

## Department of Animal Science

### Ph.D Programme

Course No.	Title of the course	Credits
<b>1<sup>st</sup> Semester</b>		
ASC- 701	Cattle and Buffalo Production Management	2+1
ASC- 702	Pig Production Management	1+1
ASC- 703	Rabbit Production Management	1+1
ASC- 704	Commercial Broiler Production	2+1
ASC- 705	Animal Husbandry Development Programmes	1+0
*ASC- 706	Advances in Cattle and Buffalo Production Management	2+0
ASC- 707	Advances in Pig Production Management	2+1
ASC- 708	Advances in Rabbit Production Management	1+0
<b>2<sup>nd</sup> Semester</b>		
ASC- 751	Sheep and Goat Production Management	2+1
ASC- 752	Shelter Management	1+1
ASC- 753	Commercial Layer Production	2+1
ASC- 754	Farm Animal Behaviour	1+0
ASC- 755	Integrated Livestock Farming System	2+1
*ASC- 756	Advances in Sheep and Goat Production Management	2+1
ASC- 757	Advances in Poultry Production Management	2+1
ASC- 758	Modern Concepts of Feeding Ruminants and Forage Utilization	2+0
ASC-799	Seminar-I	1+0
<b>3<sup>rd</sup> Semester</b>		
ASC-801	Principles of Environmental Hygiene and Waste Management	2+1
ASC- 802	Climatology and Animal Production	1+0
ASC-803	Breeder Stock and Hatchery Management	2+1
ASC- 804	Management of Poultry other than Chicken	2+1
ASC- 805	Feed Conservation, Storage and Quality Control	2+1
ASC- 806	Modern Concepts of Feeding Non Ruminant Animals	2+0
ASC- 807	Modern Concepts in Commercial Poultry Production	2+1
ASC-849	Seminar-II	1+0
<b>4<sup>th</sup> Semester</b>		

ASC- 851	Poultry Economics, Projects and Marketing	2+1
ASC- 852	Nonconventional Feedstuffs and Toxic Constituents/ Antimetabolites in Animal Feedstuff	2+1
ASC- 853	New Feed Resources and Toxicants in Animal Feeding	2+0
ASC- 854	Poultry Economics, Marketing and Integration	2+1
<b>5<sup>th</sup> Semester</b>		
	Nil	
<b>6<sup>th</sup> Semester</b>		
ASC-999	Seminar-III	1+0
ASC-1000	Doctoral Research	0+45

\*ASC-706 and ASC-756 are core courses to be taken by all PhD students of the Department

#### Semester-I

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
ASC- 501	Cattle and Buffalo Production Management	2+1
ASC- 503	Pig Production Management	1+1
ASC- 504	Rabbit Production Management	1+1
ASC- 509	Commercial Broiler Production	2+1
ASC- 516	Animal Husbandry Development Programmes	1+0
*ASC- 601	Advances in Cattle and Buffalo Production Management	2+0
ASC- 603	Advances in Pig Production Management	2+1
ASC- 604	Advances in Rabbit Production Management	1+0

#### Semester-II

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
ASC- 502	Sheep and Goat Production Management	2+1
ASC- 505	Shelter Management	1+1
ASC- 508	Commercial Layer Production	2+1
ASC- 513	Farm Animal Behaviour	1+0
ASC- 517	Integrated Livestock Farming System	2+1
*ASC- 602	Advances in Sheep and Goat Production Management	2+1
ASC- 605	Advances in Poultry Production Management	2+1
ASC- 606	Modern Concepts of Feeding Ruminants and Forage Utilization	2+0

#### Semester-III

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
ASC-506	Principles of Environmental Hygiene and Waste Management	2+1
ASC- 507	Climatology and Animal Production	1+0
ASC-510	Breeder Stock and Hatchery Management	2+1

ASC- 511	Management of Poultry other than Chicken	2+1
ASC- 514	Feed Conservation, Storage and Quality Control	2+1
ASC- 607	Modern Concepts of Feeding Non Ruminant Animals	2+0
ASC- 609	Modern Concepts in Commercial Poultry Production	2+1

### Semester-IV

Course No.	Course Title	Credit
ASC- 512	Poultry Economics, Projects and Marketing	2+1
ASC- 515	Nonconventional Feedstuffs and Toxic Constituents/ Antimetabolites in Animal Feedstuff	2+1
ASC- 608	New Feed Resources and Toxicants in Animal Feeding	2+0
ASC- 610	Poultry Economics, Marketing and Integration	2+1

\*ASC- 601 and ASC-602 are core courses to be taken by all PhD students of the Department

- ASC-601 and ASC-602 are core courses to be taken by all Ph. D students of

the Department

Student from cognate branch should take a minimum of 20 credits of 500 series courses as remedial course.

