

CURRICULA LAY-OUT FOR B. Sc. A.H. (Hons.) DEGREE

Level – 1	Semester – 1	Course No. & Title	Credit hour		Contact Hour	
			T	P	T	P
		AS 111 & 112 Animal Science and Ecology	2	1	2	2
DS 111 & 112 Fundamentals of Dairy Science	3	1	3	2		
PS 111 & 112 Fundamentals of Poultry Science	2	1	2	2		
BCHEM 113 & 114 Chemistry of Biomolecules	3	1	3	2		
VAH 115 & 116 Anatomy	2	1	2	2		
VPHY 115 & 116 Physiology	2	1	2	2		
Total Course: 12, Total Credit: 20			14	6	14	12
Semester – 2	AS 121 Zoo and Wildlife Management	2	0	2	0	
	DS 121 & 122 Market Milk	3	1	3	2	
	PS 121 Rural Poultry Production	3	0	3	0	
	Agron 123 & 124 Forage Agronomy	2	1	2	2	
	VPAR 123 & 124 Introduction to Parasitology	2	1	2	2	
	VMH 123 & 124 Principles of Animal Hygiene	2	1	2	2	
	BCHEM 125 Metabolism of Biomolecules	2	0	2	0	
	AE 123 Livestock Production Economics	3	0	3	0	
	Total Course: 12, Total Credit: 23			19	4	19

Level – 2	Semester – 1	Course No. & Title	Credit hour		Contact Hour	
			T	P	T	P
		ABG 211 & 212 Fundamental Genetics	3	1	3	2
AS 211 Integrated Livestock Farming and Environment	2	0	2	0		
AN 211 Fundamentals of Nutrition	2	0	2	0		
DS 211 & 212 Dairy Chemistry	3	1	3	2		
PS 211 & 212 Poultry Feeds and Feeding	3	1	3	2		
Stat 213 & 214 Statistics	3	1	3	2		
RS 211 Rural Sociology	2	0	2	0		
CSM 214 Computer Application	0	2	0	4		
Total Course: 12, Total Credit: 24			18	6	18	12
Semester – 2	ABG 221 & 222 Molecular Genetics	2	1	2	2	
	AS 221 & 222 Buffalo Production and Draught Animal Management	2	1	2	2	
	DS 221 & 222 Dairy Microbiology	3	1	3	2	
	AN 221 & 222 Ruminant Nutrition	3	1	3	2	
	PS 221 & 222 Hatchery Operation and Management	3	1	3	2	
	VMED 225 & 226 Elementary Preventive	3	1	3	2	
Total Course: 12, Total Credit: 22			16	6	16	12

Level - 3	Semester - 1	Course No. & Title	Credit hour		Contact Hour	
			T	P	T	P
		ABG 311 & 312 Animal Breeding Principles	3	1	3	2
ABG 313 Poultry Breeding	2	0	2	0		
AS 311 & 312 Animal by-products and waste management	3	1	3	2		
AN 311 & 312 Non-Ruminant Nutrition	2	1	2	2		
AN 313 & 314 Feeds & Fodder Science	3	1	3	2		
DS 313 Planning and Management of Dairy Farm and Milk Processing Plant	2	0	2	0		
PS 311 & 312 Duck and Specialized Fowl Production	3	1	3	2		
Total Course: 12, Total Credit: 23	18	5	18	10		
Semester - 2	ABG 321 & 322 Genetic Diversity and Breeding Practices	3	1	3	2	
	AS 321 & 322 Meat Science and Technology	3	1	3	2	
	AN 321 & 322 Feed Processing & Conservation	2	1	2	2	
	DS 321 & 322 Dairy Technology – I	3	1	3	2	
	PS 321 & 322 Poultry Farm Planning and Management	3	1	3	2	
	VMH 323 & 324 Poultry Disease Management	2	1	2	2	
	Total Course: 12, Total Credit: 22	16	6	16	12	

Level - 4	Semester - 1	Course No. & Title	Credit hour		Contact Hour	
			T	P	T	P
		ABG 411 & 412 Reproduction of Farm Animals	3	1	3	2
AS 411 & 412 Goat and Sheep Production	3	1	3	2		
AN 411 & 412 Feed Milling Industry	2	1	2	2		
AN 413 Nutrient Requirements for Livestock	2	0	2	0		
DS 411 & 412 Dairy Technology – II	3	1	3	2		
PS 411 & 412 Egg Production and Technology	3	1	3	2		
CM 419 Agribusiness	2	0	2	0		
Total Course: 12, Total Credit: 23	18	5	18	10		
Semester - 2	ABG 421 & 422 Artificial Insemination and Reproductive Biotechnology	3	1	3	2	
	AS 421 & 422 Beef Cattle Production	2	1	2	2	
	AN 421 & 422 Livestock Feeding	3	1	3	2	
	DS 421 & 422 Dairy Cattle Production	3	1	3	2	
	PS 421 & 422 Broiler Production and Technology	3	1	3	2	
	Ag. Ext. 421 & 422 Agricultural Extension Education	3	1	3	2	
Total Course: 12, Total Credit: 20	17	6	17	12		

Internship Semester	Week	Place
	1-5	Bangladesh Agricultural University <ul style="list-style-type: none"> • Department of Animal Breeding and Genetics • Department of Animal Science • Department of Animal Nutrition • Department of Dairy Science • Department of Poultry Science
	6-22	Selected Organizations
23-24	Report Writing, Submission, Evaluation, Viva-voce, and Certificate Awarding Ceremony	

SYLLABUS FOR B.SC. A.H. (Hons.) DEGREE

Level-1, Semester-1

Course No. & Title: AS 111 Animal Science and Ecology Credit Hours: 2, Contact Hours: 2

Definition and scope of Animal Husbandry and Animal Science. Zoological classification of common farm and domesticated animals. Domestication and distribution of farm animals. Contribution of livestock in the farming system of Bangladesh and in the world. Glossary of livestock according to age and sex. Principles of livestock feeding. Animal psychology and behaviour: Types and effects of behaviour in domestic animals. Causes of behavioural responses in animals. Vices of domesticated animals and their remedies. Objectives and principles of livestock farm houses and other management practices. Elementary knowledge of livestock products and by-products. Definition and branches of ecology. Relationship of ecology with other disciplines. Adaptation of farm animals. Stages and distribution of adaptation. Factors responsible for the adaptation of farm animals. Effect of climate on animals, acclimatization of exotic animals in Bangladesh.

Course No. & Title: AS 112 Animal Science and Ecology Credit Hour: 1, Contact Hours: 2

Handling and restraining of livestock. Study of animal psychology and behaviour. Identification of body points of livestock. Demonstration of livestock farm houses, dentition and ageing of livestock, casting, shoeing, marking, washing, grooming, castration, methods of measuring weights, bedding and clothing, dehorning and disbudding of farm animals. Feeding systems and identification of livestock feedstuffs. Demonstration of routine livestock farm operations.

Course No. & Title: DS 111 Fundamentals of Dairy Science Credit Hours: 3, Contact Hours: 3

Introduction to Dairy Science. Cattle and milk production statistics. Terminology of dairy animals and early history of dairying. Taxonomy, origin and classification. Characteristics of important dairy breeds. Importance and recent development in dairy farming. Factors responsible for the development of dairy industries. Definition, objectives, requirements, types of housing. Dairy farm sanitation, disposal of dead animal and farmyard manure etc. Selection of site for dairy farms. Classification of common feedstuffs. Thumb rule method of feeding dairy cows. Types and requisites of a good dairy ration. Methods of calf raising and feeding schedule. Classification and procedure of milking and hygienic milk production. Dairy records. Introduction to mammary system.

Course No.& Title: DS 112 Fundamentals of Dairy Science Credit Hour: 1, Contact Hours: 2

Introduction to Bangladesh Agricultural University (BAU) Dairy Farm. Acquaintance with different types houses. Relationship of body parts with physiological functions of dairy cattle. Handling of dairy cows, calves, heifers, buffaloes and bulls. Identification of different dairy breeds of cow and buffalo. Daily routine works at BAU dairy farm. Identification of common dairy feeds and fodder. Identification and use of dairy utensils and equipment. Identification of dairy animals (tagging, tattooing, branding and marking).Grooming, disbudding & dehorning, restraining, dentition & ageing of dairy cattle.

Course No. & Title: PS 111 Fundamentals of Poultry Science Credit Hours: 2, Contact Hours: 2

Introduction to poultry and poultry science. History, origin, domestication and distribution of different poultry species. Environment, behaviour and habitats of chicken. Importance of poultry and poultry products. Poultry production in Bangladesh and other countries of the world. Terminology in Poultry Science. Feathers and feathering in poultry. Different vices of poultry. Chronological development of breeds, varieties and strains. Classes, breeds, varieties and strains of chicken and their characteristics. External and internal body parts of chicken. Different body systems in relation to meat and egg production. Housing principles for Poultry and different types of poultry houses. Selection and culling of Poultry. Elementary breeding principles in relation to farm management. Structure and formation of egg. Egg abnormalities. Different types of poultry farming.

Course No. & Title: PS 112 Fundamentals of Poultry Science Credit Hour: 1, Contact Hour: 1

Holding and handling of poultry birds. Introduction to external body parts of chicken. Identification and classification of feathers. Demonstration on with different types of comb in chicken. Identification of different breeds and varieties of chicken.

Demonstration on modern layer and broiler strains of chicken. Identification of different parts of digestive system, skeletal system and reproductive system of poultry. Identification and uses of markings. Identification of the eggs of different poultry species. Identification and uses of different poultry equipment. Acquaintance with different kinds of poultry house and poultry rearing systems.

