Restructured Lecture Schedule of courses for M.V.Sc in Poultry Science

Maharashtra Animal and Fishery Sciences University, Nagpur

Course Title: Poultry Breeding and Genetics (Theory Classes-32)	
Course No: PSC -601	**Credits :2+1=03**
Sr. No.	Topic to be covered in the lectures
1.	Genetic classification of Poultry – origin and breed characteristics of poultry
2.	Mendel's laws of inheritance related to poultry: Law of Dominance and Recessive, Law of Segregation (Purity of Gametes), Law of Independent Assortment
3.	Qualitative and Quantitative traits in Poultry breeding
4.	Gene action/ gene interaction: Additive gene action, Non-additive gene action: Intra allelic interaction (complete dominance, incomplete dominance, co-dominance and overdominance)
5.	Non-additive gene action: Inter allelic interaction/epistasis (Recessive epistasis, Dominance epistasis, Dominant-recessive epistasis, duplicate recessive epistasis, duplicate dominant epistasis & duplicate gene with interaction)
6.	Lethals and mutations in poultry
7.	Sex-linked, Sex limited and Sex influenced traits
8.	Economic traits: Economics traits of layers, broilers and breeders
9.	Partitioning of variance- component of variance, Phenotypic variance, Genotypic variance (additive dominance and epistatic) and Environmental variance
10.	Heritability- definition, narrow and broad sense heritability, salient features/ characteristics of heritability, uses of heritability, methods of estimation of heritability
11.	Quantitative inheritance
12.	Phenotype, Genotype and environment interactions
13.	Systems of Breeding: Inbreeding- close inbreeding, line inbreeding, starin formation, genetic effect of inbreeding and uses of inbreeding.
14.	Systems of Breeding: Outbreeding- cross breeding, out crossing, top crossing, line crossing, Srain crossing, grading up and species hybridization
15.	Systems of Mating: Natural and artificial Natural mating- Pen mating, Flock mating, Stud mating Artificial -Artificial insemination
16.	Selection methods: Tandem, independent culling, selection index/ total score

17.	Selection methods: Osborne index, recurrent selection, reciprocal recurrent selection
18.	Selection criteria/ basis: individual selection, selection based on pedigree, selection based on collateral relatives, progeny testing
19.	Response to selection, intensity of selection and selection differential
20.	Breeding programme for developing egg-type, meat type and rural poultry strains
21.	Breeding and management of other species of Poultry
22.	Formation and Management of inbred pure lines, grandparent and parent stock
23.	Industrial poultry breeding
24.	Artificial insemination in chicken
25.	Autosexing: Barring and Non-barring, Silver plumage and Golden plumage, Slow feathering and fast feathering, Sex-linked dwarfism
26.	Random Sample Test
27.	Use of molecular genetics in poultry breeding- markers (Restricted Fragment Length Polymorphism)
28.	Quantitative Trait Loci (QTL)
29.	Marker-assisted selection (MAS)
30.	Conservation of poultry genetic resources
31.	Random Bred Control Population
32.	Recent advances in layer and broiler breeding

Course Title: Poultry Breeding and Genetics (Practical Classes-16)	
Course No: PSC -601	Credits :2+1=03
Sr. No.	Topics to be covered in the practical's
1.	Breeds of chicken
2.	Breeds of duck, turkey and quail
3.	Commercial strains of layers and broilers
4.	Estimation of qualitative and quantitative traits in poultry
5.	Exercises on individual and family selection
6.	Constructing multi-traits selection index
7.	Constructing Osborne index
8.	Estimating heritability
9.	Breeding program for developing commercial hybrid layers
10.	Breeding program for developing commercial broilers and Japanese quail
11.	Breeding programmes for rural poultry

12.	Semen collection, evaluation, Semen dilution and insemination in chicken and turkey
13.	Breeding records
14.	Use of computers to maintain breeding records and for selection
15.	Estimation of effective population size, rate of inbreeding, response to selection and genetic and phenotypic responses
16.	Pedigree hatching