They should undergo one year remedial programme before registering for regular courses.

## COURSE OUTLINE FOR PG STUDIES

Department of Animal Science  
Faculty of Agriculture  
Bidhan Chandra Krishi Viswavidyalaya

### COURSE CONTENTS

ASC 501. CATTLE AND BUFFALO PRODUCTION MANAGEMENT 2+1

#### Theory

- Introduction-Development of Dairy Industry in India and World-Present status and future prospects of livestock development in India.
- Important breeds of cattle and buffalo, traits of economic importance and their interrelationship- Selection of high quality animals- Role of management in improving the reproduction efficiency in farm animals-Housings and rearing system.
- Breeding Management: System of breeding Economic traits. Methods of Breeding- Prenatal and postnatal care and management of cattle and buffalo-Care of neonate and young calves- Management strategies for reducing mortality in calves, age at first calving and buffaloes.

- Management of labour, Milking management, Machine milking and hand milking, Different laws governing the livestock sectors to produce quality products on par with international standards – Technique of harvesting clean and hygienic livestock products, transportation of animals, health management. Wallowing in buffaloes-Management of draught animals and summer management.
- Feed and fodder resources used for feeding of cattle and buffaloes-Scientific technique of feeding, watering- Computation of practical ration, Supply of green fodder around the year and enrichment of poor quality roughages.

### **Practical**

**Visits to cattle farms and critical analysis of managerial practices- Study of breeding management in the farm- Analysis of practical feeding management-Disease control- Housing- milking- Calf, heifer and adult management- Dairy Cattle and Buffalo judging- Project preparation for external funding and commercial farms and enterprise for daily products- marketing strategies for milk products and meat.**

## **ASC 502. SHEEPO AND GOAT PRODUCTION MANAGEMENT**

**2+1**

### **Theory**

- Introduction- population structure and importance- Advantages and disadvantages of sheep farming under different system of management – type of housing and equipment's- important sheep and goat breeds-Advantages of sheep and goat farming.
- Breeding Management: Breeding seasons – fitness of purchase for first breeding – methods of detection of heat – Natural Service and artificial insemination – Care of the pregnant Animals – Breeding stock –Use of teaser –Culling.
- Feeding Management: Feeding methods –Printings to be followed in feeding and watering – feeder space, Water space, Designing feeders and Waterers.- Range management – Stocking rate and pasture improvement and utilization; management under stall fed conditions, Transportation of sheep and goat.
- Disease Management: Role of management in the prevention and control of diseases. Social Management: Deworming – Dipping and spraying – Avoidance of goatry odour in milk, Topping.
- Wool: Importance of wool – Fibre structure – Fleece characters –Goat fibres – Characters of mohair and pashmina, fur and Angora – Marketing of goat fibers / Wool,- planning of sheep and goat farm of various sizes – Economics of sheep and goat farming.

### **Practical**

- Visit to sheep and goat farms and critical analysis of various managerial practices under different conditions. Study of practical housing management – Analysis of practical diseases control management – Shearing management – Record keeping. – Preparation of project for commercial farming – Characterization of sheep and goat; handling of sheep and goat; daily and periodical operation for sheep and goats – Methods of identification of sheep and goat. Cost of rearing sheep and goat for mutton and wool – Housing plans for various age and categories of sheep and goat – Dipping; Vaccination of sheep and goat –Shearing of wool.

## **ASC 503. PIG PRODUCTION MANAGEMENT**

**1+1**

## **Theory**

- Introduction – Population and importance – Economic contribution of pigs- Advantages and disadvantages of swine keeping – Systems of management – Problems in pig farming.
- Breeds of pigs –Selection of breeding stock –Breeding seasons –Age and weight at first services – Methods for detection of heat – Natural service and artificial insemination- Care of pregnant sows, piglets and growers Care of breeding boar.
- Housing, sanitation and hygiene, disease prevention measures – Housing and equipment – Wallowing – Sanitation and hygiene –Role of management in the prevention and the control of diseases.
- Feeding and management of new born, Weaner and finishers, dry, pregnant and farrowing sows – Feeding principles to be followed –Methods of watering – Feeder space- Water space, etc – methods of marketing in swine production – Record keeping.