Course No. & Title: BCHEM 113 Chemistry of Biomolecules
Credit hours: 3, Contact hours: 3

Biophysical properties of water. Acids, bases and ampholytes. pH and buffers. Colloidal properties of matter. Diffusion and osmosis. Carbohydrates: Occurrence, functions and classification. Ring size determination. Homo and hetero polysaccharides. Cell wall polysaccharides. Enzymatic degradation of starch and cellulose. Proteins: Definition and Classification. Classification of amino acids. Naturally occurring peptides. Reactions related to sequence determination. Organizational levels. Denaturation. Lipids: Classification and functions. Distribution of fatty acids in nature. Fats, oils and waxes. Characterization of fat. Essential fatty acids and prostaglandins. Phospholipids and glycolipids as membrane constituents. Nucleic Acids: Occurrence, classification, composition, physicochemical properties and biological functions. DNA as a genetic material. Central dogma of genetic information. Enzymes: Classification and properties. Mode of action. Elements of kinetics. Factors affecting enzyme activity. Enzyme inhibition. Allosteric Enzymes. Enzymes in dairy industry. Animal Hormones: Chemical nature. Classification and biochemical functions.

Course No. & Title: BCHEM 114 Chemistry of Biomolecules
Credit hours: 1, Contact hours: 2

Preparation of solutions and their standardization. Identification of carbohydrates. Protein colour tests. Starch preparation and action of salivary amylase. Fehling's method of glucose estimation. Solubility tests for fats. Salting out of albumins and globulins. Determination of Isoelectric pH. Estimation of vitamin 'C'. Proteins estimation by Kjeldahl methods. Proteins estimation by Biuret methods. Determination of saponification value, iodine value and acid value.

Course No. & Title: VAH 115 Anatomy
Credit hours: 2, Contact Hours: 2

Introduction, definition and divisions of systematic anatomy. Definition and classification of skeleton and bones of Domestic animals. Introductory anatomy of the organs of Digestive system, Respiratory system and Male & Female genital system of domestic animals. Endocrine system of domestic animals.

Course No. & Title: VAH 116 Anatomy
Credit hour: 1, Contact hours: 2

Identification of important bones of domestic animals. Brief demonstration and identification of the organs of Digestive, Respiratory and Genital system (Male & Female) of domestic animals.

Course No. & Title: VPHY 115 Physiology
Credit hours: 2, Contact hours: 2

Introduction: Definition, Physiological phenomenon- osmosis, diffusion, filtration, absorption. Blood: Definition, composition and functions, plasma and serum, red and white blood cells and platelets- their structure and functions, coagulation and hemagglutination. Cardiovascular Physiology: Heart, Courses of circulation, Origin and conduction of heart beat, Heart sounds, Heart Block, Cardiac cycle, Blood vessels, Blood pressure. Respiratory System: Definition, mechanisms of respiration, volumes of air respired, exchange and transport of gases. Urinary System: Kidney-structure and functions, formation of urine, composition and regulation of urine volume. Nervous System: Classification, neuron, nerve fibers, receptors, stimuli, synapse, nerve impulse and reflexes.

Course No. & Title: VPHY 116 Physiology
Credit hour: 1, Contact hours: 2

Total count of RBC, estimation of hemoglobin. Determination of erythrocyte sedimentation rate and packed cell volume. Total WBC count and differential leukocyte count.

Level-1, Semester-2

Course No. & Title: AS 121 Zoo and Wildlife Management
Credit Hours: 2, Contact Hours: 2

Importance of zoo, wildlife conservation and bio-diversity. Habitation and causes of extinction of wild animals and birds. Classification of zoo animals, birds and laboratory animals. Psychology and behavior of common zoo and wild animals. Management of wild animals and birds in the zoo and wilderness: Housing and feeding systems. Physiological and environmental factors related to breeding and reproduction. Management of wild animals and birds in Safari Park under natural habitation. Introduction to zoological gardens and natural habitats for wild animals and birds. Common diseases of zoo and wild animals and birds and their prevention. Planning to establish zoo and its administrative management. Visit to different zoo's, safari and natural habitats.

Course No. & Title: DS 121 Market Milk
Credit Hours: 3, Contact Hours: 3

Definition, composition and structure of milk. Physical properties of milk. Food value, standards, grades and classes of milk. Sources of contamination of milk, milk borne diseases and their control. Selection of market milk. Milk collection, transportation and methods of payment. The processing of milk—Filtration, clarification, standardization, pasteurization, homogenization and cooling of milk. Cleaning and sanitization of dairy utensils and equipment. Cleaning and sanitizing agents used in dairy industry. Definition, characteristics, manufacturing procedure, merits and demerits of sterilized, UHT, flavoured, vitaminized, irradiated, mineralized, standardized, rehydrated, reconstituted, recombined, toned humanised, frozen concentrated and low fat milk.

Effect of metallic utensils on milk quality. Criteria of selecting milk producers, milk distribution and pricing of milk. Problems of milk producers and consumers.

Course No. & Title: DS 122 Market Milk
Credit Hour: 1, Contact Hours: 2

Identification of milk and colostrum of different dairy species. Sampling of milk. Judging of milk. Routine Platform Tests. Determination of total solids, fat, protein and ash in milk and in colostrum.

Determination of freezing point, boiling point, viscosity, specific heat, heat capacity, agitation and electrical conductivity of milk. Use of lactometer. Standardization, pasteurization, homogenization, sterilization and bottling of milk. Clot-on-boiling test and Alcohol test. The phosphatase test for pasteurized milk and milk products. Turbidity and Torch test for detecting heat-treated milk. Manufacture of special milk: Sterilized, soft curd, flavoured, vitaminized, reconstituted, recombined and toned milk.

Course No. & Title: PS 121 Rural Poultry Production
Credit Hours: 3, Contact Hours: 3

Introduction: Concept of backyard and rural poultry. Problems and prospects of native chicken in Bangladesh. Statistics of backyard/rural poultry around the globe. Types of native chickens of Bangladesh. Ownership, management and productivity of rural poultry. Role of women in rearing rural poultry in the developing countries. Contribution of rural poultry in Bangladesh Agriculture. Housing: Rearing systems and housing; scavenging, semi scavenging and confinement systems.

Incubation: Natural incubation of eggs, Advantages and disadvantages of different incubation procedures. Rice husk incubation. Brooding and rearing: Natural and artificial brooding under village condition. Nutrition: Nutrition of rural poultry. Basic differences between backyard poultry nutrition and commercial poultry nutrition. Utilization of poultry feed resources in the small holders production units. Feeding strategy for rural poultry.

Management: Strategy for family poultry development. Selection and development of appropriate breed for rural poultry production. Capacity building for sustainable rural poultry development.

Disease: Common diseases of rural poultry and their prevention and control. Duck Production: Duck production under rural management system. Quail Production: Quail production under rural management system. Marketing: Existing system of marketing of egg and chicken in rural areas. Problems and improvement of marketing systems.

Course No. & Title: Agron 123 Forage Agronomy

Credit Hours: 2, Contact Hours: 2

Introduction to Agronomy: Definition and scope of Agronomy. Relationship of Agronomy with Animal Husbandry and other branches of Agriculture, crop-livestock interactions.

Climatology: Concept of weather and climate. Effect of temperature, day length and solar radiation on growth, development and yield of crops. Cropping seasons of Bangladesh and their characteristics. Crops and Cropping Systems: Agronomic classification of crops. Distribution of crops in relation to season, soil, land topography and agro-ecological zones in Bangladesh. Concept of cropping systems.; Different forms of sequential and intercropping systems.

Soil and Soil Management: Definition of soil. Physical and chemical properties of soil. Management of soil fertility and productivity. Tillage: Concept, objectives and types of tillage. Tillage operations. Effect of tillage on soil characteristics and nutrient availability. Characteristics of ideal till. Seed and Seeding: Definition and classification of seed. Attributes of seed quality. Seed rate-concept, factors affecting seed rate. Importance of quality seed in crop production. Methods of seeding practices. Plant Nutrition: Plant nutrient elements, their sources and forms of absorption. Functions and deficiency symptoms of nutrient elements in crop plants. Manures and fertilizers and their methods of application. Intercultural Operations: Weeding, mulching and thinning, irrigation and drainage their objective, methods, advantages and disadvantages.

Production Technology of Fodder Crops: Origin and distribution, botanical description, climate and soil requirements, cultivation practices of the crops used as animal feed and fodder such as maize, sorghum, triticale, rice; cowpea, soybean, grass pea, black gram bar seem, alfalfa, sun hemp, dhaincha; german grass, napier, para, guinea and pangola grasses.

Pasture and Pasture Management: Concept, classification and importance of pasture. Pasture establishment, management of pasture and pasture herbage utilization. Feasibility of pasturing in Bangladesh.

Course No. & Title: Agron 124 Forage Agronomy Credit Hour: 1, Contact Hours: 2

Identification and study of farm implements. Identification and study of crops. Identification and study of seeds. Identification and study of weeds. Identification and study of manures and fertilizers. Practicing ploughing and determination of efficiency of plough. Practicing weeding, thinning and gap filling. Practicing mulching operation. Preparation of compost. Preservation of farm yard manures. Practicing different methods of application of manures and fertilizers. Preparation of silage. Preparation of hay. Purity test of seed. Germination test of seed. Study of the effect of plant nutrients/seed rate/plant density on the performance of a fodder crop in students' plot.

Course No. & Title: VPAR 123 Introduction to Parasitology Credit Hours: 2, Contact Hour: 1

Introduction: Common Definitions, History of Parasitology, Zoological nomenclature of parasites and Classification of Parasites and Hosts, Factors affecting geographical distribution of parasites, adaptation of parasite. Host-parasite relationship. General morphology, lifecycle, economic importance of common trematodes, cestodes, nematodes, protozoa and arthropods of livestock and poultry. Classification of snail intermediate host, Morphology, ecology & biology of common snail intermediate host.