Title: Poultry Nutrition and Feeding (Theory Classes-34)	
Course No: PSC -602	**Credits :2+1=03**
Sr. No.	**Topic to be covered**
1.	Digestive system and digestion of nutrients in poultry
2.	Metabolism and absorption of nutrients in poultry- Carbohydrates and fats
3.	Metabolism and absorption of nutrients in poultry- Proteins, Vitamins and Minerals
4.	Factors influencing feed consumption in birds
5.	Macro and micro nutrients
6.	Proteins and amino acids
7.	Nutrient requirements of various species of poultry
8.	Factors influencing nutrient requirements
9.	Partitioning of energy, Calorie: protein ratio
10.	Nutrient interrelationships
11.	Feed ingredients composition
12.	Feed storage techniques
13.	Milling and quality control
14.	Processing of feed
15.	Types and forms of feeds, feeding methods
16.	Commonly occurring anti-nutrients and toxicants in poultry feed ingredients
17.	Mycotoxins and their prevention
18.	Feeding chicks, growers, layers, broilers and breeders
19.	Principals of computing feed, balanced feed
20.	Least cost feed formulations and programming
21.	Feeding in different seasons and stress conditions
22.	Nutritional and metabolic disorders in poultry
23.	Systems of feeding- restricted, forced, controlled and phase feeding
24.	Use of additives and non-additives- enzymes, probiotics, probiotics
25.	Use of additives and non-additives- antibiotics, herbs and other performance enhancers
26.	Feeding of ducks
27.	Feeding of turkeys
28.	Feeding of Japanese quails ., Feeding of Guinea fowls
29.	Organic feed production ., Functional and designer feed production
30.	SPF feed production
31.	Production of feeds free from drug residue, pesticide residue and

	toxins
32.	Regulations for import and export of feed and feed supplements
Title: Poultry Nutrition and Feeding (Practical Classes-17)	
Course No: PSC -602	**Credits :2+1=03**
Sr. No.	**Topics to be covered in the practical's**
1.	**Physical and sensory evaluation of feed ingredients**
2.	Sampling techniques for ingredients and compounded feed
3.	Estimation of moisture
4.	Estimation of crude protein
5.	Estimation of crude fiber
6.	Estimation of ether extract
7.	Estimation of total ash and acid insoluble ash
8.	Estimation of nitrogen free extract
9.	Computing various feed formulae based on commonly available feed ingredients
10.	Computer applications in feed formulations
11.	Estimation of Aflatoxins
12.	Estimation of calcium and phosphorus
13.	Estimation of sand, silica and salt
14.	Mash, pellet and crumble feed preparation
15.	Feeding procedures
16.	Visit to feed mill
17.	Hands on training in feed analytical laboratory

Lecture Schedule

Course title- Commercial broiler and layer Management (Theory Classes-32)	
Course No Psc-603;	**Credits 2+1=3**
Sr. No.	**Topics to be covered in the lectures**
1.	Development of poultry industry in India & the world history, growth and present scenario, future prospects & constraints, word ranking, employment generation.
2	Location and layout of farms, systems of housing, cages, deep litter, slatted floor, environmental controlled housing system. Types of roof & roofing materials etc.
3	Poultry farm equipments for layers and broilers. Automisation in poultry houses and its maintainance.
4	Environmentally controlled housing system and their management
5	Rearing systems for broilers and layers, all in all out, multiple batch system, deep litter and cage system and its management
6	Brooding management, litter management and litter materials

7	Lighting programme for egg type birds and their importance. Thermoreceptors and their role
8	Water quality standards, Water sanitation
9	Biosecurity and health management – locational, structural, operational biosecurity. Application of biosecurity measures.
10	Production indices for broilers and layers
11	Integration in broilers and layer production
12	Cages and modified cages for egg type birds
13	Feeding management in layers
14	Medication, vaccination schedules, procedures for layers
15	Brooder and grower management
16	Pre-layer, layer, cockerel management
17	Management of layers during peak egg production, maintaining the persistency in egg production. Clutch size, pause.
18	Strategies to prolong the egg production beyond 72 weeks of age
19	Factors causing uneven growth and low egg production
20	Monitoring egg productive curve and culling of unproductive birds
21	Record keeping in layer production
22	Management of layers during different season
23	Molting. Methods of molting. Advantages and disadvantages
24	Management of broilers during different seasons
25	Mash, crumble and pellet feeding in broilers
26	Weekly growth rate, feed conversion and livability in broilers
27	Separate sex feeding
28	Feeding broilers for optimum growth rate and feed efficiency
29	Broiler farm record keeping
30	Broiler farm routine medication and vaccination schedule
31	Transport of broilers and marketing
32	Regulations and specifications for the production of export quality broilers