## **Practical**

Visits to piggeries and critical Analysis of various types of managerial practices- Analysis of the trend and structures of pig population – Analysis of practical breeding management methods, practical disease control management – special management methods – Ageing and identification –Judging – Constrains and remedial measures in pig farming –Economics of production – Project preparation for research and commercial farms.

ASC 504. RABBIT PRODUCTION MANAGEMENT

1+1

## **Theory**

- Introduction –Importance of rabbit for meat and fur production, Common breeds and strains.
- System of housing – Common disease and their control measure. Management of specific pathogen free animals
- Feeding of rabbits stages of growth and production.
- Breeding –Age at maturity, litter size –Weaning – Feeding of growers – Selection of replacement stock, transportation of rabbit, marketing of meat and fur.

## **Practical**

Handling and restraining – Visit to small animal farms and critical analysis of various type of managerial practices –Analysis of the trend and structures – Analysis of practical breeding management methods – practical disease3 control management and special management methods – Ageing and identification – Judging –Economics of production.

ASC 505. SHELTER MANAGEMENT

1+1

## **Theory**

- General principles in planning animal houses –farmstead and animals houses – Selection of site and planning layouts for livestock farm of different sizes in different climatic zone in India – Farms structures General principles of construction of enclosures, floor and road.
- Housing requirements of different classes of Livestock – Preparation of layouts, plans, arrangement of alleys – Fitting and facilities in the houses for horse, dairy cattle, calves, bulls, work cattle, dogs, pigs, sheep, and poultry.

- Improvement of existing buildings; water supply; feed and fodder delivery systems- Economics of Livestock housing.
- Housing – Disease control measures and sanitation of classes of livestock

### Practical

Score card for animal houses – Time and motion study in Animal houses – Preparation of plans for Animal houses, cattle sheep, pigs. And other livestock – Dogs and other pet animals- Economics of livestock housing – Predation of plan for animal house of different size and climate zone of India.

## ASC 506. PRINCIPLES OF ENVIRONMENTAL HYGIENE AND WASTE MANAGEMENT

### Theory

- Animal air hygiene: Definition – Composition of air- Air pollution – Factors affecting outdoor and indoor pollution – Assessment of these factors on animal health and production – Methods to control these factors.
- Water Hygiene: Importance of water – Impurities and inclusions and inclusions – Sterilization – Examination of water and water supplies – Collection of samples - Topographical
- Physical, chemical, bacteriological and microscopic examination of water – Hygienic requirement and standards for drinking water –Quantity of water required by domestic animals – Methods of watering.
- Manure-Quantity of manure voided by domestic animals – Animal excreta a factor in spread of disease – Hygienic and economic disposal of farm waste – Modern techniques used in automation /semi-automation in disposal of farm waste.
- Environmental protection act, (prevention and control of pollution) act and water (prevention and control of pollution) act-Bio security measures to be adapted for efficient and healthy production.
- Effect of environmental pollution on livestock and its products directly and indirectly – Controlling environmental pollution – Different factors affecting the quality of livestock and its products meant for human consumption.

ASC 507. CLIMATOLOGY AND ANIMAL PRODUCTION

1+0

### Theory

- Definition of climate –Classification of climatic regions – Climatic factors –Assessment

Of climate –Study of climatic factors in relation to animal production.

- Light, natural and artificial light – mechanism of light action – photo period and light responses Applications – Importance of light in production of animals and birds.
- Introduction of breeds in to different climatic regions –Agro meteorology and weather forecasting for Animal Husbandry activities – Micro climate modification in animal houses.
- Estimation of microclimatic conditions in Animal house –Measurement of Temperature , Relative humidity, Air Velocity and Mean temperature of the surrounding, measurement of intensity of light in animal house – Construction of climographs and hythergraphs –Estimation of cooling power of atmosphere heat tolerance test in bovines.