Course No. & Title: VPAR 124 Introduction to Parasitology Credit hour: 1, Contact Hours: 2

Methods of collection, Preservation and shipment of parasitological specimens. Identification of common parasites of livestock and poultry.

Course No. & Title: VMH 123 Principles of Animal Hygiene Credit Hour: 2, Contact Hour: 1

Definition, principle and scope of health and hygiene. Influence of environment of health: Soil, Air, Ventilation, Water and Housing. Soil: Formation, structure, topography, soil contamination, purification, soil borne diseases, sanitary improvement of soil. Air and Ventilation: Impurities of air, outdoor air, stable air, vitiated stable air and its affect upon health; hygienic importance of ventilation, types of ventilation. Health hazards due to radiation and use of pesticides. Water: Sources of water, hygienic requirement of water, water contamination by different organic and inorganic substances including industrial pollutants and toxic minerals. Sanitation: Definition and objectives of drainage and sewerage system, disposal of wastes. Methods of sterilization and disinfection and characteristics of their agents. Disinfection of byre, stable and farms. Health management practices: Shoeing, grooming, dipping, bandaging, shearing, bedding etc. Animal Restraining. Identification of animals by marking and common terms. Biosecurity plan in farms. Hygienic measures to prevent common infections of livestock.

Course No. & Title: VMH 124 Principles of Animal Hygiene Credit hour: 1, Contact Hours: 2

Determination of health by physical appearance. Application of bandages. Methods for administration of drugs and vaccines. Sanitary inspection of farms and sewage disposal facilities. Determination of age by dentition or dentition and aging.

Course No. & Title: Bioch 125 Metabolism of Biomolecules
Credit Hours: 2, Contact Hours: 2

Bioenergetics: Free energy, Entropy and enthalpy. Exergonic and endergonic reactions. ADP-ATP cycle. Digestion and absorption of biomolecules: In ruminant and non-ruminant An overview of metabolism: Stages in the breakdown of biomolecules. Carbohydrate Metabolism: Glycolytic pathway and fermentation. Citric acid cycle and its amphibolic nature. Anaplerotic reactions. Metabolic regulation of glycolysis and citric acid cycle. Phosphorylation and Electron transport chain. Gluconeogenesis. Pentose phosphate pathway and its relation to milk synthesis in mammary gland. Lactose biosynthesis. Protein Metabolism: Sources and utilization of amino acid. Catabolism of amino acids. Detoxification of ammonia in liver and brain. Inborn error of amino acid metabolism. Lipid Metabolism: Beta - oxidation of fatty acids. Alpha - oxidation in animals. Catabolism of odd carbon fatty acids in animals. Ketone bodies formation and their utilization. Biosynthesis of fatty acids. Nucleic Acid Metabolism: Protein biosynthesis. Concept of recombinant DNA technology. Interrelationship of carbohydrate, protein and lipid metabolism.

Course No. & Title: AE 123 Livestock Production Economics
Credit hours: 3, Contact Hours: 3

Economic Concepts of Livestock Production: Definition and concepts of Economics and Livestock Economics, Scope of Economics, Economic principles applicable to Livestock production. Theory of Demand and Supply: Meaning and types of demand, Law of demand, Factors influencing demand, Demand function, Demand schedule, Demand curves, Changes in demand, Elasticity of demand. Indifference curve analysis, Marginal rate of substitution, Properties of indifference curves, Consumer's equilibrium. Meaning of supply, Factors influencing supply, Supply function, Supply curves, Supply elasticity. Livestock Production: Theory of production, Factors of production, Production function, Stages of production, Laws of returns, Cost and return of livestock production. Marketing of Livestock Products: Meaning of market, Classification of market, Characteristics of market, Price determination of livestock products under perfect competition, Marketing channel, Marketing margin and efficiency, Marketing functions: Standardization and grading of livestock products. Project Analysis in Livestock Production: Meaning of project, Undiscounted and discounted measures of project worth: BCR, NPV and IRR.

Level-2, Semester-1

Course No. & Title: ABG 211 Fundamental Genetics
Credit Hour: 3, Contact Hours: 3

Introduction: Genetical terminology, concept, branches and application of genetics, different types of gene action. Mendelian genetics: Gregor Johan Mendel, his contribution in genetics, Mendel's laws, modification of Mendelian ratios. Linkage, crossing over and chromosome mapping: Linkage and its significance; kinds of linkage and crossing over; cytological basis of crossing over; interference and coincidence; gene mapping. Sex determination and sex related inheritance: Sex-linked, sex-influenced and sex-limited traits in farm animals. Immunogenetics: Immune response, Humoral and cell mediated antibody; antigen, antibody diversity, histocompatibility complex. Multiple alleles: Coat colour inheritance in rabbit, blood groups and blood protein polymorphisms in animals. Cytogenetics: Animal cell-its organelles and function, Chromosomes and karyotypes of farm animals, gametogenesis and fertilization in farm animals, Variation in chromosomal structure and number, Significance of chromosomal aberration. Biochemical basis of inheritance: DNA and RNA; proof of DNA as a genetic material; structure, replication, RNA types and functions. Extra-nuclear inheritance: Plasmids and mitochondrial DNA. Mutation: Definition, classification and causes; phenotypic and genotypic effect of mutation.

Course No. & Title: ABG 212 Fundamental Genetics
Credit Hour: 1, Contact Hours: 2

Materials used for genetic study and their handling. Karyotyping of domestic animals by cell culture techniques. Study of cell division. Study of multiple alleles in animals and human (blood proteins and enzymes, blood groups). Solving problems on Mendelian genetics, chi square (χ^2) test, probability and linkage in farm animals.

Course No. & Title: AS 211 Integrated Livestock Farming and Environment
Credit Hours: 2, Contact Hours: 2

Concept, characteristics and objectives of farming systems. Importance and contribution of livestock in integrated farming systems. Plant-animal interactions for sustainable crop-livestock farming systems. Concept and practices of agro-forestry

systems of livestock production. Technologies for integrated crop-livestock-poultry-fish farming systems. Socioeconomic and biophysical environment of integrated crop-livestock farming systems. Integrated livestock farming for environmental conservation and biodiversity. Visit to different integrated farms.

Course No. & Title: AN 211 Fundamentals of Nutrition
Credit Hours: 2, Contact Hours: 2

Introduction: Nutrition, gradual expansion, branches and relationships with other disciplines. Animal and Plant body: Composition of plant and animal body. Soil-plant-animal-human interrelationship. Nutrients: Classification, general functions and dietary sources. Feeding behavior: Feeding habit of different animals, feed selection, choice feeding. Digestive process: Organs involved in digestion, principles of digestion in ruminants and non-ruminants. Energy concept: Sources of energy, partitioning and measurement of feed energy, and nutritional balances. Human nutrition: Interrelationships between animal and human nutrition, role of animal products in human, nutrition, dietary allowances for different age and sex group of humans.

Course No. & Title: DS 211 Dairy Chemistry
Credit Hours: 3, Contact Hours: 3

Importance of dairy chemistry and its relationship with dairy science. Chemical composition and properties of milk and colostrum. Factors affecting the composition of milk. Milk fat: classification, composition, nature, fatty acids, properties, fat globules, Stokes law, rancidity and fat constants. Milk protein: Nature, classification and properties. Casein, whey and their industrial uses. Lactose: Nature and properties; lactic acid formation and commercial uses. Vitamins and minerals – Nature, functions and utilizations. Nature and properties of enzymes present in milk. Flavour chemistry of milk and milk products. Mechanism of spoilage of milk and its control. Normal and specific fermentation patterns of milk. Techniques of milk preservation in industrial and smallholder farmers level.

Course No. & Title: DS 212 Dairy Chemistry
Credit Hour: 1, Contact Hours: 2

Determination of fat, protein, total solids, lactose and ash in milk and milk products by official methods. Determination of adulteration in milk: Test for urea and nitrate test, detection of sodium bicarbonate, sucrose, formalin, and gelatin in milk. Detection of starch in milk by potassium iodide test. Hansa, Bromocresol blue, Starch and Guaiacol test. Determination of Animal Fat in dairy products by Valenta and Nitric acid test. Determination of Reichert Meissl Number, Polenske Number, Peroxide Value, Saponification Number, Iodine Number, Butyro-refractometer reading of fat-rich dairy products (butter, ghee, butter oil etc.) and vegetable oil. Refractive Index (RI) of milk fat.

Course No. & Title: PS 211 Poultry Feeds and Feeding
Credit Hours: 3, Contact Hours: 3

Introduction to Poultry Feeds and Feeding. Digestive system of poultry. Poultry feed ingredients: Classification, nutritive values, beneficial effects and limitations of feed ingredients. Proteins: Protein quality and requirements for meat and egg production. Energy (Carbohydrates and fats): Sources, importance, distribution, energy content and utilization of poultry feeds. Vegetable oil vs. animal fat. Vitamins and minerals: Role, requirements, sources, deficiency symptoms and their prevention and control. Water: Role, requisites of safe water and control of water quality. Feed additives: Definition, importance, classification, mode of action and residual effects. Interrelationships of nutrients: Amino acids, vitamins and minerals in relation to diet formulation. Feeding standards and feeding systems: Feeding standards for poultry. Broiler vs. layer nutrition. Feed forms. *Ad libitum* and controlled feeding. Feeding systems. Ration formulation: Ration and balanced ration. Selection of feed ingredients. Factors to be considered during ration formulation. Principles involved in the formulation of “least-cost feed”. Related topics: Feed efficiency. Cholesterol in egg. Pigmentation of broiler and egg yolks. Design and sanitation of feed storage room. Biotechnological approaches to poultry feeds and nutrition.

