	Introduction to Agricultural Extension and Rural Sociology	2
6.	Wood Formation and Properties	2
7.	Principles of Plant Protection	2

Sub-Total 16 Credits

	Second Semester	Credits
*8.	Forest Economics	2
*9.	Forest Aerial and Ground Survey	2
*10.	Forest Engineering	3
*11.	Wildlife Population Analysis	2
*12.	Forest Bio-Metrics	2
*13.	Wildlife Ecology and Management	2
*14.	Forest and Wildlife Pests and Diseases	3
*15.	Entrepreneurial Studies II	2

Sub-total 18 Credits

Total Credits = 34

Core Courses*400 Level (Practical Year)**

	Forestry/Wildlife	Credits
1.	Forest Inventory and Management Plant	3
2.	Silviculture Techniques	2
3.	Remote Sensing and Mapping	2
4.	Harvesting, Processing and Wood Utilization	2
5.	Forest Operations	2
6.	Agroforestry & Plantation Technology	3
7.	Zoo and Parks Management Techniques	2
8.	Training in Firearms and Ballistics	2
9.	Museum and Harbarium Techniques	2
10.	Wildlife Ecological Survey	2
11.	Aerial and Ground Survey	2
12.	Report Writing	2
13.	Saw Milling	2
14.	Wood Seasoning & Preservation	2

Total 30

Credits

500	Level		
	First Semester		Credits
1.	Multiple Land Use		2
2.	Forest Management and Economics		2
3.	Forest and Wildlife Policy, Law and Admin.		2
4.	Silviculture		2
5.	Forest Soils		2
6.	Forest Genetics and Tree Breeding		2
7.	Forest Pests, Diseases and Forest Protection		2
8.	Seminar		1
9.	Wood-based Panel Products		2
10.	Project		2
	Sub-Total		19 Credits
	Second Semester		Credits
9.	Management of Game Birds		2 Elective
10.	Forest Mensuration		2
11.	Forest and Wildlife Biometrics		2
12.	Wildlife Nutrition		2
13.	Forest Industries and Timber Quality Control		2
14.	Wildlife Management and Utilization		2
15.	Wood Processing and Pulping Process		2
16.	Forest and Wildlife Extension and Education		2 Elective
17.	Project		2
18.	Pulp and Paper Technology		2
	Sub-Total		20 Credits
	Total = 32 Credits minimum		
	36 Credits (with Electives)		

COURSE DESCRIPTIONS

Principles of Silviculture (2 Credits)

Introduction to Silviculture

Analysis and study of problems of raising tree crops. Natural and artificial regeneration nursery techniques. Application of principles for establishment and maintenance of forest for various purposes. Taungya and other silvicultural practices. (1 hour of lectures and 3 hours of practicals per week).

Resources Inventory and Mensuration (3 Credits)

Forest resources sampling and enumeration techniques – including timber and wildlife. Measurement and estimation of timber in logs and forest stands. Inventory instruments and their use. 2 hours of lectures and 3 hours of practicals per week.

Natural Ecosystems (3 Credits)

Distribution, structure and dynamics of land and fresh water ecosystems. The flow of energy and materials through natural ecosystems. The importance of conservation. Tree identification. (2 hours of lectures and 3 hours of practicals per week).

Introduction to Forest and Wildlife Management (2 Credits)

Organization of forest resources. Morphology, taxonomy and ecology of tropical trees. Forest production activities, forest protection and the regulation of harvest for sustained yield. Preparation of working plans. Solving managerial problems. Introduction to operations research in forestry. (1 hour of lectures and 3 hours of practical per week).

Wood Anatomy, Wood Formation and Properties (2 Credits)

Structure, properties, identification and characteristics of wood. Anatomical features of wood formation. (1 hour of lectures and 3 hours of practicals per week).

Introduction to Forestry/Wildlife Extension (2 Credits)

The need for forestry extension. Forestry extension in the world and in Nigeria, basic philosophies behind agricultural extension work. The institutional setting of forestry extension. Basic concepts and principles of rural sociology to understanding of rural situation and conflict management. Importance of rural communities and institutions, social stratification, social processes and social changes in rural areas. Leadership in rural communities, role and functions of rural leaders. Development of rural community leaders. The extension agent and the rural community. Communication techniques and strategies of change. Various agricultural extension teaching methods, aids and their use.

Principles of Plant Protection (2 Credits)

The major pests, insects, fungi, bacteria, viruses and nematodes, weeds and other diseases of tropical crops and stored products. Definition of pests. Study of insects pests of major local crops, their significance and principles of control. Study of the effects of diseases caused by virus, bacteria, fungi and nematodes. Control of these diseases. Effect of weeds on crops and livestock and the principles and methods of control of weeds. Brief outline, shortcomings and advantages of different pest assessment and pest control methods. Strategies of integrated pest control and pest management.

Second Semester

Forest Economics (2 Credits)

Definition of forest goods and services; application of economic principles to forest resources; decision making in single and multiple resource use; cost-benefit analysis. (1 hour of lectures and 3 hours of practicals per week).

Forest Aerial and Ground Survey (2 Credits)

Ground survey instruments. Boundary and topographic survey of selected project areas. Scribing, type preparation and mapping. Preparation of maps from aerial photographs. Interpretation of aerial photographs and satellite imagery. (1 hour of lectures and 3 hours of practicals per week).

Forest Engineering (Forest Operations) (3 Credits)

Design, construction, drainage and maintenance of forest roads, bridges, dams and buildings; logging and transportation. Planning, analysis and supervision of operations. (2 hours of lectures and 3 hours of practicals per week).

Wildlife Ecology and Management (2 credits)

Organisation of wildlife resources. Wildlife in relation to their environment. Factors affecting the distribution and abundance of wildlife. Interrelationship between climate, soil, vegetation, geologic history and wildlife population characteristics as related to reproduction and mortality factors. Movement, behaviours, lifecycles, reproduction, food and food habits of wildlife. Nature and efficient usage of rangeland in West Africa. Methods of range assessment and management. (1 hour of lectures and 3 hours of practicals per week)

Forest and Wildlife Pests and Diseases (3 Credits)

The major pests and diseases of forest trees. Taxonomy, biology and method of control of these major pests and diseases of forest trees and wildlife. (2 hours of lectures and 3 hours of practicals per week).

Forest Biometrics (2 Credits)

Application of basic biometric techniques to problems in forest resource management, Distribution, sampling and tests of hypotheses. (1 hour of lectures and 3 hours of practicals per week)

**500 Level
First Semester****Multiple Land Use (2 Credits)**

Nigeria's land resources; attitudes and conflicts; strategies for resolution of conflicts, integrated use of land for forestry, wildlife, fisheries and agricultural purposes. Formulation of management policies for land areas. Decision making in the allocation of land for forestry, wildlife and agriculture; legislation relating to land and environmental planning.

Forest Management and Economics (2 Credits)

Principles of sustained yield; yield control and management for optimization of set objectives; systems approach to forest management, use of analytical procedures in forest management and utilization decisions; forest goods and services. Market trends and factors affecting their demand and supply; Application of economics principles to decision making in forestry; project evaluation. Forestry and economic development.

Forest and Wildlife Policy, Law and Administration (2 Credits)

Forest, wildlife and related natural resource polices; planning effective use of forest resources; structure of wildlife administration; problems of conserving forest and endangered species. Nigerian Law in natural resources management, Administration and wildlife conservation for economic and recreational uses, problems of wildlife conservation in Nigeria.

Silviculture (2 Credits)

Major forest types of the tropics and silvicultural systems employed in their management, plantation and nursery practices; seed technology with special reference to trees.

Forest Soils (2 Credits)

Understanding of soil dynamics and influence upon forest composition; stand regeneration, tree vigour and tree growth rate; forest soil physics, chemistry and microbiology, soil moisture movement; forest nursery soil management; forest soil fertility determination, maintenance and improvement with special reference to tropical conditions.

Forest Genetics and Tree Breeding (2 Credits)

Inventory, selection and conservation of basic genetic material for mass production of improved strains for silviculture. Theory, practice, methods of consequences of breeding tree crops; principles underlying choice of species; quantitative genetics in forest tree improvement. Economics of tree breeding; tree breeding programmes; principles, establishment and management of seed orchards.

Forest Pests, Diseases and Forest Protection (2 Credits)

Taxonomy and biology of major pests and diseases of forest trees. Principles underlying disease and pest control; genetic and environmental control; fire use and control; protection against encroachment; diseases and illegal felling.

Seminar (1 Credit)

Each student is expected to prepare and deliver a seminar in the final year.

Wood-based Panel Products (2 Units)

Principles of panel production. Wood chips, flakes and fibre conversion process. Properties of wood adhesives and additive. Manufacturing techniques and mechanical characteristics of particular board, fibre and wood-cement boards. Dimensional stability of panel products. Quality control and marketing of panel products.

Second Semester**Management of Game Birds (Ornithology) (2 Credits)**

Classification, structure, ecology and economic importance of birds and avifauna of Africa; distribution and identification of game birds; management techniques.