Course title- Commercial broiler and layer Management (Practical classes-16)	
Course No Psc-603	**Credits 2+1=3**
Practical No.	Topics to be covered in practical
1	Layer farm layout- Design of different chick, grower and layer houses, their specifications.
2	Selection and culling of layers.
3	Debeaking, dubbing, deworming, delicing, vaccination and other farm routines and operations.
4	Farm sanitation, disinfection and waste disposal.
5	Record keeping
6	Visit to commercial layer farms including environmental controlled houses.
7	Calculating Hen day egg production, Hen housed egg production and economic traits of poultry.
8	Calculating the cost of production of eggs and meat and economics.
9	Location and layout for a broiler farm – Broiler house design.
10	Visit to commercial broiler farms including environmental controlled houses.
11	Broiler brooding management.
12	Medication, vaccination and transportation of broilers and layers.
13	Farm routines for poultry.
14	Calculating the cost of production of broilers.
15	Feeding of broilers at different ages.
16	Working out feed efficiency.

Course Title: Breeder Stock and Hatchery Management (Theory classes -32)	
Course Code: PSC 604 Credit Hours: 2+1	
Lecture No.	**Topics to be covered in the Lecture**
1.	Different types of commercial breeder flocks, Special care of breeder chicks
2.	Special care ofBreeder male and female management
3.	Feeding the breeder flocks: Separate sexfeeding, feed restriction in broiler breeders
4.	Management for improving fertility and hatchability
5.	Management of parent farms
6.	Management of grandparent farms
7.	Management ofpure lines
8.	Artificial Insemination
9.	Care and management of Hatching eggs
10.	Vaccination of layer and broiler parents
11.	Nutrient supplementation – Seasonalmanagement of breeders
12.	Lighting management in breeder farms
13.	Flock testingand culling.
14.	Natural and Artificial incubation
15.	Stages of embryonic development
16.	Incubation principles
17.	Location of hatchery, Layout and design of hatchery, hatchery equipment
18.	Hatchery management - Ventilation and temperature control
19.	Preincubation storage, Fumigation and sanitation
20.	Hatchery operations, routine and schedule – Egg candling -Packaging and transportation of hatching eggs and chicks, hatchery troubleshooting
21.	Factors affecting fertility and hatchability
22.	Biosecurity and hatchery waste disposal-
23.	Control of vertically transmissible and hatcheryborne diseases
24.	Special incubator management during hot summer
25.	Hatchanalysis.
26.	SPF egg production
27.	Import and export regulations
28.	Maintaining Salmonella free breeding flock
29.	Maintaining Mycoplasma free breeding flock
30.	Application of HACCP and Good Management Practices (GMP) in hatchery management for better chick quality
31.	Application of HACCP and Good Management Practices (GMP) in hatchery management for better chick quality
32.	Application of HACCP and Good Management Practices (GMP) in hatchery management for better chick quality

Course Title: Breeder Stock and Hatchery Management (Practical -16)	
Course Code: PSC 604 Credit Hours: 2+1	
Practical No.	**Topics to be covered**
1.	Layout and blueprints for breeder farm and hatchery
2.	Incubator management
3.	Candling
4.	Hatchery sanitation, fumigation procedures and hatchery hygiene
5.	Pedigree hatching
6.	Hatchery waste disposal and recycling
7.	Calculating the costof production of hatching eggs and day-old-chicks
8.	Management of bangers
9.	Attending breeder farm routines and operation
10.	Flock testing and culling of reactors
11.	Analysing hatchability results
12.	Use of computers in hatchery operations
13.	Economics of setting up of layer and broiler hatchery
14.	Vaccinating day-old chicks
15.	Concept of *in-ovo* vaccination
16.	Visit to commercial breeder farm and hatchery