Course No. & Title: PS 212 Poultry Feeds and Feeding
Credit Hours: 1, Contact Hours: 2

Identification of poultry feed ingredients and their quality tests. Formulation of balanced ration for poultry. Practices of grinding, processing, steaming, drying, mixing, sacking and storing for feeds. Different feeding and watering systems. Feed budgeting for poultry. Observation on various nutritional deficiencies and disorders in poultry. Use of computer package programme in the formulation of "least-cost diet" for poultry.

Course No. & Title: Stat 213 Statistics
Credit hours: 3, Contact hours: 3

Definition, scope and limitations of Statistics. Different types of variables. Frequency distribution: construction and graphical representation. Measures of location and variation and shape characteristics of curves. Random experiment, outcome, sample space, events, mutually exclusive, equally likely, independent and dependent events. Mathematical and statistical definitions of probability, compound and conditional probability. Additive and multiplicative laws of probability. Random variable, probability distribution. Probability function. Binomial, Poisson and Normal distributions. Simple correlation and regression: Scatter diagram, Pearson's correlation coefficient with its properties, least squares method for fitting regression line. Properties of regression coefficients.

Population and sample. Hypothesis, null and alternative hypotheses, type I error, type II error, level of significance. Basic steps for testing hypothesis. Statistical tests: a population mean is equal to a specified value, equality of two population means (independent & correlated), significance of correlation and regression coefficients, independence of attributes. Experimental design: Basic concepts and principles. Completely randomized, randomized block, Latin square and cross-over designs. Covariance analysis in completely randomized and randomized block designs.

Course No. & Title: Stat. 214 Statistics
Credit hour: 1, Contact hours: 2

Frequency tables and their graphical representation. Measures of location and variation. Moments. Measures of skewness and kurtosis. Pearson's correlation coefficient. Fitting linear regression to observed data by the method of least squares.

Statistical tests: A population mean is equal to a specified value, equality of two population means (for both independent & correlated samples), a population proportion is equal to a specified value, equality of two population proportions, independence of attributes, significance of correlation and regression coefficients. Analysis of variance for completely randomized, randomized block, Latin square and cross-over designs. Covariance analysis in completely randomized and randomized block designs.

Course No. & Title: RS 211 Rural Sociology
Credit hours: 2, Contact hours: 2

Introduction: Definition of Sociology and Rural Sociology Nature, Subject matter and importance of Sociology; Three Major Theoretical perspectives of Sociology. Origin and Development of Rural Sociology. Role of the Rural Sociology in community Development. Social Research: Social Research: Its Methods and Techniques; Social Research and its importance; Observation, Questionnaire, Interview, Social Survey. Culture: Elements, characteristics and Functions of culture; cultural complexities and Diversities; cultural changes; Primitive and Peasant culture; Folk society & its characteristics. Social Differentiation and stratification: Definition, Types and Function of stratification, Basis and Nature of Stratification in Bangladesh, Rural Class and Power Structure. Social Change: Nature and Characteristics of Social change- Social change and cultural change- Causes of social change; Social Mobility; Social Evolution and Progress. Rural Development Policy and Planning; Impact of Poultry and Livestock to Poverty Alleviation.

Course No. & Title: CSM 214 Computer Application
Credit hours: 2, Contact hours: 4

Computer science and computer fundamentals, hardware and software, data and information, information coding, number systems and their internal representation, program and algorithm. Computer operations in DOS and Windows environment; familiarity with the use of applications software: text processing, electronic sheet, presentation materials preparation, statistical analysis. Introduction to terminal use on C/C++ programming.

Level-2, Semester-2

Course No. & Title: ABG 221 Molecular Genetics Credit Hours: 2, Contact Hours: 2

Introduction: Concept and application of molecular genetics. Chemical basis of inheritance: DNA as a genetic material; composition and structure of, DNA and RNA; Genomic and non-genomic DNA; Different types of DNA and RNA; Plasmid. DNA replication: General feature, DNA replication in prokaryotes and eukaryotes. Genetic Code: Properties, codons, synonym codons.

Gene expression: Protein and protein synthesis apparatus, transcription, translation, transduction. Gene regulation in prokaryotes and eukaryotes. Genome sequencing. Molecular Markers: Characteristics; application in animal production and health. Genetic Engineering: Recombinant DNA technology and its application, transgenic animals, genetically modified organisms.

Course No. & Title: ABG 222 Molecular Genetics Credit Hour: 1, Contact Hours: 2

Materials used for study of molecular Genetics. Collection and preservation of blood cells and serum for genetic study. DNA and RNA isolation and purification from blood and muscle cells of animal origin. DNA amplification: PCR technology. Computer packages for molecular genetics.

Course No. & Title: AS 221 Buffalo Production and Draught Animal Management Credit hour: 2, Contact hours: 2

Historical background, domestication, and geographical distribution of buffaloes. Importance of buffaloes and draught animal power in the sustainable integrated farming system. Adaptation and the effect of environment on buffaloes and draught animal power output. Breeds of buffaloes and draught animals. Judging and selection of buffaloes and draught animals. Training, handling and measurement of draught animal performance. Production programme of buffaloes, their constraints and opportunities. Feeding of buffaloes. Energy expenditure of draught animal power and transmission system. Housing and equipments of buffaloes. Breeding and reproductive management of buffaloes. Common diseases and their preventive measures. Planning and evaluation of small scale and commercial buffalo farm.

Course No. & Title: AS 222 Buffalo Production and Draught Animal Management Credit hour: 1, Contact hours: 2

Approaching and handling of buffaloes and draught animals. Judging and selection of buffaloes and draught animals. Methods of feed processing and formulation of balance ration for buffaloes. Different management practices: Castration, ageing, marking, bedding, restraining, cleaning, record keeping and sanitation. Training of draught animals for ploughing, carting and threshing and the use of machineries. Estimation of draught output and energy expenditure. Planning and designing of small scale and commercial buffalo farm. Visit to small scale and commercial buffalo farm.

Course No. & Title: DS 221 Dairy Microbiology Credit Hours: 3, Contact Hours: 3

Introduction to microbiology, Importance of dairy microbiology. Classification of microorganisms-Bacteria, Viruses, Rickettsiae, Yeasts and Molds. Biological properties of microorganisms. Study of specific types of microorganisms-thermoduric, thermophilic, psychrophilic, coliform, lipolytic and proteolytic bacteria. Family: Lactobacillaceae, Micrococcaceae, Enterobacteriaceae, Pseudomonadaceae, and miscellaneous bacteria. Associative action among microorganisms. Dairy microorganisms as physiological groups. Destruction of microorganisms by physical and chemical agents. Microbiology of milk in the producing farm, market milk and microbiology of lactic culture. Microorganisms of fermented milks and their applications. Microbiological standards of dahi/yoghurt, butter, cheese, ice-cream, condensed milk, dry milk, special milks and fermented milk drinks. Starter culture, mother and bulk culture preparation, judging of starter culture. Microbiological methods for quality control of dairy products.

Course No. & Title: DS 222 Dairy Microbiology Credit Hour: 1, Contact Hours: 2

Sampling techniques of milk and milk products for bacteriological study. Methylene blue and Resazurin reduction tests, The direct microscopic count (DMC), the standard plate count (SPC) and Coliform count, Yeast and mould counts in milk and milk products. Isolation and characterization of bacteria. Characteristics of bacteria in litmus milk. Thermophilic, thermoduric, psychrophilic bacteria count. Starter culture: Preservation and its activity tests. Tests for antibiotics.

Course No. & Title: AN 221 Ruminant Nutrition
Credit Hours: 3, Contact Hours: 3

Rumen physiology and ecology: Development of ruminant stomach, rumen environment, rumen microorganisms, their classification and nutrition. Nutrition and environment: Critical temperature, thermoneutral zone, regulation of body temperature, effect of ambient temperature on digestion and metabolism of nutrients.

Digestion and metabolism of nutrients: Mechanism of microbial fermentation, utilization of end products of carbohydrates. Microbial degradation of protein and NPN, microbial protein synthesis and their contribution to host animal. Degradation of dietary lipids, lipid synthesis and its utilization. Interaction between nutrients. Minerals and Vitamins: Role of essential vitamins and minerals in ruminants, their dietary sources and deficiency symptoms. Digestibility: Determination of digestibility by *in vitro*, *in vivo*, *in sacco* and marker technique. Factors affecting digestibility. Determination of TDN and ME value. Metabolic and nutritional disorders: Aetiology, symptoms and preventive measures.

Course No. & Title: AN 222 Ruminant Nutrition
Credit Hour: 1, Contact Hours: 2

Sampling principles and procedures. Preparation of solutions for chemical analyses. Principles and procedures of proximate analysis of feedstuffs. Determination of moisture, dry matter, crude protein, crude fibre, ash, ether extract and calculation of nitrogen free extract. Determination of ADF and NDF by AOAC method.

Course No. & Title: PS 221 Hatchery Operation and Management
Credit Hours: 3, Contact Hours: 3

Artificial incubation: History and chronological development. Hatchery: Types, site selection, layout, design and construction. Incubators: Types, design, construction, selection and sanitation.

Fertility and hatchability: Influencing factors and calculations of hatchability traits. Hatching eggs: Sources, procurement, selection and care. Incubation: Methods, selection, setting eggs, requirements, embryonic development, critical period, piping, embryonic mortality, taking off hatch, trouble-shooting, counting chicks, selection and culling baby chicks. Organization of works in a hatchery: Qualities of hatchery personnel, management of egg-holding room, sexing baby chicks, chick delivery methods and record keeping in hatchery. Egg and hatchery-borne diseases: Diseases and their blood testing, prevention and control. Economics of hatchery business: Cost-return analysis. Handling newborn chicks: Transportation and marketing. Commercial hatchery: Prospects and problems.