Forest Mensuration (2 Credits)

Advanced sampling method in inventory; volume estimation and volume table construction; growth increment determination; construction of management tables.

Forest and Wildlife Biometrics (2 Credits)

Practical concepts in the design and analysis of experiments on tree crops and wildlife. Survey techniques as they relate to forestry problems. Processing of resource inventory and mensuration data for management purposes. Application of multivariate analysis to forestry and wildlife. Basic techniques in Survey Sampling and design.

Wildlife Nutrition (2 Credits)

Principles of nutrition of wildlife; Nutrient composition of wildlife foods; nutrient requirements of wildlife for various physiological processes; feed formulation, ration preparation and general methods of feeding.

Forest Industries and Timber Quality Control (2 Credits)

Forest based industries including furniture, sawmills, plymill, fibre board, chipboard, and particleboard mills, determination of timber quality and its control; inspection, sampling and grading; wood protection; minor forest based industries e.g. charcoal production, cellulose derivatives industry; marketing of forest resources; citing of forest industries.

Wildlife Management and Utilization (2 Credits)

Wildlife production; harvesting strategies and problems of game cropping; "bush meat" processing methods; traditional uses of wildlife and wildlife products; hunting techniques, game ranching and domestication; growth behaviour and reproduction of animals in captivity; food habit and food preferences. Design of paddocks, animal houses and cages. Husbandry techniques and health care in captivity. Bee keeping.

Wood Processing and Pulp and Paper Process (2 Credits)

Evaluation of quality of standing trees. Felling and logging techniques; wood conversion and processing; wood seasoning and preservation; machining, gluing, preservation and finishing; charcoal production, chemical processing of pulp and paper.

Forest and Wildlife Extension and Education (2 Credits)

Management interpretation to include methods and techniques for communicating values of forestry, parks, game reserves and other wildlands. The role of the extension agent in providing organizational and administrative support in Forestry. Training programmes for extension workers in forestry and wildlife.

Project (4 Credits)

Each student in the forestry and wildlife option is required to choose and execute a special project under supervision. Duration of the project is two semesters.

Pulp and Paper Technology (2 Units)

Raw materials for pulp and paper production. Wood pulping techniques: mechanical, chemical, semi-chemical and thermo-mechanical pulping. Pulp bleaching and bleaching agents. Waste paper recycling. Paper production - mat formation, sizing, dye application, pressing and drying. Physical and mechanical properties of paper, paper products - writing paper.

B. SC. HOTEL MANAGEMENT AND TOURISM

100 Level

First Semester

Course Number	Title	Units
GSS 111	Use of English 1	2
BIO 111	General Biology	4
MTH 111	Mathematics I	2
AEC 111	Basic Principles of Economics	1
GSS 114	Elementary French	1
GSS 112	Nigerian History	2
GSS 115	Basic German	1
CHM 111	Physical Chemistry	1
CHM 112	Organic Chemistry	2
HMT 111	Principles of Psychology	2
HMT 112	Principles of Sociology	2
GSS 113	Physical and Health Education	1
UGC 111	Farm Practice	<u>2</u>
Total		<u>23</u>

Second Semester

Course Number	Title	Units
GSS 121	Use of English II	2
GSS 126	Social Science	2
CHM 123	Inorganic Chemistry	2
CHM 122	Organic Chemistry II	2
CHM 124	Practical Chemistry	1
BIO 121	General Biology II	4
MTH 124	Elementary French II	2
GSS 125	Basic German II	1
*HMT 121	Principles of Accounting	2
UGC 121	Farm Practice	<u>1</u>
Total		<u>20</u>

200 Level

First Semester

Course Number	Title	Units
GSS 212	Philosophy and Logic	2
AEC 201	General Agriculture	2
NUD 211	Introduction to Nutrition and Dietetics	2
MCB 212	General Microbiology	3
GSS 214	Intermediate French I	1
HCM 211	Introduction to Catering	2
HMT 211	Food and Society	2
HMT 212	Hotel Accounting and Book Keeping	2
TRM 211	Introduction to Tourism	2
HMT 228	Financial Accounting in the hospitality Industry I	<u>2</u>
Total		<u>22</u>

Second Semester

Course Number	Title	Units
NUD 222	Fundamental of Nutrition Dietetics	2
FST 225	Introduction to Food Science and Technology	2
HEC 221	Introduction to Home Economics	2
HEC 224	Agricultural Food Products	2
HMT 222	Food Production Theory and Practice	2
HMT 223	Food Service (Theory and Practice)	2
HMT 224	Personnel Management	1
GSS 224	Intermediate French II	1

HMT	225	Accommodation Management	1
HMT	226	Restaurant Operational Management	2
MTH	227	Introduction to Computer	2
HMT	228	Financial Accounting in the hospitality industry I	<u>2</u>

Total **22**

300 Level

First Semester

Course Number		Title	Units
HMT	311	Cost Control	2
HCM	311	Managing Housekeeping Operations	2
HMT	312	Food and Beverage Experations	2
FST	314	Food Analysis and Sensory Evaluation	3
TRM	311	Intermediate Tourism	2
HMT	314	Front Office/Reception Management	2
HMT	313	Maintenance Management	1
HMT	315	Liquor Studies	1
GSS	314	Advanced French I	1
HCM	312	Catering Hygiene and Safety	2
HMT	316	Financial Accounting in the Hospitality Industry II	<u>2</u>
Total			<u>20</u>

Second Semester

Course Number		Title	Units
HMT	321	Employee Labour Relations	2
HEC	427	Interior Decoration and Design	2
HEC	422	Recipe Development and Testing	2
HCM	321	Hotel and Catering Law	2
FST	324	Food Microbiology	4
FST	325	Post Harvest Physiology and Storage	2
HMT	322	Bar Organizational and Management	2
HMT	323	Food Preparation Management	2
GSS	324	Advanced French II	<u>1</u>
Total			<u>21</u>

400 Level

First Semester

Course Number		Title	Units
HMT	411	Quantity Food Production and Service	2
HMT	412	Organization and Administration of Hotels and Tourism Centres	2
HMT	413	Planning and Development of Hotel and Tourism Attractions	2
HCM	411	Catering Equipment and Systems	2
TEM	405	ornamental Plants and Flower Production	2
HCM	412	Hotel Furnishing and Management	2
HCM	413	Catering Technology	2
HMT	414	Research Methods in Catering and Tourism	2
FRW	403	Zoo and Park Management	2
TEM	402	Landscaping and Environmental Management	<u>2</u>
Total			<u>20</u>

Second Semester

SIWES 400 6 Months Industrial Training in Hotel or Tourism Centres.

Hotel and Catering Management Option

500 LEVEL

First Semester

Course Number	Title	Units
HCM 511	Hotel Book Keeping and Reception	3
HCM 512	Advanced Food Production and Management	3
HCM 513	Restaurant Management	3
HCM 514	Hotel Marketing and Sales	3
HCM 515	Hospitality Facility Planning and Design	3
HMT 500	Project in Hotel Management	2
HMT 501	Seminar in Hotel Management	1
GSS 414	Specialized French I	1
ABF 512	Business Law	<u>2</u>
Total		<u>21</u>

Second Semester

Course Number	Title	Units
HMT 527	Advanced Food Service	3
HMT 521	Human Resources Management	2
HMT 522	Management Accounting and Financial Control I	2
HMT 523	Business Decision Making	2
HMT 524	Strategic Planning in Hospitality	2
HEC 427	Interior Decoration and Design	2
HCM 528	Legislation and the Caterer	2
HMT 502	Project in Hotel Management	2
HMT 525	Marketing and Business Development	2
HMT 526	Insurance Security and Loss Prevention Management	<u>2</u>
Total		<u>21</u>

500 Level

First Semester

Course Number	Title	Units
TRM 511	Tourism Transportation	2
TRM 512	Tourism Planning and Environment	2
TRM 513	Tourism Economics	2
TRM 514	Travel Retail Operation I	2
HMT 500	Project in Tourism	1
HMT 501	Seminar in Tourism	2
TRM 515	Tourism Marketing Management	2
TRM 516	Tourism Planning and Development	2
ABF 512	Business Law	2
GSS 414	Specialized French I	1
TRM 517	Travel Product Management	<u>2</u>
Total		<u>20</u>

Second Semester

Course Number	Title	Units
HMT 527	Advanced Food Service	3
HMT 521	Human Resources Management	2
HMT 522	Management Accounting and Financial Control	2
HMT 523	Business Decision Making	2
HMT 524	Strategic Planning in the Hospitality	2
HMT 525	Marketing and Business Development	2

HMT	526	Security and Loss Prevention Management	2
TRM	521	Travel Retail Operation II	2
HMT	522	Hospitality Marketing Management	2
HMT	500	Project in Tourism	<u>2</u>
		Total	<u>21</u>

COURSE DESCRIPTIONS

HCM 211 Introduction to Catering (2 Units)

History of Catering in Nigeria. Types of Catering institutions: Welfare, hospital, school meal services; residential establishments, industry, transport catering, services, contract and outside catering, licensed house (Pub) Catering. Catering terms, Career opportunities; Restaurant industry and organization, hotel industry and organization; club organization and operation; Meetings Industry, Cruise Industry, Casino hotels, Management and Leadership Ethics.