Course Title: Poultry Health and Biosecurity **Theory: 32 lectures**	
Course Code: PSC 605. Credit Hours: 2+1	
Sr. No.	**Title of lecture**
1	*Salmonella,*
2	*Pasteurella,*
3	*E.coli,*
4	Fowl typhoid,
5	Mycoplasma,
6	Infectious *Coryza*,
7	*Gallibacterium, Clostridium*
8	Newcastle Disease
9	Infectious bronchitis
10	Infectious laryngeotracheitis
11	Marek's Disease
12	Fowl pox
13	Infectious Bursal disease
14	Egg drop syndrome-76
15	Avian Encephalomyelitis
16	Avian influenza
17	Duck viral hepatitis
18	Chicken Infectious Anaemia, etc.
19	Aspergillosis
20	Mycotoxicosis
21	Fatty liver haemorrhagic syndrome(FLHS)
22	Gout
23	Ascites
24	leg weakness
25	Coccidiosis
26	Ecto- and endo-parasitic infestation of poultry, etc.
27	Diagnosis of various poultry diseases.
28	Vaccination
29	Control, Prevention and Treatment of various poultry diseases.
30	Principles of biosecurity Locational, structural and operational biosecurity in Poultry farms
31	Water sanitation and control of water-borne diseases
32	Quarantine of poultry, Farm sanitation and disinfection procedures.

Course Title: Poultry Health and Biosecurity **Practical: 16 lectures**	
Course Code: PSC 605. Credit Hours: 2+1	
Sr. No.	**Title of lecture**
1	Ante-mortem examination of birds
2	Post-mortem examination of birds
3	Sample collection
4	Despatch of samples
5	Processing of samples
6	Detection of pathogens/ viral agents
7	Detection of pathogens/ bacteriological, mycological and parasitological agents
8	Different sanitizers available and their uses.
9	Different disinfectants available and their uses.
10	Care and contraindication of using different products.
11	Personal hygiene and isolation
12	Different vaccines
13	Routes of administration of vaccines
14	Methods of medication
15	Water quality analysis
16	Field visit to poultry diagnostic lab.

Course Title: Management of Other Avian Species

Theory classes -48

Course Code: PSC- 606 Credit Hours: 3+1

Lecture No:	Topics to be covered in the lectures
1	Importance of Turkey, Duck, Goose, Guinea fowl, Japanese quail, Emu and Ostrich
2	Breeds and varieties of Duck, Goose,
3	Breeds and varieties of Guinea fowl, and Japanese quail,
4	Breeds and varieties of Emu and Ostrich
5	Incubation periods and incubation procedure for different species –
6	Fumigation and sanitation of Hatchery
7	Bio-security and its importance in rearing of other poultry birds
8	Factors affecting fertility and hatchability
9	Production standards - for other poultry birds
10	Different Systems of rearing for other poultry birds
11	Equipments for other poultry birds under different rearing systems
12	Rearing systems of Turkey
13	Rearing systems of Duck, Goose,
14	Rearing systems of Guinea fowl,
15	Rearing systems of Guinea fowl, and Japanese quail,
16	Rearing systems of Emu
17	Rearing systems of Ostrich
18	Management and rearing of Turkey,
19	Management and rearing of duck and gees
20	Management and rearing of Guinea fowl
21	Management and rearing of Japanese quail
22	Management and rearing of emu
23	Management and rearing of ostrich
24	Feeding standards of turkey and there feeding and watering managements
25	Feeding standards of duck and gees and there feeding and watering managements
26	Feeding standards of Guinea fowl and there feeding and watering managements
27	Feeding standards of Japanese quail and there feeding and watering managements
28	Feeding standards of Emu and there feeding and watering managements
29	Feeding standards of ostrich and there feeding and watering managements
30	Breeding programmes for egg production in different species.
31	Breeding programmes meat production in different species.
32	Commercial rearing of turkey, J.quail, Guinea Fowl and geese
31	Importance and prospective of pet bird rearing in India
32	Management and rearing of Pigeon
33	Management and rearing budgerigar
34	Management and rearing of parakeets
35	Management and rearing of love birds
36	Management and rearing macaws
37	Management and rearing doves
38	Management and rearing of parrots