Course No. & Title: PS 222 Hatchery Operation and Management
Credit Hour: 1, Contact Hours: 2

Selection of hatching eggs. Practical demonstration for artificial incubation of eggs. Hatching of eggs by broody hens. Sanitation of incubator and hatchery building. Candling and transferring of pedigree and general eggs from setter to hatcher. Taking off hatch. Sexing baby chicks. Counting, selection, culling, packaging and transportation of baby chicks. Vaccination, debeaking, dubbing, toe clipping and wing banding. Collection and preservation of embryos for observation of development. Detection of causes of failure to hatch. Recording keeping in hatchery. Blood testing of breeding stock. Field trips to commercial hatcheries.

Course No. & Title: VMED 225 Elementary Preventive Veterinary Medicine
Credit hours: 3, Contact hours: 3

Introduction, History, definition, aims and objectives of preventive veterinary medicine. Scope of preventive veterinary medicine and its relationship with animal husbandry and other related sciences. Principles of Veterinary Epidemiology and its scope and relationship with preventive veterinary medicine and animal husbandry. Application of veterinary epidemiologic knowledge for maintenance of health and production of livestock. Introduction and scope of veterinary immunology. Principles of immunologic techniques for maintenance of health and production of livestock.

Course No. & Title: VMED 226 Elementary Preventive Veterinary Medicine
Credit hour: 1, Contact hours: 2

Collection of data on animal health and production. Farm visits for assessments of feeding, housing and management of livestock in relation to health and production. Assessment of immunization schedule under farm and rural condition. Financial support is essential to conduct practical classes in the different animal farms and rural areas.

Level-3, Semester-1

Course No. & Title: ABG 311 Animal Breeding Principles Credit Hours: 3, Contact Hours: 3

Introduction: Concept of Animal Breeding, its development and application; breed, strain, line and type; breed association. Genetic constitution of population: Gene and genotype frequencies; Hardy-Weinberg law, factors changing genetic properties and gene frequency. Phenotypic variation: Traits of economic importance, Values and means, discrete and continuous variation, normal distribution, components of phenotypic and genetic variation, genotype- environment interaction, average effect of genes. Population parameters: Heritability, repeatability and genetic correlation, methods of estimation and their uses. Breeding value: Concept, estimation and uses, best linear unbiased prediction (BLUP), most probable producing ability (MPPA) and transmitting ability. Selection: Natural and artificial selection, selection objectives and criteria, aids to selection, progeny testing, sib testing, methods of selection for more than one traits. Response to selection: Selection programme for livestock improvement, prediction and estimation of selection response, implication to livestock improvement and selection limit.

Course No. & Title: ABG 312 Animal Breeding Principles Credit Hours: 1, Contact Hours: 2

Methods of data collection, management and analysis. Calculation of gene and genotype frequency in animal population. Measurement of variance and co-variance using full-sib and half-sib data. Estimation of heritability, repeatability and genetic correlation, Estimation of breeding value, transmitting ability, most probable producing ability, Calculation of selection differential, selection responses, construction of selection indices, Use of specialized computer program for solving breeding problems.

Course No. & Title: ABG 313 Poultry Breeding Credit Hour: 1, Contact Hours: 1

Introduction: Brief history, scope of poultry breeding origins of poultry, poultry genetic resources, Ancestral species of wild fowl, their geographical distribution evolution, diversity and conservation. Inheritance of Morphological traits: Plumage colour and pattern, Naked neck, dwarfism, creeper condition, comb pattern and auto sexing. Inheritance of production traits: Egg production, growth rate, meat production, fertility, hatchability and feed efficiency. Heritability estimation: Phenotypic variance and its partitioning, parent-offspring regression and sib-method of heritability estimation, heritability estimates for different productive traits both in layers and broilers. Selection: Mass selection, family selection, index selection, reciprocal recurrent selection. Breeding system: Systems of mating used in poultry; breeding for egg, meat and disease resistance (immunological aspects), Breeder stock development for layers and broilers.

Course No. & Title: AS 311 Animal By-products and Waste Management Credit Hours: 3, Contact Hours: 3

Importance, prospects and potentials of animal by-products. Glossary on hides, skins wool and slaughterhouse by-products. Chemical composition and microscopic structures of hides, skins, and wool. Factors affecting wool and hair growth. Factors affecting the quality of hides, skins and wool. Production, curing, damage and defects of hides and skins. Virtues of wool. Physical properties of wool and specialty hair fiber and their uses. Classification and grading of wool. Manufacturing process and factors influencing the price of wool. Prospects of leather and wool industry. Introduction, glossary and objectives of waste management. Animal wastes and their nutritional values. Farm animal wastes, wastes from tanneries and slaughterhouses. Animal wastes as livestock feed and other purposes, safety and regulation of feeding animal wastes. Development of technologies for processing and treatment of animal wastes. Use of Animal wastes in bio-gas plant. Disposal of animal wastes, control of odors and environmental pollution. Economics of animal waste management.

Course No. & Title: AS 312 Animal By-products and Waste Management Credit Hours: 1, Contact Hours: 2

Preparation of animal before slaughter for quality production of hides and skins. Methods of flaying, washing, meating, fattening, trimming, and curing of hides and skin. Detection of damages and defects of hides & skins. Measures for their protection. Microscopic studies of hides, skins and wool. Pulling, sorting, dusting, scouring, drying, determination of staple length and types of wool and fibers. Collection and storage of animal waste in the farm. Identification and chemical composition of farm animal wastes. Commercial by-products plant and estimation of cost analysis. Visit to different slaughter houses, hides and skins markets and tanneries of Bangladesh.

Course No. & Title: AN 311 Non-ruminant Nutrition
Credit Hours: 2, Contact Hours: 2

Introduction to non-ruminant nutrition. Digestion and metabolism of nutrients: Carbohydrate, protein and fat. Energy value of feeds: Terms related to energy expression and measurement, applicability of different systems, calculation of energy requirements for avian and non-ruminants. Protein nutrition: Amino acids, their essentiality, measurement of availability. Methods for evaluating protein quality, estimation of protein requirements. Lipid Nutrition: Essential fatty acids, oxidation, cholesterol or fat as an energy source, synthesis of fatty acids and glycerol. Vitamin and mineral nutrition: Characteristics, physiological functions, deficiency symptoms and sources. Composition of vitamin and mineral mixture. Nutrient interrelationships: Interactions among the nutrients. Nutrition and feeding: Nutrient requirements, diet formulation and feeding methods of avian, laboratory animals, rabbits, pigs and horses.

Course No. & Title: AN 312 Non-ruminant Nutrition
Credit Hour: 1, Contact Hours: 2

Feeds for avians and non-ruminants. Ration formulation and preparation of stock diets Preparation of vitamin and mineral mixtures. Dietary allowances for avians and non-ruminants. Metabolic trials with rabbits and poultry. Survey of feed markets.

Course No. & Title: AN 313 Feeds and Fodder Science
Credit Hours: 3, Contact Hours: 3

Feeds: Importance, detailed classification, composition and characteristics. Fodders: Fodder germplasm in Bangladesh. Production and harvesting of leguminous and non-leguminous fodder. Quantitative and qualitative improvement of fodder. Application of GIS in fodder production. Agro-industrial byproducts and unconventional feeds: Importance, sources, nutrient contents and utilization. Feed additives and supplements: Classification, sources, doses, mode of action and their uses. Anti-nutritional factors: Classification, anti-metabolites, inhibitors, and antagonists. Weeds and aquatic plants: Classification, composition and nutritional characteristics of crop land and wasteland weeds, various aquatic plants of nutritional importance. Poisonous plants: Predisposing factors, characteristics, symptoms and prevention of animals from plant poisoning. Topical pastures & their nutritional characteristics

Course No. & Title: AN 314 Feeds and Fodder Science
Credit Hour: 1, Contact Hours: 2

Identification of various feeds and fodder. Fodder production plan. Cultivation of leguminous and non-leguminous fodder. Preparation of fodder album.

Course No. & Title: DS 313 Planning and Management of Dairy Farm and Milk Processing Plant
Credit Hours: 2, Contact Hours: 2

Dairy Farm: Introduction to planning and management. Factors involved in establishing dairy farm. Planning and prospectus of dairy farm of different herd size. Layout of commercial and small scale dairy farm. Planning of year round economic fodder production and feed supply. Labour management, Hygienic and Occupational safety. Pasture management. Water supply & waste water treatment, air ventilation, drainage facilities, energy supply, cleaning, disinfection & sanitation to dairy farm. Cost of milk production. Milk processing plant: Dairy plant design, layout and utilization. Plant operations: cleaning, disinfections and sanitation, receiving of milk & container, milk processing, product making, production records, storage, labeling, packaging, shipping, plant supplies. Food safety and hazard analysis and employees sanitation. Application and maintenance of different equipments in milk processing plant: heaters-coolers and heat exchange equipment, pasteurize, homogenizers, evaporating and drying equipment, can washing and sterilizing equipment, bottle washers and fillers, cream & butter handling equipments, cheese and casein plant equipment. Steam and its use in milk processing plant. Automation of dairy industry. Visit to plant for inspection, quality control and food plant sanitation.

Course No. & Title: PS 311 Ducks and Specialized Fowl Production
Credit Hours: 3, Contact Hours: 3

Introduction: Origin, domestication, geographical distribution of ducks and other fowls. Problems and prospects of rearing duck, quail, geese, pigeon, guinea fowl, turkey, and zoo birds in Bangladesh. Duck Production: Classification, recent development and production systems. Types and characteristics of egg and meat type ducks. Brooding, rearing, housing and feeding of ducks. Management of breeding stock. Integrated duck farming. Mule ducks production. Prevention and control of diseases. Quail production: Breeds and varieties, housing, feeding and reproductive behavior. Prevention and control of

diseases. Geese Production: Classification and behavior. Selection, mating, brooding, rearing, feeding and fattening. Prevention and control of diseases. Pigeon Production: Breeds, selection, mating, housing, feeding and preparing pigeon for show and races. Prevention and control of diseases. Guinea fowl Production: Varieties, housing and feeding. Prevention and control of diseases. Turkey Production: Varieties, selection and mating, breeding and artificial insemination, brooding and rearing, housing and feeding. Prevention and control of diseases. Zoo bird Production: Behavior and reproduction. Management of Peafowl, Pheasant birds, Swan, Love birds, White breasted hen, Common Myana, Ostrich, Falcons and other birds.