HMT 211 Food and Society (2 Units)

Food habits, their formation and change, ethnic cultural influences, introduction to ethnic cookery, religious influences European, Mediterranean, Middle, Eastern, American, Mexican and South American, Carribean, Indian, Pakistani, Bangladesh, Chinese, Japanese, South East Asian and African Cookery.

HMT 212 Hotel Accounting and Book Keeping (2Units)

Accounting concepts, Nature and purpose of book keeping, gross departmental net profit, assets Sales Book-Keeping, cost-profit-volume relationship Budgetary Control, Pricing-time period, pricing formula, pricing of accommodation, food and beverage accounting records, accounting transactions, final accounts, capitals, development of management accounting concepts, mechanization, legal aspects.

TRM 211 Introduction to Tourism (2 Units)

Historical development, key factors and events in the development of tourism. Significance of tourism, structure and organization, Growth of tourism, demand for tourism, tourism in Nigeria. Significance for management, planning and development, Travelling, procedure for booking and ticking routing, and scheduled individual and group travel, linking carriers, financial consideration in owning traveling agency, Provision of information services owning a travel agency.

HMT 213 Principles of Food Purchasing

Sources of supply and purchasing information raw materials, prepared and point prepared product purchasing methods and organization, tendering, contract buying, nominated suppliers, cooperative buying groups food quality, standards, sizes, weights, labeling requirements and specifications, purchasing methods and organization for liquors, arrangement with brewers, wine merchants; wine suppliers, nominated suppliers, contractors, cooperative buying groups, cash and carry. Legal standards for licences.

HMT 200 Financial Accounting in the Hospital Industry I (2 Credits)

Basic introduction to accounting steps in the accounting cycle. Preparation reading and analysis of financial statements. Processing of accounting information. Accounting for expenses, Fixed assets, inventory, depreciation equities, sales and payroll. Accounting process from recording through posting, adjusting entries, closing entries. Fund statements; partnership accounting, cost management accounting. Cost accumulation; costing methods, Decision making, cost volume profit analysis. Pricing, Principles of budget control.

Product costing, costing concepts.

HMT 222 Food Production: Theory and Practice (2 Unit)

Menu planning, balance of costs, balance of selling price, nutritional requirements, production and service requirements, stockholding and stock turnover considerations. Men as marketing tool, menu writing language, grammar, technical terms, descriptions, layout structure, suitability to type of operation. Centralized, cooke-freeze, dispersed production, convenience food operations, traditional organizations.

HMT 223 Food Service

Principles and techniques of food service, service methods and organization. Modern, traditional and commercial, industrial and welfare service systems, vending and disposables, dispensing, control of material flow and handling, recipe construction, balance, item substitution, establishing and measuring standards, applied quantity and cost control production methods and organization.

HMT 224 Personnel Management (2 Units)

Nature and challenge of personnel management, organization of the personnel unit, planning and controlling fair employment practices, organization and job design, human resources planning, management, individual and organizational development, performance, appraisal and management by objectives, career development, compensation types, motivation, organizational behaviour modification, status of labour union, collective bargaining, management of conflicts, communication and counseling. Turnover, lay offs, outplacement, personnel research and change.

HMT 225 Accommodation Management (1)

Types of accommodation, cost and control of material, labour, over heads, total and unit cost of cleaning, prices, types of tariffs, calculation, charges based on breakdown/cost basis of cost plus profit basis, Gross and net profit control techniques, performance analysis-sales/expenditure statements, internal and external audit, daily and periodic summaries of function e.g. guests/room/bed of performance relating to different sectors of the industry using standards and comparisons.

HMT 226 Restaurant Operational Management (2 Units)

Restaurant organization, staff uniforms, preparation and duties. Restaurant presentation and equipment. Procedure for service of a meal, social skills, Types of service, technical skills, Services area, beverages. The men, menu knowledge, covers for different occasions, control systems, meal service-breakfast, lunch, dinner, afternoon teas, banqueting, guardian service, licensing law.

HMT 227 Institutional Equipment Management (2 Units)

Definitions, designs and classification of institutional equipment; requirement and specifications for installation and operating large equipment; methods of evaluation of equipment performance; use and routine care of equipment and special maintenance practices of equipment and environment.

HMT 311 Cost Control

Cost as a management function in hotel and tourism industry; Factors affecting food cost control, by – menus, types, of service, purchasing methods; storage room control, pricing methods, portion standardization etc; labour cost control, bar and restaurant control, records for control, financial reports, operational control, store keeping.

HCM 311 Managing Housekeeping Operations (2 Units)

House keeping organization. Housekeeping staff. Relationship with other departments. Head housekeeping his duties, recruitment of staff. Duty rosters for commercial hotel housekeeping, seasonal hotels, motel, etc. Duties and responsibilities of other housekeeping staff – Assistant housekeeper, chamber maids, staff maids, cleaners, clock room attendant, houseporters, valets. Sitting and large rooms, linen, beds and beddings, keys, safety and fire precautions, health, Hygiene and first aid. Storage containers, towels – different sizes/types kitchen rubbers, oven cloths, dusters, death of a guest, control of rodents and pest, bed bugs, clothes moth and their control.

HMT 312 Food and Beverage Operations (2 Units)

Management and evaluation of food and beverage systems. Developing marketing strategy, merchandizing concept, menu concept and planning operations for profitable operations. Pertinent legislation. Simulated commercial operations will be used to develop management skills and evaluate operating systems within a realistic Scenario.

TRM 311 Intermediate Tourism (2 Units)

Role of tourism within the broader context of leisure. Developing an appreciation of theoretical perspectives. Concepts and techniques used in the study of tourism. Factors which determine demand for tourism and identification of those which are of particular importance in the Nigerian context. Analysis of signification of tourism to Nigerian economy and ways in which the net contribution can be maximized. Assessment of measures taken by government worldwide to balance the growth of tourism with the necessity for adequate conservation.

HCM 312 Catering Hygiene and Safety (2 Units)

Definition, purpose and importance of Hygiene of Personal hygiene of food handlers, personal cleanliness, General Health and fitness, kitchen design and equipment, kitchen hygiene, food poisoning, reservoirs of infection and ways of spread, vehicles of infection e.g. dairy products, meat, storage sterilization and disinfection, cleaning methods, control of infestation e.g. rats, Legislation relating to Nigeria Law on hygiene, health, safety and welfare, markets, stalls and delivery vehicles, health education.

HMT 313 Maintenance Management (2 Units)

Introduction to maintenance and engineering principles required in today's lodging and food service operations. Technical information needed to establish effective preventive maintenance programmes, role and function of maintenance department, effect of travel trends on maintenance, responsibilities of the chief engineer, basic electricity concepts and electrification of building, electric devices and appliances, swimming pools, elimination of pollution.

HMT 314 Front Office/Reception Management (2 Units)

Reception terms – Reception and receptionist. Functions and staff of reception. Personal qualities and qualification of receptionist, duties. Reservations – advance, reservation diary, description and use. Guidance notes on advance reservation. Communication and counseling, social skills, selling and marketing techniques, legal aspects. Ancillary services checking in, checking out, night clerk.

HMT 315 Liquor Studies

Storage and control of liquors, beers, cidar and mineral waters, introduction to wines – definition, terms, wine making, French Wines – Bardux, Burgurdy, Champagnes, German Wines, Italian Wines, Wines of other countries – Spain, Portugal, Hungary etc, fortified wines, vermouths and aperitifs-definitions and types, Brandys, Whisky-Scotch and other, gin, blended, compounded and mixed drinks, cordials, liquors, cocktails.

HMT 316 Financial Accounting in the Hospitality Industry II (2 Units)

The accounting process. Role of book keepers and accountants in collection financial information. The three legal forms of business organization – proprietorships, partnerships, and corporations. Major accounting categories that appear on the statement of income, equity statements and balance sheets, advantages of uniform system of accounts for specific segments of the hospitality industry. Major classification of accounts (assets, liabilities, equity, revenue and expenses) and specific account fund in each classification Record keeping in perpetual and periodic inventory systems; application of debits and credits; nature of contra accounts, Purposes and characteristics of special journals, how they are designed and used in accounting system. Understand the month-end and year-end accounting processes for hospitality companies.

HCM 321 Hotel and Catering Law (2 Units)

Basic concepts of law – common, civil, criminal cases. Introduction to company law, partnership law, sole trading. Introduction to employment law, employers liability, common law provisions. Relevant provision of ECOWAS, Contractual basis of employment, the contract and its incidence at common law and by statute, Remunerations – salary controls and negotiation, the payment of salaries Health, safety and welfare, conditions and at work.