39	Housing for pet birds, their habitat, feeding and breeding under captivity.
40	Common diseases affecting pet birds and their control –
41	Breeding of exotic birds in captivity and rearing their young ones
42	Conservation of rare species
43	Utilities of these birds and products processing
44	Marketing of various species of birds
45	Regulations for import and export of different species of poultry
46	Common bacterial diseases affecting other avian species and their control
47	Common viral diseases affecting other avian species and their control
48	Common parasitic diseases affecting other avian species and their control
49	Regulations for import and export of different species of poultry
	Exotic diseases of alternate poultry birds
50	Preventive measures for exotic diseases through the import of live birds.
51	Project report for farm set up for different species
52	Concept and definition of organic poultry
53	Present status of organic Poultry farming in India
54	Challenges in adapting the organic poultry farming
55	Certification and guidelines for organic poultry production –.
56	Government policies on organic poultry farming

Course Title: Management of Other Avian Species **Practical classes -17**	
Course Code: PSC 606 Credit Hours: 3+1	
Practical No	**Topics to be covered in the practical's**
1	Layout and design of housing and cages for other avian species
2	Management and rearing of quails
3	Management and rearing of turkeys
4	Management and rearing of ducks and
5	Management and rearing of geese
6	Management and rearing of budgerigar
7	Management and rearing of guinea fowls
8	Management and rearing of pigeon
9	Management and rearing of Emus
10	Management and rearing of Ostrich
11	Designing of Aviary
12	Equipments required for different types of bird
13	Incubation and are of hatching eggs and young ones of different species of birds
14	Sexing of pet birds
15	Preparation of project reports different species of birds
16	Work out of cost of production of eggs and chicks
17	Visit to commercial Japanese quail, Turkey and duck farms and rearing practices followed under field conditions

Title: Poultry Products Technology **Theory Classes -32**	
Course No: PSC -607 Credits: 2+1=3	
Sr. No.	**Topics to be covered**
1.	Physical and chemical composition of egg
2.	Nutritive value of egg
3.	Effect of different cooking methods on nutritive value of egg
4.	Physical and chemical composition of poultry meat ; Nutritive value of meat
5.	Effect of different cooking methods on nutritive value of poultry meat
6.	Grading of eggs and poultry meat by different standards
7.	Egg quality deterioration
8.	Factor affecting egg quality
9.	Handling, packaging, transport of whole eggs
10.	Packaging materials for eggs
11.	Marketing of eggs
12.	Factors affecting meat yield
13.	Handling, packaging and marketing of poultry meat
14.	Quality control of poultry meat
15.	Preservation of egg
16.	Preservation of poultry meat
17.	Functional and value added egg products
18.	Functional and value added poultry meat products
19.	Further processing of eggs
20.	Further processing of poultry meat
21.	Various egg and poultry meat fast foods
22.	Sanitary and phytosanitary measures to ensure food safety
23.	Pre and post oviposition value addition to eggs
24.	Post processing value addition to poultry meat for export
25.	Microbial safety of poultry products
26.	Import and export of poultry products
27.	Further processing of poultry for export
28.	Implementation of GMP and HACCP procedures for food safety
29.	Codex regulations for poultry products safety
30.	Traceability and branding of poultry products
31.	FSSAI regulations for egg and poultry meat and their products
32.	Myths about egg and poultry meat products

Title: Poultry Products Technology Practicals: -16	
Course No: PSC -607 Credits: 2+1=3	
Sr. No.	**Topics to be covered**
1.	Measuring external egg quality
2.	Measuring internal egg quality
3.	Measurement of poultry meat quality
4.	Preservation of table eggs
5.	Grading of eggs
6.	Processing of chicken (Dressing)
7.	Grading of poultry meat
8.	Further processing of poultry meat
9.	Preservation of poultry meat
10.	Preparation of various egg products
11.	Preparation of various poultry meat products
12.	Preparation of egg and poultry meat fast foods
13.	Preservation, packaging and transport of egg and poultry meat products
14.	Quality control of value added poultry products
15.	Measures of microbial safety of poultry products for export
16.	Visit to poultry processing plant