Course No. & Title: PS 312 Ducks and Specialized Fowl Production
Credit Hour: 1, Contact Hours: 3

Identification of different body parts of duck, geese, pigeon, guinea fowl, quail and turkey. Identification of breeds and varieties of ducks and other species. Housing, feeding, watering and other management practices of different species of fowls. Selection and culling of the breeding stock. Dressing percent and meat yields of different species. Identification of eggs of different species. Analysis of cost benefit ratio of raising different species. Visits to duck farms and preparation of reports. Vaccination programmes. Routine works and sanitary measures.

Level-3, Semester-2

Course No. & Title: ABG 321 Genetic Diversity and Breeding Practices
Credit Hours: 3, Contact Hours: 3

Animal Diversity: Biodiversity in animal agriculture, genetic diversity, and avenge heterozygosity, animal genetic resources (FAnGR), status of genetic resources-extinct, critical, endangered, and at risk. Causes for loss of genetic resources, conservation of genetic diversity and improvement of FAnGR and their wild relatives. Inbreeding: Genetic and phenotypic effects, inbreeding coefficient, inbreeding depression, purebred breeding, close breeding and line breeding. Out breeding: Out crossing, crossbreeding, line crossing, grading up, species hybridization, heterosis and its application. Specialized breeding: Selection and breeding policies and plans for the improvement of cattle, buffalo, goat, sheep and poultry for specific purposes, sire reference scheme, Community based livestock breeding system, nucleus breeding system (NBS) and breeding for disease resistance and threshold traits. Breeding small population: Systems of breeding for captive and pet animals, conservation and management of endangered animal species.

Course No. & Title: ABG 322 Genetic Diversity and Breeding Practices
Credit Hours: 1, Contact Hours: 2

Identification of indigenous livestock genetic resources. Systems of keeping breeding records in different farm animals. Measurement of inbreeding and relationship co-efficient. Estimation of heterosis, combining ability. Formulation / Designing various mating strategies. Visit to Livestock breeding farms, centers, natural habitats and germplasm conservation center.

Course No. & Title: AS 321 Meat Science and Technology
Credit Hours: 3, Contact Hours: 3

Introduction to meat science and meat technology. Prospects, potentials and constraints of meat industry. Glossary on meat and meat technology. Structure, characteristics and growth of muscle. Care and management of meat animals. Biosecurity and environmental impact of meat production. Slaughtering and dressing of animals. Disposal and utilization of packing house by products. Factors affecting quantity and quality of meat. Grading of meat. Preparing, packaging and serving meat and its products. Processing, preservation and spoilage of meat. Marketing of meat and meat products. Meat borne diseases and their prevention. Planning & design of abattoir and small-scale slaughterhouse.

Course No. & Title: AS 322 Meat Science and Technology
Credit Hour: 1, Contact Hours: 2

Essentials of slaughtering. Inspection of meat animals prison to slaughter. Methods of slaughtering of animals. Demonstration of carcass of meat animals. Isolation of edible and in edible portion of the carcass. Identification of meat from different species of animals. Demonstration of meat cuts for different species of animal. Preservation of meat. Preparing meat products. Planning and demonstration of slaughterhouse. Visit to meat industry.

Course No. & title: AN 321 Feed Processing and Conservation
Credit Hours: 2, Contact Hours: 2

Importance of processing and conservation of feeds & fodder. Introduction to processing- Reasons for processing cereals and protein concentrates. Processing cereal grains- dry processes, and wet processes. Effect of processing on physical and chemical properties of cereal grains. Effect of processing cereal grains for beef cattle, dairy cattle and sheep and goat. Processing poor quality roughages: Methods for treatment of poor quality roughages, ammonia treatment, urea treatment, treatment with NaOH. Conservation of feeds & fodders: Importance of conservation of feeds and fodders, Principles of conservation, Different methods of conservation, Nutritive value of conserved feed. Preparation of silage: Definition, advantages of silage making, Methods of silage making, fodders suitable for silage, types of silo-pits etc. Factors affecting nutritive value of silage. Use of additives during ensiling, Use of sterilizing agents and lactic acid stimulants. Preparation of hay: Definition, advantage of hay making, Methods of hay making, Fodders suitable for hay, Avenues of losses of nutrients during hay making.

Course No. & Title: AN 322 Feed Processing & Conservation
Credit Hour: 1, Contact Hours: 2

Practical aspects of feed processing. Physical, Chemical and biological treatment of low quality roughages. Preparation of silage and hay.

Course No. & Title: DS 321 Course Dairy Technology - I
Credit Hours: 3, Contact Hours: 3

Introduction to Dairy Technology:

Cream: Classification, grading, objectives, principles and methods of cream separation. Cream separator. Factors affecting the richness, efficiency of separation, standardization and uses of cream. Butter: Composition and nutritive value. Butter making- selection, grading, neutralization, pasteurization, ripening and churning of cream. Addition of colouring, materials, washing, salting, working, printing, packaging and storing of butter. Overrun in butter, defects of butter and remedies. Ghee/Butter oil: Composition and food value. Methods of manufacturing, defects and their remedies, utilization of ghee residues. Ice-cream: Composition, food value and classification. Ice-cream ingredients, calculation of mix, pasteurization, homogenization and ageing of mix, freezing, packaging and hardening, overrun in ice-cream. Condensed and evaporated milk: Composition, food value, manufacturing process of condensed and evaporated milk. Dry milk: Composition, food value, classification, manufacturing process, properties and uses of dry milk.

Course No. & Title: DS 322 Dairy Technology - I
Credit Hour: 1, Contact Hours: 2

Parts of cream separator. Separation of cream by modern centrifugal cream separator. Organoleptic evaluation, grading and standardization of cream. Determination of fat, acidity, total solids and ash content of cream. Manufacture of butter, butter oil /ghee. Manufacture of condensed milk. Ice cream mix making. Manufacture of powdered milk.

Course No. & Title: PS 321 Poultry Farm Planning and Management
Credit Hours: 3, Contact Hours: 3

Planning and Management: General considerations in planning and management of poultry farm. Environmental aspect of planning and management. Farm Planning: Planning for modern poultry hatcheries, commercial broiler and layer farms, parent stock farms, duck, quail and integrated farms and processing plants. Farm Management: Equipment and machineries, personnel, routine work and products marketing, disposal of dead birds and farm manure. Cost-benefit Analysis: Cost-benefit analysis of different poultry farms.

Course No. & Title: PS 322 Poultry Farm Planning and Management
Credit Hour: 1, Contact Hours: 2

Farm Planning: Layout and financial statement of parent stock farms, modern hatcheries, commercial broiler and layer farms, duck, quail, integrated farms and processing plants. Biosecurity in planning and designing poultry farms. Farm Management: Personnel, routine work, machineries, financial management and marketing. Field trips: Visits to poultry farms and smallholders' production units.

Course No. & Title: VMH 323 Poultry Disease Management
Credit Hours: 2, Contact Hours: 2

Factors influencing health and diseases of poultry, practices of hatchery and flock hygiene, disposal of wastes, litters and carcasses spread of infectious agents of important poultry disease. General measures for the prevention and control of common poultry diseases, isolation, quarantine, disinfection and immunization practices, bio-security, Influence of stress and stressors on poultry health.

Course No. & Title: VMH 324 Poultry Disease Management
Credit Hour: 1, Contact Hours: 2

Hatchery and flock hygiene management, disposal of wastes, litters and carcasses, General measure for the prevention and control of common poultry disease, isolation, quarantine, disinfection and immunization practices.

Level-4, Semester-1

Course No. & Title: ABG 411 Reproduction of Farm Animals
Credit Hours: 3, Contact Hours: 3

Introduction: Definition and scope of Animal Reproduction. Type of reproduction in various species of animals. Relationship with genetics and breeding. Reproductive System: Embryology, anatomy, histology and physiology of reproductive system in farm animals. Reproductive Endocrinology: Hormones and receptor, classification, properties function and mode of action. Endocrine regulation of male and female reproduction. Hormone assay. Hormone like substances-growth factors and prostaglandins. Interaction between genetics and endocrinology.

Germ cells: Primordial germ cells, life history of the germ cells. Oogenesis and its biochemical aspects. Ovulation, follicular atresia and structure of egg, spermatogenesis, sperm transport in the male and female genital tract, and egg 'pick-up', Reproductive cycle and sexual behavior: Puberty and its practical application. Estrous cycle and related events in different farm animals. Breeding season and its effect on reproduction, maternal and neonatal behavior. Fertilization, pregnancy and parturition: Fertilization, preparation of gametes, acrosome reaction, interaction of spermatozoa with the zona pellucida, gamete fusion, activation of the egg, cleavage, blastocyst formation, implantation, embryonic and fetal development, act of parturition. Herd fertility: Concept of fertility and sterility. Reproductive failure and measures of reproductive efficiency in male and female. Common reproductive diseases, disorder and their prevention. Economics of poor fertility, herd fertility improvement.

Course No. & Title: ABG 412 Reproduction of Farm Animals
Credit Hours: 1, Contact Hours: 2

Methods of reproductive sample collection. Male and female reproductive organs in different farm animals. Management of breeding animals. Heat detection in farm animals. Routine activities at maternity house. Rectal palpation in farm animals for reproduction management. Histological study of different parts of male and female reproductive organs. Hormone assay. Monitoring herd/flock reproductive efficiency.