HMT 322 Bar Organization and Management (2 Units)

Characteristics and properties of minerals, beers, wines, Spirits and liquors, General Characteristics of liquors, origins, growers, shippers, distributors, new varieties and developments, Classification, grading, breakdown of various types. Properties, varieties, New varieties, legislation regarding classification and grading. Quality classification, handling liquor, equipment requirements, combination drinks (aperitifs, long coled drink, stimulation drinks etc), Service techniques, (modern, rending, dispensing, disposables, traditional service etc), Glasses, decanters, serving features. Hygiene cleanliness of premises and equipment; legal aspects, drink occasions, merchandizing.

HMT 323 Food Preparation Management (2 Units)

Purposes of cooking food, use of heat, effect of various methods of heat application on physical nutritional and aesthetic aspects of foods, solutions and colloids; enzymatic and microbiological aspects of food preparation, measuring techniques, leavenings; flour mixes; modern and traditional equipment and procedures in relation to time, energy and monetary expenditures and health preparation.

HMT 411 Quality Food Production and Service (4 Units)

Development of food service institution, meal planning food standards and service, food selection and storage, food products and their preparations.

HMT 412 Organization and Administration of Hotels and Tourism Centres (2 Units)

Factors and responsibilities of management. Art and Science of hospitality management. Three types of skills required of managers and need for management development in hospitality industry. Four types of on-the-job management instructions. 4 Steps in the planning process. Criteria for good objectives, organization chart. Method of communication, their importance and functions. Responsibilities of personnel department. Maslows hierarchy of needs and other motivational theories. Record keeping responsibilities. Accounting and benefits of uniform systems of accounts. Five basic financial statements. Daily operation reports and preparation of annual budget.

HMT 413 Planning and Development of Hotel and Tourism Attraction (2 Units)

Special consideration for planning and development. The process of planning. Planning the facilities – floor layout of the different areas. Major recreational facilities and activities; Personnel organizations and human relations.

HCM 411 Catering Equipment and Systems (2 Unit)

Catering Equipment, combined systems, vending machine-technical reliability and aesthetic acceptability, types of vending machines and their safety, hygiene for vending systems catering, convenience food catering.

HCM 412 Hotel Furnishing and Management (2 Units)

Factors affecting the type, number and quality of furnishing. Use of roller or Venetian blinds. Window Curtains, glass curtains, draperies and furniture. Choice of liners for different areas of hospitality industry.

HCM 413 Catering Technology (2 Units)

Kitchen planning, catering services – gas, electricity, comparison of fuels, energy conservation standards of hygiene, cook-chill system, cook –freeze system, sous-vide, centralized production, computer in catering, Hotel Management Software.

SIWES 400 Students will spend a total of one year in reputable hotels; tourism centres to as part of their practical experience. The student will be exposed to all sections of the hotel and tourism industry.

TRM 511 Tourism Transportation (2 Units)

Tourism transportation within the overall framework of the passenger transportation industry. Examination of the physical, economic, pricing and regulatory components followed by selected industry analysis of major modes in tourism transportation using the systems approach. Local and national legislation, international treaties and organizations, current policy issues and future trends with reference to Nigerian tourism industry.

TRM 512 Tourism Planning and Environment (Credits)

Planning and progress in the last decade. Environmental awareness and environmental impact of tourism in an area. Tourism planning process and levels of tourism resources. Evaluating Scenarios where a symbolic relationship can be forged between planning tourism and conservation.

TRM 513 Tourism Economics (2 Credits)

Concepts and relationships that result in creation of wealth by the tourism industry. Major economic phenomenon associated with tourism industry in developed and developing countries. Economic contributions and importance of tourism industry in Nigeria.

TRM 514 Travel Retail Operations (2 Credits)

Accessing information essential for competent operations in a travel agency. Operation of computer reservation systems and technological development in retail travel industry. Travel terminology, costings, documentations, ancillary services, tourism destination studies. Special office systems.

TRM 515 Tourism Marketing Management (2 Credits)

Relevant marketing concepts, need for systematic approach to the marketing function in hospitality and tourism service. Analysis of distinct problems.

TRM Tourism Planning and Development (2 Credits)

Tourism planning and planning process, its responsible tourism development in relation to time, market demand and specified objectives. Impact of tourism development and consequences of unplanned development.

TRM 517 Travel Product Management (2 Credits)

Growth of tour package market and the design, development and management of the travel product through the stages of research, planning, negotiating and pricing, marketing and operations.

HCM 511 Hotel Bookkeeping and Reception (3 Units)

Nature and purpose of Hotel Book-keeping, Day-to-day routine book keeping, sales, purchases, cash accounts, use of double entry, sales book-keeping. Normal accounts, purchases and purchases return journal. Purchases and trading ledgers. Suppliers statements.

HCM 512 Advanced Food Production and Management (3 Units)

Menu making, pricing, cost control. Production methods, production systems, service systems. Management of different menus table note, a la carte, etc.

HCM 513 Restaurant Operational Management (3 Units)

Restaurant organization, staff uniforms, preparation and duties. Restaurant presentation and equipment. Procedure for services of meal, social skills, Types of Service, technical skills, service area, beverages. The menu, menu knowledge, covers for different occasions, control systems, meal service-breakfast, lunch, dinner, afternoon teas, banquetting, gueardon service, licencing laws.

HCM 514 Hotel Marketing and Sales (3 units)

Introduction to hospitality marketing and sales, scope, elements and organization of hospitality marketing and sales. Theoretical concepts of marketing, marketing functions, cost, efficiency analysis. Marketing research and improvement techniques. The four "PS" of marketing. Marketing and sales plan, Personal sales, Telephone sales, Internal marketing and sales, restaurant and lounge sales; catering and meeting rooms sales; marketing to business travelers; Marketing to leisure travelers; Marketing to travel agents, marketing to special segments.

HMT 515 Hospitality Facility Planning and Design (2 Units)

Design and maintenance of buildings, furniture fixtures and equipment in hospitality industry. Factors affecting selection and location of food service, laundry, water and surface parking systems. Inputs needed for operational efficiency, cost control through extending equipment and building life and reducing utility expenses. Innovative and environmentally friendly options for solid waste reduction and disposal. Using modern technology to streamline operational procedures, Renovation.

RMT 521 Human Resource Management (2 Units)

Employment Laws and applications. Job analysis and job design. Planning and recruiting; selection; orientation and socialization; training and development. Evaluating employee performance; compensation administration; incentives and benefits administration. Groups and conflict in hospitality industry. Labour unions. Negotiations and collective bargaining; Health, safety and employee assistance programmes. Turnover, discipline and exits; social responsibility and ethics. Communication. Groups processes with emphasis on diagnosing and developing human management potential of individuals.

HMT 522 Management Accounting and Financial Control (2 Units)

Analysis of hospitality products and markets, preparation of marketing plan, evaluation of media strategies, principles and practice of promotions and public relations in hospitality industries. Problems on marketing issues and marketing management.

HMT 523 Business Decision Making (2 Units)

Decision making models; Quantitative techniques used to aid decision making in business. Marginal analysis. Decision making under risk and uncertainty.

TRM 524 Travel Retail Operation (2 Credits)

Principles of agency management and establishment. Various business functions of marketing; commercial management, information systems, organizational management, accreditations, legal aspects and consumer protection including major trends in travel distribution system (CRS) domestically and internationally. Functional differences between retail, wholesales, and ground operations.

HMT 524 Strategic Planning in Hospitality Industry (2 Units)

Using business and management concepts to conceptualize holistic view of hospitality operations; evaluating statistical and financial reports as a basis for decision making; applying elements of strategic management process in hospitality organizations. Integrating knowledge of the principles of marketing management and hotel operations and applying these to selection of strategies needed in the formation of a market plan to achieve organizational objectives.

HMT 525 Marketing and Business Development (2 Units)

Principles of marketing, marketing concepts, buyer behaviour, market research, market segmentation, marketing mix variable, sales promotion, communication techniques to evoke response from users and potential users. Pricing. Distribution and promotion. Implementating, organizing and controlling marketing programmes. Business analysis for marketing. Financial analysis for marketing decisions. Strategies for marketing.

HMT 526 Security and Loss Prevention Management (2 Units)

Safety and security. Security and hospitality industry. Security equipment; Security procedures covering guest concerns. Department Responsibilities in Guest and asset protection; Protection of funds. Emergency management. Safety in lodging property. Insurance in the hospitality industry. Different types of insurance. Problems of insurance in hospitality industry.

HMT 526 Finishes in Interior (2 Units)

Physical, chemical and aesthetic properties of finishes and used on walls, floors, ceiling, furniture and cabinets. Application and maintenance of finishes and surface coverings. Care of finishing equipment and safe handling of finishing chemicals.

HMT 527 Advanced Food Service (2 Units)

Organization of the restaurant brigade – Manager, or matre d’hotel, head waiter etc, factors governing size of restaurant brigade, personal qualities required of restaurant staff, ancillary departments, services of various menus – a la carte and table d’hotel services, service routine, breakfast, floor and room services. Table laying for Table d’hotel and a la carte menu, staff luncheon, afternoon routine, buffets, these evening routines, floral decorations, Types of service – silver service, plates service, cafeteria or self service, light refreshment service, full service. Beverages-brewing of different types of teas, coffee making. Restaurant control system, barquets and other arrangements, buffet dinners, balls, wedding and outdoor catering. Bar and cellar organization.