## ASC 508. COMMERCIAL LAYER PRODUCTION

2+1

### Theory

- Layer Industry in India and the world – Systems of layer farming –Location –Lay out of the farm – Systems of housing –Types of roof, materials, pillars, trusses for poultry house –Design of different poultry Houses for large & medium size layer farms Cages & modified cages for egg type birds – Layer farm equipments –Automation in poultry houses and its maintenance – Management of layers in different systems of rearing.
- Deep litter & cage system of management –Medication and vaccination schedules & procedure for layers – Lighting programme for egg type birds – Water quality standards, watering of layer and water sanitation –Brooder, grower, and layer management – All in All out and Multiple batch system of rearing layers.
- Management of layers during peak egg production and maintain and maintaining the persistency in production –Factors causing uneven growth and low egg production – Monitoring egg `production curve.
- Culling of unproductive birds –Record keeping- Biosecurity & health management – Management during different seasons – Induced moulting.- HACCP application for safe egg, value added egg production – Production of egg free from harmful microbes, Mycotoxins & during –Integation in layer production.

### **Practical**

Layer farm lay out and blue print – Design of different chick, grower & layer houses, their specification & blue print of deep litter and cage system –Selection & Culling of layers, debarking, dubbing, deworming, de-icing, vaccination & other farm routines and operation – Farm sanitation, disinfection & waste disposal – Maintaining farm records visit to commercial layer farms- recording keeping –calculating Hen day egg production, Hen housed and other economic traits case study of production loss, reasons and corrective measures – preparing project reports for layers under different batch systems Calculating the cost of production of eggs.

ASC 509. COMMERCIAL BROILER PRODUCTION

2+1

### **Theory**

- Broiler Industry in India and the World –Systems of rearing broilers –Location, layout and design of Broiler houses –Broiler farm equipment.
- Brooding and rearing of broilers- All in all out and multiple batch systems –Litter materials and deep litter management – Lighting for broilers – Environmentally controlled broiler houses & their management – Water quality and Watering of broiler and water sanitation – Management during different seasons.
- Mash, crumble and pellet feeding of Broilers –Weekly growth rate, feed conversion and liveability in broilers sex separate feeding broilers for optimum growth rate & feed efficiency Broiler performance indices – Broiler farm records.
- Broiler farm routine, medication and vaccination schedule – Bio –security and health management and their control – System of Integration in broiler production and marketing –transport of broilers –

Different ways of marketing of broiler – Regulations and specifications for production of export quality broilers – Organic broiler meat production.

### **Practical**

Location and blue print for a broiler farm –Broiler house design –Preparation of project report for broiler farm –Visit to broil farms – Judging of live broilers and ready to cook broiler – Broiler vaccination, medication, brooding and transportation and farm routines. Record keeping – Calculating the cost of production of broilers – Feeding of broiler at different ages –Working out Feed efficiency – Case study on low body weights, reasons and corrective measures.

ASC 510. BREEDER STOCK AND HATCHERY MANAGEMENT

2+1

### **Theory**

- History of Natural and Artificial incubation – embryo development –different breeder flocks – Planning a hatchery, breeder farm – Special care of breeder flock – Collection, selection and care of hatching egg – Breeder male and female management – Flock testing & culling – Farm and hatchery equipments – Incubation practices – Ventilation and temperature control –Hatchery Management, Fumigation and sanitation – Breeder farm and hatchery operations, routine & schedule – Factors affecting fertility and hatchability.
- Care of day old chicks and their vaccination –Restricted & controlling feeding of breeders –Sex separate feeding and nutrient supplementation. Seasonal management of breeders – Location of hatchery –Layout and design of breeder houses, hatchery & other buildings.
- Biosecurity, health management and waste disposal – Vaccination & medication schedule for breeders. Control of vertically transmissible & hatchery borne disease.
- Principles of bio security –Farm sanitation and disinfection procedures –Common bacterial diseases – Salmonella, pasteurilla, E. Coli, Fowl typhoid, CRD, Infectious Coryza, Viral diseases – Newcastle, Infectious bronchitis, infectious larynge tracheitis, Mareks, Fowl pox, Infectious Bursal disease, Egg drop syndrome -76, Avian Encephalomyelitis, Avian influenza, Duck viral Enteritis, Duck viral hepatitis – Fungal diseases—Aspergillosis, Mycotoxicosis, Metabolic disorders – Fatty liver haemorrhagic syndrome (FLHS), Gout and Ascites, Protozoan disease –Coccidiosis. Ecto and endo parasitic infestation of poultry. Diagnosis, Vaccination, Prevention, treatment and control- Locational, Structural & operational biosecurity in poultry farms water sanitation & control of water borne diseases –Quarantine of poultry. Packaging and transportation of hatching egg and chicks.
- Hatching egg & SPF egg import and export regulations –Maintaining Salmonella and Mycoplasma free breeding flock-Application of HACCP and good management practices (GMP) in hatchery management for better chick quality.