Course No. & Title: AS 411 Goat and Sheep Production
Credit Hours: 3, Contact Hours: 3

Geographical distribution and world production systems of goat and sheep. Importance of goat and sheep, their functional roles in poverty alleviation in Bangladesh. Classification and description of goat and sheep breeds according to their uses. Thermoregulation and biostatistics of goat and sheep and adaptation to different environment. Housing of goat and sheep, their requirements and types with specifications. Management of goat and sheep for reproductive purposes. Feeding systems of goat and sheep for growth, meat, milk and wool production. Growth pattern and meat production of goat and sheep. Systems of measuring efficiency of production. Management practices of goat and sheep flock. Farming systems, biological and economic efficiency. Common diseases and parasites of goat and sheep, their prevention and impact on productivity. Planning and evaluation of small scale and commercial goat and sheep farm. Prospects and potentialities for increased goat and sheep production.

Course No. & Title: AS 412 Goat and Sheep Production
Credit Hour: 1, Contact Hours: 2

Approach, handling and care of goats and sheep of different age and physiological conditions. Methods and procedures of judging of goat and sheep for meat, milk and wool production. Housing: Types of housing, equipment and facilities for housing of goat and sheep. Management practices in goat and sheep farm. Formulation of balanced ration and feeding schedule at different productive stages. Record keeping in goat and sheep. Studies of rural goat and sheep production system: Case studies through participatory rural appraisal (PRA). Planning and designing of small and commercial goat and sheep farm. Visit to goat and sheep farm.

Course No.& Title: AN 411 Feed Milling Industry
Credit Hours: 2, Contact Hours: 2

Feed milling: Importance, present status and future scope. Planning: Planning, site, size and capacity of feed mill. Feed mill operation: Outline, flow-chart for compound feed production. Machines, intake and handling of raw materials: Intake of bulk and bagged materials, liquid ingredients, bag and bulk handling machineries. Conveying systems, weighing and cleaning of raw materials. Raw material storage: Bag and bulk storage. Bin construction. Moisture in raw materials during storage. Raw materials quality: Physical characteristics, chemical analyses, bioassays, feed microscopy. Processing of agricultural and industrial byproducts: Grinding, grinding equipment, hammer mill installation, breaking rolls, roller mills, mixing, mixing equipment. Pelleting: Principles of pelleting, pelleting equipment, various aspects of pelleting, operation and maintenance of machines. Weighing and packing: Weighing methods, steps in packing, types of bags used in the feed mill. Storage and delivery: Types of bin/silo, bulk intake and storage, intake of bagged materials, bulk and bag in the machineries, bulk and bag transportation. Quality control of finished products: Importance, basic quality assurance programme. Cost for feed milling: Production costs, fixed and running costs.

Course No. & Title: AN 412 Feed Milling Industry
Credit Hour: 1, Contact Hours: 2

Layout of a typical feed milling industry. Handling and operation of grinder, mixer, pellet die, roller shell etc., Feed drying and grinding, on-farm hand mixing. Compound feed manufacturing. Visit to feed mills.

Course No. & Title: AN 413 Nutrient Requirements for Livestock
Credit Hours: 2. Contact Hours: 2

Energy requirements: Energy systems for ruminants and non-ruminants. Energy requirements for maintenance, growth, lactation, reproduction, wool growth and work of different species of ruminants and non-ruminants. Efficiency of utilisation of metabolisable energy. Protein requirements: Methods of estimation of protein requirements. Protein systems for animals. Protein requirements of animals for maintenance, and productive purposes. Mineral requirements of farm animals: General approach of assessing the requirements Methods of estimation of requirements. Estimation of requirements for calcium, phosphorus, magnesium and important trace elements for cattle, buffaloes, sheep, goats, horse and rabbits. Vitamin requirements for farm animals: Requirements for maintenance, growth, lactation and pregnancy, Interrelationship of vitamins and minerals. Water and its requirements: Sources of water. factors affecting water intake of farm animals. Estimation of water requirements for ruminants and non-ruminants.

Course No. & Title: DS 411 Dairy Technology - II
Credit Hours: 3, Contact Hours: 3

Cheese: Composition, nutritive value and classification of cheese. Principles of cheese making, coagulants and their properties, mechanism of milk coagulation. manufacturing process of domestic and foreign cheese, cheese rheology, vegetable cheese. Dahi/yoghurt: Composition, food value and manufacturing process of sweet, sour and fruit dahi. Characteristics of good quality dahi, mechanism of milk coagulation. Defects of dahi and their remedies. Indigenous dairy products: Classification of indigenous sweetmeat, manufacturing technology of rossogolla, rasomalai, chamcham, kalojam, lalmohan, peda, kanchagolla and sandesh, judging and quality control of sweetmeat. Other milk-based products: Pudding, Custard, Cummins, Kefir, Acidophilus milk, Bulgarian butter milk. Milk processing plant and creamery: Prerequisites for plant establishment, design, plant and creamery operation, cleaning and hygiene. Quality Control: Definition, concept and applications in dairy industry, food adulteration, product specifications, National and International standards for dairy food, Codex Alimentarius; ISO: 9000

Course No. & Title: DS 412 Course Dairy Technology -II
Credit Hour: 1, Contact Hours: 2

Cheese making: Dhaka cheese, Cottage cheese, Cheddar cheese, Brick cheese and Swiss cheese. Manufacturing of Dahi, Yoghurt, Cultured milk and Cultured butter milk (matha).

Preparation of sweetmeat :Chhana, Khoa, Rossogolla, Khanchagolla, Sandesh, Monda, Rasamalai, Peda, Chamcham, Malaikari. Manufacturing of sherbets, water ices and novelties, pudding, custard, milk-shake and lachhi. Visit to modern dairy plants. Judging of Dairy Products.

Course No. & Title: PS 411 Egg Production and Technology
Credit Hours: 3, Contact Hours: 3

Introduction: Distinction and sources of parent stock and commercial hybrids, table eggs and hatching eggs. Statistics on grandparent stock, parent stock, commercial hybrids, table and hatching egg production. Modern strains: Concept, types and chronological development.

Parent stock and commercial layer production: DOC transportation, clean up and disinfection, care on arrival, critical period, tools to reach target, flock uniformity and management practices from day-old to end of lay. Housing and environment: Housing types—general rules. Dirty and clean concept. Open-sided house and environment controlled house. Ventilation and light control. Equipment and their uses. Litter management. Heat stress and its consequences on growth and production. Combating heat stress. Egg production in smallholder's farms: Selection of birds. Management procedures. Constraints and ways of overcoming. Prevention of diseases: Biosecurity. Principal diseases and their vaccination and medication schedule. Disposal of poultry manure, used litter and dead birds. Preparation and transportation of samples to diagnostic laboratories. Organic egg production: Management and feeding of layer chicken. Egg: Food value, uses, and products technology. Egg production and quality: Factors involved. Methods of improvement and measurements of egg quality. Marketing eggs: Marketing channel, marketing problems and solutions.

Course No. & Title: PS 412 Egg Production and Technology
Credit Hour: 1, Contact Hours: 2

Preparation of poultry house: Cleaning, washing, disinfection and fumigation. Equipment and materials for production: Use of equipment and materials in brooder, grower and layer houses. Practice of debeaking. Feeding: Feeding practices of parent stock and commercial birds. Vaccination and medication: Preparation and uses of vaccination and medication schedule. Care and handlings of eggs: Collection, grading, packaging, storage and transportation. Eggs: Structures and identification of normal and abnormal eggs. Measurements of egg quality traits: Shell quality and internal quality. Field trips: Observation of operation systems of rural parent stock and commercial layer farms, visit to industrial parent stock and commercial layer farms.

Course No. & Title: CM 419 Agribusiness
Credit Hours: 2, Contact Hours: 2

Agribusiness: Definition, scope and importance. Agribusiness system, goals of agribusiness firm. Starting the agribusiness. Managing the agribusiness: business location, business facilities, production, service or sales activities, business costs and business accounting. Agribusiness products, packaging & branding, pricing, promotion and distribution system. Agribusiness commodity systems of livestock & livestock products, poultry and poultry products and the related inputs.

Level-4, Semester-2

Course No. & Title: ABG 421 Artificial Insemination and Reproductive Biotechnology
Credit Hours: 3, Contact Hours: 3

Artificial Insemination: Recent advances, advantages and limitations of artificial insemination. Semen physiology and sperm biology: Composition and properties of semen, structure, physiology and fertilizing ability of sperm. Survival of sperm *in vivo* and *in vitro*. Semen evaluation, diluents and their composition. AI management: Management of females, Preparation and examination of AI bulls. Management of breeding males, teasers. Insemination techniques, time and fertility, diseases transmitted through AI and their control, maintenance of AI records.

Reproductive biotechnology: Concept, scope and its application in animal industry. Reproductive manipulations: Background Estrus synchronization, Multiple Ovulation and Embryo Transfer (MOET). *In vitro* maturation (IVM) and *in vitro* fertilization (IVF) of mammalian oocyte, *in vitro* culture, (IVC) of embryos and their transfer in surrogate mother. Ultrasound guided transvaginal 'ovum pick-up' (OPU) technique, sex control techniques in farm animals. Frozen semen production technology. Cryopreservation: Principles of cryobiology, Cryopreservation of semen, oocyte and embryos. Principle of Cloning: Historical

perspective; basic biological processes; Methods and application of cloning in-different species. Embryo cloning: Concepts and consequences. embryo slicing and their application in modern animal production, embryonic stem cells culture.

Course No. & Title: ABG 422 Artificial Insemination and Reproductive Biotechnology
Credit Hours: 1, Contact Hours: 2

Collection and evaluation of semen for artificial insemination (AI) in cattle, buffalo, goat, sheep and chicken. Preparation of diluents and extension of semen. Production of frozen semen.