HMT 528 Legislation and the Caterer (2 Units)

Legislation, Environmental health officer and legislation, accidents, accident prevention, First aid, fire precautions, personal, kitchen, food hygiene, food hygiene regulations, legal aspects.

HMT 501 Seminar in Catering Management and Tourism (1 Unit)

Each student will present an oral report based on library research on current problems and development in the hotel/catering management and tourism industry.

HMT 500 Project in Hotel Management (2 Units)

Each student will work under supervision on a project which provides them with the opportunity to put into practice all the knowledge accumulated in hotel management and tourism. Project will aim at advancing hotel and tourism industry in Nigeria. A student may opt to concentrate on catering and hotel management or tourism. The work will be embodied in a thesis and is a prerequisite for graduation.

HRT 501 Micro-Propagation of Agricultural Crops (2 Units)

Tissue Culture: Physiological basis of plant culture at cellular level. Identification of suitable plants and plant parts for tissue culture. Environmental control in tissue culture, influence of pathogens on cultured propagules. Recent advances in Biotechnology. Role of tissue culture in Plant Breeding and induction of mutants. Role of tissue culture in horticultural crop production and rapid multiplication of clonal materials.

HRT 502 Park Design and Management (2 Units)

Architectural design, principles and concepts for various types of parks. Functional designs, e.g. parks for family relaxation, parks for holidaying, concepts of national parks, picnic parks.

HRT 503 Floriculture (2 Units)

Identification of tropical and ornamental plants, culture of trees, shrubs and flowers. Shade trees, ground covers, annual flowers, perennial shrubs and hedge plants, bedding and foundation plants, lawn grasses, nursery management, palms as ornamental plants, rock gardens, aquatic plants, Rose, forms and orchids.

Practicals: Field work – to identify various species of trees, shrubs, hedge plants. Propagation, esteem cuttings and seeds, etc. potting media, flower show. Flower arrangement.

HRT 504 Landscape Design (2 Units)

Design principles, design practice, basic styles, preparing the plan design, landscape construction. Hard landscaping, soft landscaping. Contouring and levels. Maintenance and management of established landscape. Landscape contracts and contractual agreements.

Practicals: Drawing and design production, design concepts. Field work contour development. Topographic map production. How to prepare contract documents.

B. WATER RESOURCES MANAGEMENT AND AGRO-METEOROLOGY

First Semester

100 Level

Course Code	Course Title	U	L	T	P
BIO 101	General Biology I	2	2	-	-
BIO 191	Practical Biology 1	1	-	-	1
CHM 101	Practical Chemistry	3	3	-	-
CHM 191	Practical Chemistry 1	1	-	-	1
MTS 101	Algebra	3	2	1	-
PHS 101	General Physics 1	3	2	1	-
PHS 191	Physics Laboratory 1	1	-	-	1
GNS 101	Use of English	2	2	-	-
GNS 103	Introduction to Social Problems	2	2	-	-
GNS 102	Introduction to Nigerian History	1	1	-	-
Total No. of Units		19	15	2	4

Second Semester

Course Code	Course Title	U	L	T	P
BIO 102	General Biology II	2	2	-	-
BIO 192	Practical Biology II	1	-	-	1
CHM 102	Intro. Organic Chemistry I	2	2	-	-
CHM 104	Intro. Inorganic Chemistry I	2	2	-	1
CHM 192	Practical Chemistry II	1	-	-	1
MTS 102	Calculus and Trigonometry	3	2	1	-
AEM 102	General Physics II	2	2	-	-
PHS 102	Physics Laboratory II	2	-	-	1
PHS 192	Physics Laboratory II	1	-	-	1
Total No. of Units		16	12	1	3

200 Level

First Semester

Course Code	Course Title	U	L	T	P
WMA 201	Introductory Meteorology	3	2	1	-
MCE 205	Fluid Mechanics I	2	2	-	-
STS 201	Applied Statistics	3	2	1	-
CPP 201	Principles of Crop Production	3	2	-	1
CSC 201	Computer Programming I	3	2	-	1
SOS 211	Principles of Soil Science	2	1	-	1
GNS 203	Logic and History of Science		2	2	-
MTS 201	Mathematical Foundations	3	2	1	-
Total No. of Units		21	15	2	5

Second Semester

Course Code	Course Title	U	L	T	P
WMA 204	Elements of Hydrology	2	2	-	-
WMA 202	Intro. Climatology & Biogeography	3	3	-	-
CSC 202	Computer Programming II	3	2	-	1
CHM 202	Analytical Chemistry I	2	2	-	1
APH 202	Introduction to Animal Agriculture	3	2	-	1
GNS 202	Elements of Politics & Government	1	1	-	-
MTS 232	Ordinary Diff. Equations	2	2	-	-
	Electives (Minimum)	2	2	-	1
Total No. of Units		18	15	-	4

Electives

MCE	309	Strength of Materials	2	2	-	-
WMA	210	Elements of Geo-Science	2	2	-	1
AEM	212	Principles of Agric. Economics	2	2	-	-
MTS	242	Mathematical Methods	3	2	1	-

300 Level**First Semester**

Course Code	Course Title	U	L	T	P
WMA 301	Surface Hydrology I	2	2	-	-
WMA 303	Groundwater Hydrology I	2	2	-	-
CVE 303	Hydraulics I	2	2	-	-
MCE 305	Fluid Mechanics II	2	1	-	1
WMA 307	Water Resources of Nigeria	2	2	-	-
WMA 309	Agro-meteorology I	2	2	-	-
WMA 313	Hydro-met Instrumentation and Network Design	2	2	1	1
EHS 311	Introduction to Entrepreneurship Studies				
	Total No. of Units	19	18	-	5

Electives

FMW 315	Remote Sensing & Mapping Techniques	3	2	-	1
STS 203	General Statistics	2	2	-	-
FWM 210	Intro. To Forest Res. Management	2	2	-	-
MTS 233	Real Analysis	3	2	1	-
CVE 302	Concrete Structures	3	2	1	-
CHM 305	Environmental Chemistry	2	2	-	-
STS 343	Sampling Techniques	2	2	-	-

Second Semester

Course Code	Course Title	U	L	T	P
WMA 302	Groundwater Hydrology II	2	2	-	-
CVE 304	Hydraulics II	3	2	-	1
WMA 308	Synoptic Meteorology	2	2	-	-
WMA 314	Surveying & Photogrammetry	3	2	-	1
WMA 316	Agro-meteorology II	3	2	-	1
WMA 322	Surface Hydrology II for Water	3	2	1	-
WMA 320	Field Work	1	-	-	-
PHS 364	Energy and Environment	3	2	-	-
	Total No. of Units	21	15	1	3

Electives

FMW 304	Aerial and Ground Survey	3	2	-	1
CVE 312	Soil Mechanics	3	2	-	1
STS 352	Experimental Design 1	3	2	-	1
STS 394	Experimental Design I (Practical)	1	-	-	1
WMA 318	Water Quality Assessment And Pollution Control	2	2	-	-
CVE 322	Water Supply Engineering	2	2	-	-

**400 Level
Water Res. Management & Hydrology Option**

First Semester

Course Code	Course Title	U	L	T	P
WMA 401	Prin. of Soil & Water Conservation	2	2	-	-
WMA 403	Principle of Irrigation	3	2	-	1
WMA 407	Tropical Water System I	3	2	1	-
WMA 409	Water Quality Assessment	3	2	1	-
WMA 411	Hydrometeorology III	3	2	-	1
WMA 413	Agro-met. Instrumentation & Network Design II	2	1	-	1
CVE 421	Waste Water Engineering	2	2	-	-
	Total	20	15	2	4

Electives

ARD 201	Intro. To Rural Sociology & Community Development	3	2	1	-
FWM 314	Principles of Agro-Forestry	2	2	-	-

Second Semester

Industrial Training

WMA 402	Industrial Training Practical	6	-	-	6
WMA 404	Industrial Training Field Assessment	4	-	-	4
WMA 406	Industrial Training Report	4	-	-	2
WMA 408	Industrial Training Seminar	2	-	-	2
	Total No. of Units	16	-	-	16

400 Level

Agricultural Meteorology Option

First Semester

Course Code	Course Title	U	L	T	P
WMA 401	Prin. Of Soil & Water Conservation	2	2	-	-
WMA 403	Principle of Irrigation	3	2	-	1
WMA 407	Tropical Water System I	3	2	1	-
WMA 411	Agrometeorology III	3	2	1	-
WMA 413	Hydro-meteorological Instrumentation & Network Design II	2	1	-	1
WMA 415	Weather Analysis & prediction	3	1	-	2
CPP 301	Crop Production I	3	2	-	1
	Total No. of Units	21	14	2	6