### **Practical**

Breeder farms and hatchery records, selection, fumigation, care and storage of hatching egg. Layout and prints for breeder farm and hatchery – Incubation requirements- Incubator management – Hatchery sanitation & fumigation procedures –Pedigree hatchery waste disposal and recycling – Calculating cost of production of hatching egg and day- old chicks – Attending breeder farm routines & operation – Flock testing& culling of reactors – Analyzing hatchability results and hatchery records – Economies of layer and broiler hatchery.



**Theory**

- Breeds and varieties of Turkey, Duck, Goose, Pigeon, Guinea fowl, Budgerigar, Japanese quail, Emu and Ostrich – Incubation periods & incubation procedure for different species –Housing, cage & equipments for different species –Duck, Turkey, Japanese Quail, Guinea fowl, Emu, Ostrich production and rearing under different system.
- Management and rearing of Turkey, duck, goose, Guinea fowl, Japanese quail, Pigeon, emu and ostrich – Feeding, watering and rearing systems and procedure for different species of poultry – Breeding policies of egg and meat production in different species –Preparation of project reports for different species for commercial exploitation.
- Common disease affecting poultry other than chicken and their control –Regulations for import and export of different species of poultry –Prevention of diseases through import of poultry products and live birds.

**Practical**

Layout and design of housing & cages for other species of poultry. Visit to commercial Japanese quail, turkey and duck farms. Incubation and care of hatching eggs and young one –Rearing practices followed by duck, quails and turkey farmers under field conditions. Preparing project reports for different species and calculating the cost of production.

**Theory**

- Glossary of terms used in poultry economics & Projects Measures of performance efficiency in broiler, layer, breeder and other poultry species, hatcheries and other poultry related operations –production standards and goals.
- Planning poultry enterprise –Bank norms for poultry project –Poultry insurance – Methods to improve the production efficiency and reduce the production cost-Components of projects.
- Integration in poultry production –Marketing channels for eggs and meat- integration in marketing of eggs and meat –Cost of production of egg, broiler, hatching egg, day-old chick, compounded feed – Effect of new economic policies on poultry industry viability of poultry project.

**Practical**

Preparing different poultry projects for bank finance –Calculating the cost of production of various products under various systems case study –Preparation of Balance sheet break even points, benefit: cost ratio & other farm economic indices –Preparation of feasibility & viability reports.

**Theory**

- Introduction to Animal behaviour Importance of animal behaviour studies –Patterns of behaviour – Daily and seasonal cycles of behaviour –Physiological basis of behaviour.
- Environmental modification of behaviour –developmental changes in behaviour genetic differences in behaviour- Behavioural disorders.
- Group formation –Social relationship,process of socialisation locality and behaviour practical application –Behavioural character for manage mental practices –favourable and unfavourable behaviour for domestication – Behavioural adaptations under domestication.
- Physical environment and behaviour Common vices and their remedial measures- Analysis of behaviour in relation to location –Analysis of behaviour in relation to climate environment –Analysis of social behaviour.

ASC 514. FEED CONSERVATION, STORSGE AND QUALITY CONTROL 2+1

### Theory

- Principal of feed and fodder processing and preservation techniques, their merits and demerits. Procurement, planning and purchase procedures; traditional and modern farm level storage structures. Feed storage and go down management, estimation of storage capacity and stack plan.
- Evaluation of processed and preserved feeds and forages. Role of moisture, temperature and relative humidity during storage of feedstuffs and their effect on biotic factors. Handling and storage of liquid feed ingredients. Physical and chemical changes in feeds during storage; storage losses; insect pests and rodents in fed stores and their control; Role of fungi, tolerance limits and measures to check them in stored products.
- Factors affecting the quality of feed and feedstuffs on preservation. Microbiological evaluation of processed and preserved feeds, Effect of preservation on nutritional value of feed. Properties and mode of action of pesticides and fumigants; principles of goodsanitation and hygiene of godowns.
- Proximate composition, Limitations of various systems of analysis, partitioning of forage fibre by van soest method, Quality control of fed ingredients, Specifications of feed ingredients and finished feeds, BIS standard, pesticide and insecticide residues in feeds.