Artificial insemination in farm animals and poultry. Pregnancy diagnosis. Handling and shipment and frozen semen. Collection of reproductive organ for biotechnological studies. Oocyte collection, *In vitro* maturation, in vitro fertilization and *in vitro* culture. Embryo collection, selection, cryopreservation and thawing of gametes. Routine activities at AI center.

Course No. & Title: AS 421 Beef Cattle Production
Credit hours: 2, Contact hours: 2

Domestication, geographical distribution and adaptation of beef cattle. Prospects and constraints of beef cattle enterprise. Breeds of beef cattle. Judging and selection of beef cattle. Production programmes of beef cattle, their constraints and opportunities. Feeding systems and feed requirement of beef cattle. Housing and equipments of beef cattle. Breeding and reproductive management of beef cattle. Methods of measuring growth pattern, prediction of carcass composition and beef grading. Use of growth promoters and feed additives for beef cattle. Effect of environment on beef cattle production. Application of biotechnology for beef cattle production. Common diseases and their preventive measures. Farm planning and evaluation of small scale and commercial beef cattle farm.

Course No. & Title: AS 422 Beef Cattle Production
Credit hours: 1, Contact hours: 2

Judging of beef cattle. Formulation of beef cattle ration and demonstration of feeding systems. Beef cattle management practices. Restraining, clipping, ageing, marking, bedding, castration, record keeping, marketing. Demonstration of beef cattle housing. Demonstration of beef cattle production programmes. Planning and design of commercial beef cattle farm. Survey of small scale fattening program in rural areas of Bangladesh. Beef cattle farm manager checklist. Visit to small scale and commercial beef cattle farm.

Course No. & Title: AN 421 Livestock Feeding
Credit Hours: 3, Contact Hours: 3

Prediction of feed intake for livestock: Voluntary intake. Feed intake in monogastric and ruminants. Factors affecting feed intake. Feeding standard: Development, types and uses in different species of farm animals. Ration formulation: Ration, characteristics of a good ration. Formulation of ration for cattle, buffaloes, sheep and goat. Economic analysis. Feeding systems: Concept of feeding systems. Feeding systems for different classes of livestock. Usefulness of modern feeding systems under Bangladesh condition. Feeding of farm livestock: Feeding farm animals for different productive purposes. Feeding during scarcity period. Feeding urea-molasses liquid diet, urea-molasses straw, urea-molasses block and unconventional feedstuffs. Feeding conserved forages: Feeding silages, hays and dried grasses and leaves. Factors to be considered in feeding conserved forages. Feeding conserved forages for young stock and for milk and beef production.

Course No. & Title: AN 422 Livestock Feeding
Credit hour: 1, Contact Hours: 2

Formulation of ration for large and small ruminants for different productive purposes. Computer programming for ration formulation. Feed evaluation systems. Feeding trial with farm animals for determination of digestibility, nutritive values of feedstuffs and performance of animals. *In vitro* fermentation of feedstuffs using Menke's gas production technique and Tilley and Terrie method. Rumen degradability study of feedstuffs using nylon bag technique.

Course No. & Title: DS 421 Dairy Cattle production
Credit Hours: 3, Contact Hours: 3

History of development of major dairy breeds. Systems of dairy development in different countries. Role of cooperative in dairy development. Factors affecting the success of dairy farm operation, quality and quantity of milk. Environmental effects on productivity. Management of dairy cows: Exercise, grooming, trimming of hooves, dehorning, disbudding and removal of extra teats. Care of dam before and after calving, new born calves, heifers, dry, lactating cows and dairy bulls. Record keeping for successful dairy farm operation.

Cow's udder structure and development, physiology of milk synthesis, secretion and letdown. Milking procedures and use of milking machine. Milk production in relation to skin thickness and udder size. Methods of feeding of dairy animals. Use of rumen undegradable dietary protein in relation to higher milk production. Supplementation strategies for milk production in smallholder dairy farming. Nutrient partitioning, lactation persistency and mobilization of body reserves. Blood metabolites for prediction of dairy cattle feeding status. Judging and condition scoring of dairy cows. Problems of Dairying in Bangladesh and their possible solutions. Feeding and management of dairy buffaloes and goats for milk production. Reproductive performance and abnormalities in Dairy cattle. Prevention and control of common diseases and parasites of dairy cattle. Organic dairy farming.

Course No. & Title: DS 422 Dairy Cattle production
Credit Hour: 1, Contact Hours: 2

Routine works in dairy farm. Casting and castration. Computation of balanced rations for dairy cows, heifers and calf. Judging of dairy cows, buffaloes and dairy bulls. Detection of heat in cows and buffaloes. Culling of Dairy cows. Dairy farm plan, layout and prospectus for successful dairy operation. Planning for year round feeds & fodder supply in a dairy farm. Cleaning and washing of dairy cows, utensils and equipment. Different methods of milking—hand and machine milking, milk let down mechanism, rules for good milking. Silage and hay making for dairy animals. Tests for detecting abnormal milk and mastitis. Methods of administration of drugs and technique of vaccination in the dairy cattle. Proper utilization of dairy farm waste. Use of dairy records. Visit to Dairy Farms. Fifteen days round the clock farm practice.

Course No. & Title: PS 421 Broiler Production and Technology
Credit Hours: 3, Contact Hours: 3

Introduction: Development of broiler and broiler industry. Statistics of broiler and poultry meat production. International chicken meat trade. Problems and prospects of broiler production. Development and concept of pure line, grand parent stock, parent stock and commercial hybrids. Selection of broiler strain. Housing: Tunnel ventilated controlled house, ventilation system, cooling system, insulation, open-sided houses, costing system, isolation, etc. Housing environment, materials and equipments. Litter: Types, materials, quality evaluation and management. Grand Parent Management: Brooding, lighting, beak trimming, selection, water and feed management, body weight control. Parent stock management: Management of male and female parent stock. Brooding, housing, feeding, body weight control, flock uniformity, grading of parent stock and post grading management. Commercial broiler management: Brooding, feeding, watering, lighting and other management practices. Organic broiler production.

Stress management: Stresses from feed and feed management, heat stress and other stressors. Contract growing: parent stock and commercial broiler. Bio-security: Concept and measures. Cleaning and disinfection of poultry houses and equipments. Prevention and control of common broiler diseases. Vaccination and medication for parents and hybrids. Broiler meat: Factors affecting meat production and its quality. Food value. Processing: Transportation of live broilers. Receiving and anti-mortem inspection. Steps in processing live broilers, dressing yields and cut up parts. Packaging and preservation. Production cost: Chicks, feed, labour and other costs. Factors affecting profit and loss in broiler production. Marketing: Marketing systems and marketing of live and dressed broilers.

Course No. & Title: PS 422 Broiler Production and Technology
Credit Hour: 1, Contact Hours: 2

Handling of broilers. External body parts of commercial broiler and acquaintance with different body systems of broiler through dissection. Acquaintance with modern broilers, breeds, varieties and strains. Identification and uses of different equipment, utensils and machineries used in broiler farming. Preparation of brooder house: Cleaning, disinfecting, lighting and placement of essential equipment. Maintenance of temperature, humidity and fresh air. Measurement of heat, light and air movement and pressure static in broiler house. Floor vs. battery brooding and other management practices. Feeding parents and hybrids at different stages of growth. Vaccination and medication Programme. Evaluation of parent stock: Flock uniformity, grading of parents stock, Post-grading management. Evaluation of broiler performance by production number and performance index. Grading of live and dressed broilers and processing and cut-up parts of broilers. Visit to processing plant and commercial broiler and parent stock farms.

Course No. & Title: Ag. Ex. 421 Agricultural Extension Education
Credit hours: 3, Contact Hours: 3

Introduction: Concept of extension education; Philosophies, Principles, Scope and Phases of extension work; History of livestock extension in Bangladesh; Importance and present condition of livestock in Bangladesh. Learning Process: Meaning of learning; Elements of learning situation, Laws of learning and their implications in extension work. Extension Teaching methods: Meaning and Classification of extension teaching, Steps in extension teaching; Advantages and Limitations of extension teaching methods. Communication: Meaning, types, process, importance and functions of communication in extension work; Key elements in the communication process and their characteristics; Communication models: Berlo Model and Leagans Model; Feedback: characteristics and role; Problems in getting feedback. Diffusion Process: Concepts of

innovation and diffusion; Elements of diffusion process; Attributes and consequences of innovations; Types of innovation and innovation-decision process; Innovativeness; Adopter categories based on innovativeness; Characteristics of different types of adopters. Organization: Concept of organisation and extension organisation; Features of an extension organisation; Qualifications and duties/functions of an extension administrators, specialists, supervisors and extension workers. Leadership: Concept of leadership; Importance of leadership in extension work; types of leadership; Qualities of a good leader; Duties and responsibilities of local and professional leaders; Opinion leaders and their importance in extension work. Extension Programme Planning and Evaluation: Concept, Importance, Principles and Steps of extension programme planning for livestock development; Concepts and Steps of monitoring and evaluation of programmes/projects related to livestock extension work.

Course No. & Title: Ag. Ex. 422 Agricultural Extension Education
Credit hour: 1, Contact Hours: 2

Development Organizations: Orientation to Livestock development organizations in Bangladesh. Lecture: Preparation and presentation of a lecture. Teaching Aids: Preparation of Poster, Leaflet and Flash cards. Group Discussion Techniques: Brainstorming and Role Play. Data Collection: Methods of collecting data and preparation of an interview schedule. Training Programme: Preparation of a training programme. Extension Field Trip: Extension field trip to Upazilla Headquarters to be acquainted with rural development activities with special emphasis on livestock.

Assignment:

- i. Identification of different technologies along with their origin, target group and salient features.
- ii. Submission of Extension Field Trip Report.