Electives

ARD 201	Introduction Rural Sociology & Community	3	2	1	-
FWM 314	Principles of Agro-Forestry	2	2	-	-
ARD 401	Agricultural Communication	2	2	-	-
EMT 401	Environmental Monitoring System & Techniques	3	2	1	-
WMA 417	Principles of Aeronautical & Marine Meteorology	2	2	-	-

**400 Level
Water Res. Management & Hydrology Option**

First Semester

Course Code	Course Title	U	L	T	P
WMA 401	Prin. of Soil & Water Conservation	2	2	-	-
WMA 403	Principle of Irrigation	3	2	-	1
WMA 407	Tropical Water System I	3	2	1	-
WMA 409	Water Quality Assessment	3	2	1	-
WMA 411	Hydrometeorology III	3	2	-	1
WMA 413	Agro-met. Instrumentation & Network Design II	2	1	-	1
CVE 421	Waste Water Engineering	2	2	-	-
	Total	20	15	2	4

Electives

ARD 201	Intro. To Rural Sociology & Community Development	3	2	1	-
FWM 314	Principles of Agro-Forestry	2	2	-	-

Second Semester

Industrial Training

WMA 402	Industrial Training Practical	6	-	-	6
WMA 404	Industrial Training Field Assessment	4	-	-	4
WMA 406	Industrial Training Report	4	-	-	2
WMA 408	Industrial Training Seminar	2	-	-	2
	Total No. of Units	16	-	-	16

400 Level

Agricultural Meteorology Option

First Semester

Course Code	Course Title	U	L	T	P
WMA 401	Prin. Of Soil & Water Conservation	2	2	-	-
WMA 403	Principle of Irrigation	3	2	-	1
WMA 407	Tropical Water System I	3	2	1	-
WMA 411	Agrometeorology III	3	2	1	-
WMA 413	Hydro-meteorological Instrumentation & Network Design II	2	1	-	1
WMA 415	Weather Analysis & prediction	3	1	-	2
CPP 301	Crop Production I	3	2	-	1
	Total No. of Units	21	14	2	6

Electives

ARD 201	Introduction Rural Sociology & Community	3	2	1	-
FWM 314	Principles of Agro-Forestry	2	2	-	-
ARD 401	Agricultural Communication	2	2	-	-
EMT 401	Environmental Monitoring System & Techniques	3	2	1	-
WMA 417	Principles of Aeronautical & Marine Meteorology	2	2	-	-

**Second Semester
Industrial Training**

WMA 402	Industrial Training Practical	6	-	-	6
WMA 404	Industrial Training Field Assessment	4	-	-	4
WMA 406	Industrial Training Report	4	-	-	2
WMA 408	Industrial Training Seminar	2	-	-	2
	Total No. of Units	16	-	-	16

500 Level

Water Res. Management & Hydrology Option

First Semester

Course Code	Course Title	U	L	T	P
WMA 501	Hydro-Meteorological Forecasting	2	1	-	1
WMA 503	Water Res. Planning & Management	3	3	-	-
WMA 511	Agro-met. Instrumentation & Observation and Network Design	3	2	-	1
EMT 511	Ecological Disasters and Control	2	2	-	-
WMA 515	Seminar	2	-	2	-
CVE 521	Hydraulic Structures I	2	2	-	-
EMT 501	Environmental Law	2	2	-	-
	Total	16	12	2	3

Electives

CPP 501	Methods of Field Experimentation	3	2	-	1
AEM 505	Research Methods	3	2	-	1

Second Semester

Course Code	Course Title	U	L	T	P
WMA 502	Hydro-Meteorological Forecasting II	2	2	-	-
CVE 502	Irrigation & Drainage Engineering	3	2	-	1
WMA 510	Watershed Management	3	2	-	1
WMA 599	Project	6	-	-	6
	Electives (Minimum)	3	2	-	1
	Total No. of Units	17	10	-	9

Electives

EMT 306	Environmental Impact Assessment (Compulsory)	3	2	1	-
EMT 504	Waste Water Management	3	2	-	1
WMA 516	Water Res. And Public Health	3	2	-	1
CVE 522	Hydraulics Structure II	2	2	-	-

500 Level

Agricultural Meteorology Option

First Semester

Course Code	Course Title	U	L	T	P
WMA 501	Hydro-Meteorological Forecasting I	2	1	-	1
CPP 501	Methods of Field Experimentation	2	1	-	1
CPP 505	Crop Production II	3	2	-	1
WMA 507	Agro-meteorology IV	2	2	-	-
WMA 511	Agro-meteorological Instrumentation	3	2	-	1
	Observation and Network Design				
WMA 515	Seminar	2	-	2	-
EMT 501	Environmental Law	2	2	-	-
	Total No. of Units	16	10	2	4

Electives

AEM	501	Research Methods	3	2	-	1
EMT	505	Ecological Disaster and Control	2	2	-	-
SOS	511	Soil Fertility and Plan Nutrition II	2	2	-	-
CPP	503	Crop Production Systems	3	2	-	1

Second Semester

Course Code	Course Title	U	L	T	P
WMA 502	Hydro-Meteorological Forecasting II	2	2	-	-
WMA 508	Agro-met Methods & Applications	3	2	1	-
HRT 508	Organic and Urban Farming	3	2	-	1
WMA 512	Tropical Weather System II	3	2	1	-
WMA 599	Project	6	-	-	6
	Electives (Minimum)	3	2	-	1
	Total No. of Units	20	12	2	8

Electives

*EMT	306	Environmental Assessment	3	2	1	-
CVE	502	Irrigation & Drainage Engineering	3	2	-	1
FIS	310	Oceanography	2	2	-	-

COURSE DESCRIPTIONS

WMA 201 Introductory Meteorology (3 Units)

General properties of the atmosphere; composition and structure of the atmosphere. Basic gas laws applicable to the atmosphere. Principles of atmospheric statistics. Radial energy in the atmosphere, solar radiation; Effective radiation and radiation balance. Heat-exchange in the soil, water and atmosphere. Heat regime of the soil and bodies of water principle of atmosphere thermodynamics. Heat transfer in the atmosphere-air temperature, vertical distribution of air temperature; water cycles in the atmosphere. Evaporation and methods of measurement. Condensation of water vapor, cloud types and cloud classification. Network of meteorological stations-observation times and the transmission of information.

WMA 202: Introductory Climatology And Biogeography (3 Units)

Basic definitions and explanations in Climatology and Biogeography. Climatological problems and investigation methods. Relationships with Meteorology, Biogeography and Hydrology. Climatological data processing methods; basic factors of climate formation, influence of relief on climate and plants. Geographical distribution of climatic elements, plants and animals. Climate and soil. The concept of adaptation in plants and animals. Classification of climates and biogeography of the earth.

WMA 204 Elements Of Hydrology (2 Units)

Definition, scope and application of hydrology. The concept of hydrological cycle and drainage basin characteristics; Precipitation: Forms, types etc. and measurements. Factors affecting interception, evaporation, evapo-transpiration, surface run-off and subsurface flow. Determination and analysis of infiltration, percolation and permeability. Aquifers and Groundwater movement.

WMA 210: Elements of Geo-Science (3 Units)

Definition, Scope and approaches to Geo-science. The nature, composition and classification of the earth's system (open systems, closed systems, matter and energy classification of rocks).

Environmental processes; the atmosphere, earth's-atmosphere and energy system. The inter-relationship between the atmosphere, hydrosphere, lithosphere, biosphere and man. Lithologic and hydrologic cycle, denudation processes, action of flowing water and erosion, flood plan features and characteristics of wetlands; deltas, classification of types of relief, biogeochemical cycle; man's interaction with natural environment and energy system.

Composition of the Earth's crust; minerals and rocks (classifications of rocks); Lithologic cycle; classification of types of relief; denudation processes; action of flowing water and erosion; flood-plain features, deltas; biogeochemical cycle.

WMA 301: Surface Hydrology 1 (2 Units)

Pre-requisite: WMA 204

Precipitation, Analysis of data: Thiessen, Isohyetal and Arithmetical method of computations. Detection of missing data, Double mass curve, Intensity-Depth-Duration-frequency analysis.

Evapo-transpiration, Water budget and energy budget methods of determination of reservoir evaporation – Evapo-transpiration from climatological data –Penman method.

Streamflow: Discharge volume and depth of runoff. Average annual runoff, seasonal runoff. Relation between water levels and discharges – rating curves. Stream-flow hydrograph. Overland flow.

Unit hydrograph: derivation of unit hydrograph, synthetic unit hydrographs. Application of unit hydrographs.

Sediment Transport: Erosive action of rivers, suspended load and bed load.

Lake and Reservoirs: hydrology of lakes and reservoirs. Inflow-outflow balance of lakes. Heat and temperature balance in lakes. Rivers, estuaries, Salinity, waves and current. Swamps and marshes. Principles of Oceanography.

WMA 302: GROUND WATER HYDROLOGY II (2 Units)

Pre-requisite: WMA 303

Non-steady radial and rectilinear flows in aquifers. Well pumping tests. Theis and Jacob methods, multiple well systems. Types of wells, Methods for well construction. Well drilling methods: Cable tool, rotary and reserve rotary; well design, development and maintenance. Evaluation of aquifer behavior and water quality. Analysis and interpretation of water level maps, laboratory determination of permeability, porosity, compressibility and velocity of flow. Ground water in Nigeria, groundwater data analyses.