Course Title: Poultry Economics, Project Formulation and Marketing	
Course Code: PSC 608 **Credit Hours**: 2+1	
Unit No	**Title of Lecture**
1.	Glossary of terms used in poultry economics and projects
2.	Measures of performance efficiency in the broiler, layer and breeder
3.	Measures of performance efficiency in other poultry species
4.	Measures of performance efficiency in hatcheries and other poultry-related operations
5.	Production standards and goals for layers and broiler
6.	Production standards and goals for breeders
7.	Future trends in broiler production
8.	Future trends in egg production
9.	Marketing channels
10.	Present trends in consumption
11.	Various poultry enterprises ., Planning poultry enterprise
12.	Minimum viable units
13.	Bank norms for poultry projects., Poultry insurance
14.	Methods to improve the production efficiency
15.	Methods to reduce the production cost
16.	Components of project reports
17.	Technical aspects of project report
18.	Financial Aspects of Project report
19.	Preparing projects and return on investment
20.	Contract broiler farming
21.	Role of NECC in egg marketing
22.	Role of BroMark and other marketing agencies
23.	Market managerial skills and Human resource development
24.	Integration in Poultry production and marketing
25.	Marketing channels for eggs and meat
26.	Calculating the cost of production of egg
27.	Calculating the cost of production of broiler
28.	Calculating the cost of production of day-old chick
29.	Calculating the cost of production of feed
30.	New regulations on cage rearing of layers.
31.	Traceability and branding of poultry products.
32.	Export norms for poultry products.
33.	
34.	

Course Title: Poultry Economics, Project Formulation and Marketing **Practicals-17**	
Course Code: PSC 608 **Credit Hours**: 2+1	
Practical No	**Title of Practical**
Practical 1	Preparation of Balance sheet, break-even points, Cost: Benefit ratio
Practical2	Farm economic indices
Practical3	Calculating the cost of production of egg

Practical4	Calculating the cost of production of broiler
Practical5	Calculating the cost of production of day-old chick
Practical6	Calculating the cost of production of feed
Practical7	Technical aspects of project report
Practical8	Financial Aspects of Project report
Practical9	Techno economic parameters of commercial broilers
Practical10	Techno economic parameters of commercial layers
Practical 11	Techno economic parameters of breeders
Practical 12	Project report for broilers
Practical 13	Project report for layers
Practical 14	Project report for quails
Practical 15	Contract broiler farming
Practical 16	Bank norms for poultry projects
Practical 17	Preparation of feasibility and viability reports

Course Title : Physiology of Poultry Production **Theory-16**	
Course Code : PSC 609 Credit Hours: 1+1	
Sr.No.	Topics to be covered
1.	Study of skeletal system of poultry
2.	Comb pattern and plumage
3.	Study of physiology of poultry digestive system- Digestion, metabolism and absorption of feed and water
4.	Role of enzymes
5.	Study of circulatory system
6.	Study of respiratory system
7.	Physiology of growth
8.	Study of poultry Nervous system and its function
9.	Study of Excretory system
10.	Study of Male reproductive system - Semen production-semen characteristics- Semen extenders
11.	Study of female reproductive system- Ovulation and Oviposition – Clutch and Pause
12.	Egg formation- Egg laying pattern-photo periodic responses
13.	Role of endocrine glands and their functions
14.	Neuro-endocrine control of egg production
15.	Thermoregulatory mechanism - Stress due to adverse environmental factors
16.	Acid-base balance in poultry

Course Title : Physiology of Poultry Production **Practical-16**	
Course Code : PSC 609 Credit Hours: 1+1	
VII.	**Practical**
1.	Demonstration on skeletal system of poultry
2.	Demonstration on Comb pattern and plumage
3.	Demonstration on poultry digestive system
4.	Demonstration on poultry excretory system
5.	Demonstration on poultry circulatory system
6.	Demonstration on respiratory system
7.	Demonstration on male reproductive system
8.	Demonstration on female reproductive system
9.	Structure of feather, types of feather and parts of feather
10.	Identification of endocrine glands
11.	Demonstration of hormones estimation in poultry production and reproduction
12.	Haematology of poultry species
13.	Serum evaluation -SGOT, SGPT, free fatty acids
14.	Morphology of Poultry spermatozoa
15.	Demonstration of artificial insemination in poultry
16.	Effect of light on performance of birds