### Practical

Laboratory evaluation of preserved and processed feed and forages. Physical properties of feeds and feedstuffs; identification of insect-pests and fungi in stored products; techniques for detection of hidden infestation in grains; control and inspection of stored feed materials; moisture equilibrium determination and estimation of chemical changes including alcoholic acidity, rancidity and uric acid in feeds during storage. Weaned proximate analysis, Van soest fibre fractionation, Enzymatic evaluation, prorate dedication (Feed laws), urea, FFA, peroxide value, adulterants, and heavy metal.

ASC 515. NON CONVENTIONAL FEES STUFFS AND TOXIC CONSTITUENTS/ANTIMETABOLITES IN ANIMALFEED STUFF 2+1

### Theory

- Present and future feed requirements and current availability for livestock and poultry. Use of traditional feds –By – products of agricultural, industrial, food processing unit and forest by-products. Evaluation by chemical and biological methods. Formulation of economical rations. Level of inclusion of various non conventional feeds in livestock ration.

- Classification of toxic principles in animal feedstuffs. Chemico-physical properties of various toxins. Effect of toxins on biological system and nutrients utilization in different species of livestock. Detoxification of toxin principles by various physical, chemical and biological techniques. Insecticide and pesticide residue detection.

#### Practical

Estimation of various protease inhibitors; tannins; and mycotoxins in various feeds and feedstuffs. Nitrates, HCN, oxalates, insecticide and pesticide residues, saponins, Gossypol, mimosine, heavy metals.

ASC516. ANIMAL HUSBANDRY DEVELOPMENT PROGRAMMES

1+0

#### Theory

Concept of development, social and economic development; Historical overview on Rural development in India

- Ongoing Animal Husbandry Development programming – NPCBB, PM assistance livestock development programme, rural development programmes with special reference to livestock-SGSY, EGS
- Transfer of technology (TOT) programmes of ICAR-National Demonstration, krishi Vigyan Kendra, Trainers` Training Centres, Lab to Land programme, Operational Research project, National Agricultural research project, Agricultural Technology Management Agency, National Agricultural Innovative project.
- Understanding the functioning of livestock development institutions –DRDA,NABARD, Insurance Companies, NGOs.

ASC517. INTEGRATED LIVESTOCK FARMING SYSTEM

2+1

#### Theory

- Scope and limitation of integrated farming system – Sustainability of integrated Livestock Farming Systems and their economic importance.
- Integration of fish, arable farming and different livestock enterprises vis –a-visobar gas plant, FYM, solar and wind energy utilization, cattle, buffalo sheep, goat, pig, poultry, rabbit, silk worm, bee keeping etc.
- New approach for changing farming system in present energy crises.
- Project formula and evaluation of various livestock enterprises.

#### Practical

Various livestock farming units and their economic analysis –Evaluation of different farming systems and their

Economic importance –Preparing feasibility report for various farming projects.

ASC 601. ADVANCES IN CATTLE AND BUFFALO PRODUCTION MANAGEMENT

2+0

## Theory

- Dairy farming in India –Global scenario –Present status and reasons for the same- Avenues for progress –The needs of the nation and how to achieve it.
- Advance in housing management of dairy cattle and buffaloes in various agro climatic zone of India- Management systems for cattle and buffaloes.
- Establishing Dairy Cattle enterprise –Characteristics of successful dairy farm choice of the foundation stock –Breeding Management problems associated with reproduction.
- Advances in Feeding Management of cattle and buffalo, Feed milking herd , dry cows, bulls and calves, management of high yielding animals.
- Milking Management- Biosynthesis of milk –Factors affecting the composition and yield of milk – milk ejection reflex –Milking systems Sanitary standards for the f quality milk –Cessation of milking, advances in herd management- raising calves –Growing heifers, replacements and culling – marketing, Computerization of dairy enterprises.
- Advance in health management of dairy animals, metabolic diseases of high yielders- advances in preventive measures for production related diseases