WMA 303 Groundwater Hydrology I (2 Units)

Pre-requisite: WMA 204

Origin, occurrence and role of groundwater. Basic definitions of terms in groundwater studies, classification of aquifers; aquifer parameters, porosity, specific yield, permeability, transmissivity, storativity, anisotropy and heterogeneity.

Groundwater geology; rock types and aquifers, geologic processes and aquifers; typical sedimentary rock aquifers. Exploration of groundwater, geological and geophysical methods (Surface and sub-surface). Equation of groundwater flow; Darcy's law and simple applications. Steady radial and rectilinear flows in aquifers.

WMA 307: Water Resources Of Nigeria (2 Units)

Rainfall; Pattern, spread and quantity. Daily, monthly and yearly rainfall in different regions of the country. Rivers in Nigeria; Main rivers and their flows, average flow, maximum and minimum flow, annual yields. Rivers Niger, Benue, Ogun, Kaduna, Sokoto, Rima, Hadejia, Jamaire, Gurara, etc.

Lakes and reservoirs: Natural and artificial lakes. Reservoirs above dam – Kainji, Jebba, Tiga Dams and Reservoirs etc. Reservoirs behind small and medium earth dams in different States in Nigeria.

Tidal and Saline water in the coastal areas.

Groundwater: exploitation through Boreholes and Tube wells.

Use of Water: irrigation for agriculture, water supply and wastewater engineering, navigation, hydropower generation, environmental sanitation, industrial use, etc.

Agencies: Federal Ministries of Agriculture and Water Resources. Water Corporations, Department of Waterway and Navigation, River Basin Development Authorities, Research Institutes, Universities.

WMA 308: Synoptic Meteorology (2 Units)

Pre-requisite: WMA 201

General information on synoptic Meteorology. Methods of Long and Short range weather forecasts. Basic synoptic codes-prospects of using meteorological satellite data-elements of world weather watch; compilation and analysis of weather charts.

Analysis of the fields of meteorological elements.

Air masses – their classification and properties; Atmospheric forms. Cyclone activity, Macro-synoptic processes and Long-range weather forecast; Laws of general atmospheric circulation; peculiarities of circulation in various areas of the globe.

WMA 309: Agrometeorology I (3 Units)

Pre-requisite: WMA 201, 202, CPP 201

Focus of Agrometeorology, Classification of Agro-meteorological indices. Instrumentation and method of observation of Agro-meteorological indices. The thermal based Agro-meteorological indices; Temperature (Soil and air), radiation and photoperiods. The moisture-based indices; precipitation (rainfall, dew, fog), humidity evaporation and evapotranspiration. Evaluation of crop evaporation by lysimeters.

Indirect estimation of evaporation, Penman, Thornthwaite, Blarney-Criddle and Oliver's method. Installation of Agro-meteorological stations.

WMA 318: Water Quality Assessment And Pollution Control (2 Units)

Pre-requisite: CHM 202

Solvent properties of water, principles of physico-chemical analysis, major ionic components of natural water. Chemistry of natural waters, water quality requirements standards for potable water, irrigation and livestock. Types of water, lithological control of surface and ground water.

Water Pollution Studies: Sources, fate, pathways and effects of water pollution, Chemical, Mechanical and Biological methods of maintaining and improving water quality.

WMA 313: Hydro-Meteorological Instrumentation and Network Design I (3 Units)

Pre-requisite: WMA 202, 204

Meteorological data: sunshine hours, radiation, relative humidity and wind speed.

Precipitation: Location, Recording and non-recording gauges. Evaporation and evapotranspiration. Pan evaporation, soil evaporimeters and lysimeters, short and long wave radiation, indirect methods.

Network design: General principles for design of networks, general requirements, optimum network, minimum network, optimum use of existing stations in organizing a minimum network. Data to be considered in determining network density. Quality of data to be collected, Density of observation, stations for a minimum network, Factors affecting the density, Minimum density limit of climatological networks.

WMA 314: SURVEYING AND PHOTOGRAMMETRY (3 Units)

Pre-requisite: FWM 315

Contouring: Characteristics of contours; methods of locating contours and plotting, area and volume. Construction survey general principles, setting and laying out Engineering structures, pipes and drains. Production, reading and interpretation of maps. Basic Photogrammetry and practical uses of aerial photographs.

WMA 316: Agro-Meteorology II (2 Units)

Pre-requisite: WMA 301.

A general survey of climate-agriculture relationships: classification of Agro-meteorological indices. The concept of plant environment. The relationship between climate and plant's biophysical environment. Geomorphic, Edaphic and Biotic factors. Major climatic attributes in plant and animal distribution. General climatic aspects of pests and diseases of plants and animals, forestry, fisheries, water resources, livestock production, crop storage and insect control. Water and energy budget of the plant environment. Modification microclimate environment modification of soil temperature regime rainmaking, evaporation suppression and wind speed checks.

WMA 322: Surface Hydrology II (3 Units)

Stream flow routing: the storage equation, determination of storage, Reservoir routing, routing in river channels. Analytical and graphical methods of routing, drainage basin outflow by routing. Applications of statistical methods of hydrology – hydrologic variable's probability distribution functions used in hydrology, Gumbel, Gaussian, Lognormal etc. Analytical and graphical solution of extreme value distribution.

Design frequency, Frequency analysis from synthetic data, Data generation methods, probable maximum flood, Precipitation probability, Rainfall frequency data and analysis, Regression and correlation analysis, Curve fittings.

Flood Frequency Analysis: flood series (partial, annual). Computation, procedures, plotting formulae. Flood peak frequency analysis –graphical and analytical fitting distribution to flood events. Flow duration curves.

WMA 401: Principles Of Soil And Water Conservation (2 Units)

Definitions, Ethics and Scope of soil and Water conservation principles. Geomorphological factors in soil water consideration. Types, forms and significance of soil erosion. Spatial and temporal measurement of erosion processes. Erosivity of rainfall, preparation of erosivity indexes, drainage basin studies. Grazing animal as erosion hazard.

Effect of cultivation methods and cropping systems on erosions, slope profiles and soil development. Soil particles, porewater pressure, geomorphology and weathering processes. Soil deterioration by agriculture and other malpractices.

Soil conservation methods mechanical and cultural methods. Universal Soil Loss Equation (USLE) and adaptation for Nigeria.

Wind erosion, Mechanical methods, terracing types, design and spacing of terrace. Terraces and diversion ditches. Construction and maintenance. Design and construction of grassed waterways, drop structures, gully controls.

WMA 403: Principles Of Irrigation (3 Units)

Pre-requisite: CVE 304

Types of soil. Soil moisture, Field capacity, Wilting coefficient, Available Water.

Water requirements of crops, consumptive use of water. Estimating evapotranspiration by Blarney-Criddle and Penman methods. Irrigation efficiencies. Effective rainfall. Net irrigation requirements, Gross irrigation requirements, Water requirements of major crops.

Quality and classification of irrigation water. Soil management, cultivation and maintenance of fertility of irrigated land, Reclamation of swampland, re-use of irrigation water. Problems of drainage, organic soils, special irrigation problems. Use of saline water and urban or industrial effluent.

WMA 407: Tropical Weather Systems I (3 Units)

Definition of the meteorological tropics: General characteristics of the tropical atmosphere, spatial and seasonal distribution of weather elements in the tropics .

Isolation and temperature air masses, sub-tropical anticyclones, cloudiness, rainfall and evapo-transpiration, radiation and water balance in the low attitudes. Implications for agriculture and water resources management of the tropics. Basic features of planetary scale motion in the tropic aspects for tropical circulation. The sub-tropical high-pressure cell (STHs) the trade winds, the equatorial trough, the Southeast Asian monsoons, the westerlies. Effects on tropical climate and agriculture.

WMA 409: Water Quality Assessment (3 Units)

Comparative studies of natural water: River, Lakes, Sea, Ground and Rainwater. Oxygen demand in aerobic and anaerobic oxidation. Demineralization and Desalting. Hydro-chemical data analysis. History of water quality management: the problem and its science. Developing standards from the traditions of toxicology, classification and environmental quality assessment; the search for ecologically accurate aquatic metrics. The role of scale issues in water quality management. Coastal zone water quality management structuring water management goals by ecological level, effects of land use on water quality.

Management of water quality in:

- i. A forested landscape
- ii. An agricultural landscape
- iii. An urban landscape.

WMA 411: Agro-Meteorology III (3 Units)

Pre-requisite: WMA 316

The nature of climate-agriculture relationships and the methods of their investigation. Specific effects of moisture and thermal Agro-meteorological indices on agricultural production. Effects of amount of spatial and temporal variation of precipitation (rainfall, dew, and fog). Insolation and photo-periodism, soil and air temperature,

evapotranspiration, cloud, wind and atmospheric humidity. Micro meteorological research in the boundary layer below plant canopies, crop phenology and microclimate. Quantitative and qualitative effects of solar energy received at the earth's surface, soil heat flux and soil temperature, carbon dioxide balance of the plants environment, wind towers and estimation of boundary layer characteristics. Inter-relationships of wind shelter, moisture conservation and plant growth.