Course Title : Commercial Poultry Nutrition (Theory Casses-16)	
Course Code: PSC- 610 Credit Hours: 1+1	
Sr.No.	**Topics to be covered in the lecture**
1	Breed specific nutrient requirements- strain specific nutrient requirement in broilers
2	Breed specific nutrient requirements- strain specific nutrient requirement in layers
3	Breed specific nutrient requirements- strain specific nutrient requirement in Breeders
4	Factors influencing the digestibility of nutrients Reasons to assist the birds for digestion
5	Gut health management
6	Commercial use of feed ingredients by the industry – their drawbacks
7	Use of different feed additives and supplements: Enzymes, prebiotics, probiotics, postbiotics,
8	phytobiotics
9	Use of nucleotides, acidifiers, emulsifiers, and essential oils, etc in poultry diets.
10	Trace minerals: organic and inorganic
11	Nanoparticles
12	Pre-digested proteins
13	Unconventional feed ingredients: Merits and demerits Measures to counteract the demerits responsible use of them for reducing the cost of production
14	Least cost feed formulation
15	Phase feeding for broilers and layers
16	Juvenile nutrition

Course Title : Commercial Poultry Nutrition (Practical Casses-16)	
Course Code: PSC- 610 Credit Hours: 1+1	
Practical No.	**Topics to be covered in the practical's**
1	Estimation of Moisture with NIRS
2	Estimation of Crude Protein with NIRS
3	Estimation of Crude fiber with NIR
4	Estimation of ether extract with NIR
5	Estimation Nitrogen free extract with NIR
6	Estimation of Calcium with NIRS
7	Estimation of phosphorus with NIRS
8	Estimation of amino acid with HPLC
9	Estimation of aflatoxicosis with HPLC
10	Force feeding in poultry
11	Challenge feeding in poultry
12	Factors preventing the birds from optimum feeding- Particle size, feed milling technologies
13	Seasonal variations in feeding practices
14	In-ovo feeding
15	visit to commercial poultry nutrition lab
16	visit to feed mill

Course Title: Poultry Welfare and Waste Management Theory Classes-32	
Course Code : PSC-611 ., Credit hours: 2+0=2	
S. N.	**Topic to covered in the class**
1.	Poultry Welfare – Concept and definition, factors involved in poultry welfare, hatchery, commercial poultry and at slaughterhouses including transport
2.	Different freedoms to the birds
3.	Behavior of birds for understanding welfare
4.	Commercial poultry production and welfare challenges
5.	Housing systems in relation to the welfare
6.	Poultry Welfare and comparison with productivity
7.	Feed restriction – Qualitative and Quantitative
8.	Debeaking and toe trimming– Cannibalism and its effects, managing birds with intact beaks
9.	Welfare cages – Community cages, Aviaries, Enhanced cages, etc.
10.	Assessing welfare of layers
11.	Assessing welfare of broilers
12.	Welfare at hatchery and slaughterhouses
13.	Economics of application of use welfare measures
14.	Welfare in relation to country's requirement
15.	Waste generated from poultry farms
16.	Waste generated from poultry hatcheries
17.	Waste generated from poultry slaughterhouses
18.	Hazards of waste for humans and environment
19.	Spread of diseases to humans, animals and poultry
20.	Fly problems and control measures
21.	Rodent problems and control measures
22.	Leaching of toxic substances in groundwater
23.	Emission of gases – various stages of poultry production
24.	Dust and smell problem due to poultry
25.	Methods of disposal of carcasses – burial, burning, incineration, etc.
26.	Mitigating hazardous effects of waste, waste as resource
27.	Composting of manure and dead birds
28.	Generation of biogas, usage of slurry
29.	Rendering plant products for feeding other species
30.	Wastewater recycling – effluents from washing sheds, slaughterhouse wastewater, etc.
31.	Utilization of slaughterhouse waste - poultry byproduct meal., Methods of recycling feathers
32.	Biodiesel from dead birds and Preparation of bio-fuel pellets