ASC 602. ADVANCES IN SHEEP AND GOAT PRODUCTION MANAGEMENT

2+1

## Theory

- Utility origin –Domestication –Numbers and distribution of meat and dual purpose breeds –Methods of rearing –Range sheep production-
- The farm flock –Pure bred flock –Management drying breeding season –The sexual seasons and its control –puberty –Time of the year to breed –Flushing –Ram –Ewe ratio.
- Advances in feeding management, Nutrient deficiencies in range forage, feed to supplement range forage, General feeding practices, Feeding materials ,Lamb feeding, Use of antibiotics and hormones, Hand feeding, Self feeding, Pellet feeding, feeding lambs and ewes during lactation.
- Recent development in sheep and goat management and their relevance under Indian economic conditions, needs and possibilities for future research.
- Role of sheep husbandry in dry farming in India,
- Present development programmes in sheep and goat production, Advances in reproduction, housing, feeding and watering, diseases, shearing methods and culling of sheep and goat
- Role of goat in animal agriculture, Goat farming in India, selection of Breeding, stock, Breeding problems, Housing, principles of feeding, practices, Crops and crop residues for goats, Milking practices.

## Practical

Study of population trend and structure – Visit to sheep and goat farms and critical analysis of various farm practices, Analysis of breeding, feeding, housing – Disease control management, management of young ones and maturing systems Estimation of fibre diameter modulation percentage crimps, tensile strength, Grease, pH and moisture content of wool – Score card and grading of wool.

ASC 603. ADVANCES IN PIG PRODUCTION MANAGEMENT

2+1

## Theory

- The past, present and future of swine production system in India and production policies adopted in advanced countries.
- Advances in breeding and selection –Prenatal and postnatal development –Growth reproduction and lactation –Economic traits of swine production.
- Advances in feeding and nutrition in pigs; automatic feeding and watering techniques, Feed stuff, Energy, Protein, minerals and vitamin sources, metabolic and nutritional disorders –Toxic substances.
- Advances in housing of pigs, environmental physiology –Infectious diseases and parasitism. Reduction in new piglet mortality.

#### Practical

Marketing –Study of population trend and structure .Analysis of breeding, feeding, housing, health care, farrowing management summer management and special management principles practiced.

#### ASC 604.ADVANCES IN RABBIT PRODUCTION MANAGEMENT

2+1

#### Theory

- Planning, organization, executive and management of poultry farms and hatcheries of various sizes – alternative in poultry production.
- Demand, supply, present status of poultry production.
- Problems and new management techniques in poultry for egg and meat in India vis-a vis in other countries of the world, automation in poultry houses, management of specific pathogen free flock.
- Poultry development policies and planning for higher production constraints in development and solutions, Ethology and entology in relation to poultry production.

#### Practical

Planning and preparation of research and commercial projects on broiler and layer production management

#### ASc605. ADVANCES IN POULTRY PRODUCTION MANAGEMENT

2+1

#### Theory

- Planning, organization, executive and management of poultry farms and hatcheries of various sizes- alternative in poultry production.
- Demand, supply, present status of poultry production.
- Problems and new management techniques in poultry egg and meat in India vis-a vis in other countries of the world, automation in poultry houses, management of specific pathogen free flocks.
- Poultry development policies and planning for higher production constraints in development and solutions, Ethology and entology in relation to poultry production.

#### Practical

Planning and preparation of research and commercial projects on broiler and layer production management.

#### ASC 606. MODERN CONCEPTS OF FEEDING RUMINANTS AND FORAGE UTILIZATION

## Theory

- Development in ruminant digestive physiology –Energy protein requirement and measurement- Requirements of other nutrients. Importance of energy and protein quantity and quality feed input and milk output relationship.
- Concept of limiting amino acid for high yielders. Strategic feeding of high yielding dairy cows and meat producing ruminant Concept of phase feeding. Bypass Nutrient technology. Feeding during stress. Nutrition –immunity interaction. Designer milk and meat. Rumen manipulation to reduce methanogenesis. Nitrogen oxide emission and heavy metal residues. Metabolic profile tests.
- Use of conserved forages in ruminant feeding. Chemical Composition of common and newer forage – Factors affecting nutritive value of commonly available grasses, pastures, silage, hay and crop residues, voluntary intake of fodder at different stages of growth. Newer methods of forage evaluation- calculated in vitro ME and DMD by using prediction equations. Merits and demerits of using leaf protein. Top feeds and their effective utilization – pasture consumption and evaluation studies.