WMA 413: Hydro-Meteorological Instrumentation And Network Design II (2 Units)

Pre-requisite: WMA 313

Water levels of rivers, lakes and reservoirs, Gauges and procedures for measurement of state. Frequency of gauge measurements. Discharge measurements: by current meter, float method, dilution method. Measurement of correspondence stage by moving boat method, Ultrasonic methods, Electromagnetic methods, Stream gauging stations. Purpose: selection of sites, control sections, Artificial controls, stage discharge relationships. Stream flow computation, computation of average gauges height, computation of average discharge, Quality control of stream flow data.

Sediment discharge: Measurement of suspended sediment discharge, Measurement of bed-sediment discharge.

Collection, processing and publication of data. Collection and observation procedures. Transmission of hydrological and meteorological observations. Quality control, storage and cataloging. Special data collection requirement: 'bucket surveys' of storm rainfall, weather radar data. Extreme stages and discharges.

WMA 415: Weather Analysis And Prediction (3 Units)

Principles of objective analysis and numerical weather prediction; observational statistic, prediction of individual weather elements. ;short range forecasting by various methods. Meso-scale analysis, convection systems, local winds and other weather phenomena. Barotropic and baroclinic forecast; surface analysis, analysis of constant pressure surfaces and other surfaces; cross-section analysis, numerical computation of map factors and of geostrophic winds; static stability computation, satellite data and other modern techniques.

Formulation of basic equations of motion: vector from Cartesian coordinate, continuity equation hydrodynamic equation, equation of state. General circulation of the atmosphere: vorticity, divergence and deformation, static stability, circular vortex, and dynamics of mesoscale phenomena, atmospheric turbulence, and waves small-scale turbulence convection treatment of Barotropic and baroclinic waves.

WMA 417 Principles Of Aeronautical And Marine Meteorology. 2 Units

Meteorological aspects of flight planning. (Pressure pattern flying, definitions of rub line, great circle, metrological requirement for en-route winds and temperatures etc.) Operational knowledge and meteorological services for international air navigation; operation of aircraft: effects of air density, humidity, king, turbulence and wind and meteorological hazards to aviation. Climatological aspects of the organization of observations on ships (ocean weather ships, commercial vessels, etc). Preparation of climatic atlases, climate of oceanic regions in relation to marine activities (transport, fishing, etc).

WMA 501: HYDRO-METEOROLOGICAL FORECASTING I 2 Units

Pre-requisites: WMA 308, 409

Statistical methods in Climatological and meteorological studies. Application of statistics in decision-making and objective analysis of boundary layer climatology. Weather analysis and forecasting reviews. Critical appraisal of forecast methods and products. Hydrological forecasts and warnings. Classification of hydrological forecasts, Hydrological forecasting services, operations, organization, collection of data and issue of

forecasts and warnings, use of radar observation for meteorological and Hydrological forecasting services.

WMA 502: HYDRO-METEOROLOGICAL FORECASTING II (2 Units)

Pre-requisite: WMA 501

Forecasting methods: Seasonal and annual flow forecasts, stages and flows, flood forecasts, formulation, evaluation and verification of hydrological forecasts, formulation of hydrological forecasts, evaluation of forecasting methods, relation between Meteorological and Hydrological forecasting, cost-benefit analysis for hydrological forecasting, forecasting, forecasting meteorology in relation to drought, flooding, blizzards, erosion and prevention of forest fires.

WMA 503: WATER RESOURCES PLANNING AND MANAGEMENT (3 Units)

Pre-requisite: CVE 322, CVE 421.

Quantity survey – unit price, bill of quantities, contract procedure and management. Contract law, pretender planning and preparation. Project appraisal – comparison of alternatives, feasibility study technical feasibility and economic feasibility planning of water resources – general elements of planning. Stages of development plan; Multipurpose and single purpose planning. Project formulation. Introduction to CPM, PERT and operations research and systems analysis.

Use of statistics and computer in planning and management of irrigation and other water resources projects. Water policy, water law and water administration – water policy as it relates to Nigerian conditions, Federal and State, water law-common law, Riparian rights, Inter-State and International boundaries as they relate to water rights and limitations, water administration – line and Staff organizations. Structure of organizations – Federal level, State level, Nigerian drainage basins, river basin development authorities, water corporations, water boards, research institutes and relevant ministries/directorates.

WMA 507: Agro-Meteorology IV (3 Units)

Pre-requisite: WMA 411

Quantitative characterization of plants climatic environment. Statistical concept in plant climate relationship. Assessment of moisture and thermal Agro-meteorological indices for agriculture: predicting the onset, cessation and duration of the rains, rainfall variability, rainfall seasonality and precipitation effectiveness. Climatological assessment of water resources and soil loss. The concept of potential Evapo-transpiration, crop moisture requirements and irrigation need: methods of improving water use efficiency, Concept of photosynthetic active radiation (PAR) and efficiency of energy conversion. Measurement of photosynthesis in the field, Quantification of crop yield-climate relationships under different management inputs; Pearson product moment correlation, simple linear regression analysis, principle component and factors analysis. Elementary stochastic models.

WMA 508: Agro-Meteorological Methods and Applications

Agro-meteorological statistics and models for prediction: random variables and probability theory, probability (prior-posterior) likelihood, Baye's theorem, independent, joint, conditional probabilities. Climatological series. Description of population by means of frequency distribution. Estimation problems: empirical frequency estimates, parametric estimation, etc.; test of hypothesis, relationship problems (correlation, simple and multivariate distributions, and correlation, regression (Linear, non-linear, multiple significant, non-significant regression coefficients in adjusted relations; discriminate analysis, factor analysis; time series: stochastic processes, Markov chain, spectral analysis. Computations: digital computers; programming; numerical models etc.

WMA 510 Watershed Management (3 Units)

Pre-requisite: CVE 322

Introduction: definitions, watershed management, importance, objective and relation with hydrology, watershed management and agriculture. Hydrologic cycle and watershed management: review of hydrologic cycle and its elements. Soil moisture and its measurement. Soil moisture, runoff and erosion interactions. Watershed management principles.

Interception: Review of processes of interception. Measuring Interception: Gross, through fall and stream flow, impact of interception and watershed management. Importance and application. Watershed Morphology and Characteristics: watershed morphologic characteristics and their influence on stream flow. Physiographic characteristics: size, shape, elevation, slope, aspect and orientation. Geologic characteristics, Geologic composition of watershed. Drainage basin and stream features: drainage pattern, stream orders, stream lengths, stream (drainage) density, bifurcation ratio, stream frequency, stabilization ponds and septic tanks. Sludge treatment and disposal. Rural sanitation, solid waste collection and disposal.

WMA 511: Agro-Meteorological Instrumentation, Observation And Network Design (3 Units)

General rules and procedures of meteorological observations and instrumentation (instrumentation, observation and recording of pressure, and temperature, atmospheric humidity, wind, sunshine and radiation, precipitation, soil temperature, soil moisture content and soil moisture tension, evaporation, evapo-transpiration, interpretation and analysis of autographic charts, cloud classification, estimation of cloud base etc.)

Biological/phonological observations, (observation of soil condition, native plants, cultivated crops and trees, farm animals, diseases and pests).

Instruments and method of observation: the choice of a site for an instrument enclosure, procedures for installation, maintenance, checking and calibration of instruments used in agricultural meteorology.

WMA 512: Tropical Weather Systems II (3 Units)

Trends in the study of tropical weather systems. Recent advances in the study of low altitude weather systems. The mean state of the tropical atmosphere. The major producing systems in the tropics, tropical cyclones, tornadoes, monsoon depressions, easterly waves, thunderstorms, synoptic disturbances in the tropics. The disturbance line of West Africa. Inter-tropical convergence zone (ITCZ). Designation of tropical storm development regions. Models of prediction in the tropics – the single and multi-level models.

Stratospheric ozone depletion, El Nino and La Nina phenomena, relationship with tropical cyclone in the tropics and their typical global impacts. Application of tropical weather systems to human health, food and water supply, building designs and urban planning. Global climate change and tropical climate. Drought and desertification in the tropics.

WMA 516: Water Resources And Public Health 3 Units

Springs: Types of springs, location spring development, spring protection. Surface water: Rivers and streams water. Methods of exploiting surface water, infiltration galleries, bank filtration, micro dams and reservoirs. Rain water catchment.

Excreta disposal: septic tanks and soak away pits. Appropriate sewerage. Disposal of sewage in constructed wet lands. Appropriate drainage: Urban drainage, rural drainage and on-farm drainage. Land use and environmental quality.

Rural well construction methods. Community participation in rural projects: conception, planning, feasibility, execution (development) operation and maintenance. Gender issues in community projects. Case studies in operation and maintenance of hand pump project etc.