ASC 607. MODERN CONCEPTS OF FEEDING NONRUMINANT ANIMALS

2+0

## Theory

- Nutritional factors affecting egg quality and hatchability in poultry. Feeding for designer eggs. Role of essential fatty acid, amino acids imbalance, toxicity and interactions in monogastrics
- Developments in digestive physiology of swine –equines –Measurement of protein and energy requirements –Influence of processing of feeds and fodders in mono-gastric animal nutrition.
- Modern concepts of amino acid nutrition at various physiological status–Role of vitamins and minerals in health and disease. Advances in new generation feeds and feed additives.

ASC 608. NEW FEED RESOURCES AND TOXICANTS ANTS IN ANIMAL FEEDING

2+0

## Theory

- Demand and availability of feed –formulation of database in computer – strategy in food animal production – agricultural by products –Agro industrial by-products, farm waste, crop residues, organic wastes of animal origin. Slaughter house waste, industrial waste and their feeding value in animals.
- Processing to enhance feed utilization and availability. Possible health hazards due to waste utilization – chemical and nutritional changes in waste product due to processing. Quality standard and their acceptance.
- Naturally occurring toxicants –Toxicants of plants and non-microbial origin. Naturally occurring alkaloids, mycotoxins and their toxicity –Acquired toxicants, pesticides, weedicides and heavy metals.
- Effect of toxins on rumen fermentation and nutrient utilization .methods of detoxification. Food and feed contaminants- their impact on animal performance

ASC 609. MODERN CONCEPTS IN COMMERCIAL POULTRY PRODUCTION

2+1

## Theory

- Global trends in poultry production –Advances in broiler production in India- concepts in egg production – Latest concepts in hatchery operations for higher hatchability & chick quality.
- Optimal microclimatic condition in poultry houses and cages for higher production-Management of poultry in environmentally controlled houses –Management of poultry
- Under adverse climatic conditions advances in the management of other species of poultry- Behaviour patterns of poultry in different growing systems.
- Advanced management techniques for egg and meat production – advances in lighting management, feeding management, litter management and manure management.
- The role of integration in poultry production –Factors influencing egg production in different species of poultry –Factors influencing growth rate and egg production Automation in poultry production.
- Regulations for cage free egg production and organic chicken production –Functional feed for functional foods –Production of HACCP and GMP certified table egg, meat, chicks, hatching egg and other value added products for export.

#### Practical

Performance study in commercial layer, broiler, Japanese quail, duck, turkey and other species of poultry farms by Interpretation of the farm records –Managerial routines of different species of poultry- calculating the cost of production –Estimation of microclimatic condition and comparing the productive traits –Modern poultry house and cage design for optimal efficiency and cost reduction.

ASC 610. POULTRY ECONOMICS, MARKETING AND INTEGRATION

2+1

#### Theory

- Present practices and future trends in production of egg and meat- consumption- demand and supply seasonal variations in production and consumption. Marketing channels –procedures of marketing for eggs and meat –Market intelligence – Advertising and branding of poultry products – Wholesaling and retailing and retailing quality of egg and meat.
- Various poultry enterprises – choice size of business- input and output analysis –calculating cost of various inputs – calculating cost of production. Price determination –Least demand and supply indices of performance – performance targets and achievements marketing and business management-market managerial skills and human resource development-0cost and financial management.
- Future trends in broiler and egg production –Factors influencing the profit margin in poultry enterprises.

#### Practical

Study of marketing channels of egg and meat, calculating cost of production of eggs, meat, day old chick, feed and processing plants-processing plant –preparing other related poultry project.

ASC-691.SEMINAR-I

1+0

ASC-629.SEMINAR-II

1+0

ASC-693. SEMINAR-III

1+0

Ph. D THESIS

(45 NON-CREDIT COURSE)

ASC-601 and ASC-602 are core courses to be taken by all Ph. D students of the Department.