

**DIPLOMA IN POULTRY NUTRITION AND
FEED MILLING TECHNOLOGY**

Curriculum & Scheme of Examination

Academic Year 2016-2017 onwards

BHARATHIAR UNIVERSITY
COIMBATORE-641 046

CENTRE FOR COLLABORATION OF INDUSTRY AND INSTITUTION (CCII)
DIPLOMA IN POULTRY NUTRITION AND FEED MILLING TECHNOLOGY
(For the CCII candidates admitted from the Academic Year 2016-2017 onwards)

Sl. No.	Name of the Course	Total Marks
SEMESTER I		
1	Basics of Poultry Nutrition	100
2	Feeds and Feeding of Poultry	100
3	Feed preparations and formulations	100
4	Nutritional deficiency diseases	100
5	Feed Additives	100
6	Practical – I	100
SEMESTER II		
7	Layout and designing of Feed Mill	100
8	Feed manufacturing technology	100
9	Feed milling equipment	100
10	Quality control-National and International regulations	100
11	Biosecurity in feed mills	100
12	Practical – II	100
13	In-Plant Training (3 months in Industry)	100
TOTAL		1300

SEMESTER - I

1 – BASICS OF POULTRY NUTRITION

Total Marks: 100

Total Hours: 75

Objective:

To make the students to understand about the basic concepts of poultry nutrition.

UNIT-I

(15 HRS)

Introduction – Poultry nutrients – Water, Carbohydrate, Proteins, vitamins, minerals and lipids. Water – chemical structure, water requirements.

UNIT-II

(15 HRS)

Carbohydrate – definition, classification, sources of carbohydrates and nutritional requirements of different ages of poultry.

UNIT-III

(15 HRS)

Lipids - definition, classification, sources of lipids and nutritional requirements of different ages of poultry.

UNIT-IV

(15 HRS)

Protein - definition, classification, sources of protein and nutritional requirements of different ages of poultry.

UNIT-V

(15 HRS)

Vitamins and minerals - definition, classification, sources and nutritional requirements of different ages of poultry. Digestion, absorption and utilization of nutrients.

Textbook

1. Mahajan Naresh, 2015. Poultry Nutrition and Management. 1st Edition. Anmol Publications Pvt. Ltd., New Delhi.
2. Wiseman. J, and Garnsworthy. P. C., 1999. Recent Development in Poultry Nutrition.
3. Titus Harry. W, and Fritz James. C, 1971. The Scientific Feeding of Chickens. 5th Edition.

References

1. Reena Kandwal, 2013. Nutrient Requirements of Poultry. 3rd Edition.
2. Bell D. Donald and Weaver D. William Jr., 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt. Ltd., Noida.
3. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution Co., Lucknow, India.

SEMESTER I

2 – FEEDS AND FEEDING OF POULTRY

Total Marks: 100

Total Hours: 60

Objectives:

To make the student to understand about the basic principles of nutrition and different kinds of feeds and their feeding methods in poultry.

UNIT-I

(15 HRS)

Classification of Feed Ingredients- Conventional feeds and Non-Conventional Poultry Feeds- Energy sources, Vegetable protein sources, Animal Protein sources.

UNIT-II

(15 HRS)

Nutritive value and utilization of different cereals, cereal – byproducts, alternate energy sources, fats and oils.

UNIT-III

(15 HRS)

Physical and sensory evaluation of feed ingredients – sampling techniques for ingredients and compounded feed – estimation of proximate principles of feed and feed ingredients – computing various poultry feed formulae based on commonly available feed ingredients.

UNIT-IV

(15 HRS)

Feeding chicks, growers, layers, broiler and breeders – feeding in different seasons– nutritional and metabolic disorders in poultry.

UNIT-V

(15 HRS)

System of feeding – restricted, forced, and controlled – use of additives and non-additives – enzymes, probiotics, prebiotics and antibiotics, herbs, performance enhancers. Commonly occurring anti nutrients and toxicants in poultry feed ingredients – Mycotoxins and their prevention.

Textbook

1. Leeson S., & Summers J. D., 2001. Scott's Nutrition of the Chicken. 4th Edition. University Books, Canada
2. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution Co., Lucknow, India.
3. Mahajan Naresh, 2015. Poultry Nutrition and Management. 1st Edition. Anmol Publications Pvt. Ltd., New Delhi.

References

1. Bell D. Donald and Weaver D. William Jr., 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt. Ltd., Noida.
2. Wiseman. J, and Garnsworthy. P. C., 1999. Recent Development in Poultry Nutrition.
3. Titus Harry. W, and Fritz James. C, 1971. The Scientific Feeding of Chickens. 5th Edition.

SEMESTER - I

3 – FEED PREPARATIONS AND FORMULATIONS

Total Marks: 100

Total Hours: 60

Objective:

To understand the basis of feed preparation and formulations in poultry industry.

UNIT-I

(12 HRS)

Composition of poultry feeds – Nature or type of feeds – feeds for broiler, breeder and layer chicken, Ingredient inclusion levels – types of feed stuffs used in practical poultry feeds and anti-nutritional factors. Acceptability and physical condition of ingredients.

UNIT-II

(12 HRS)

Nutrient requirement of birds, Nutrient composition of feed stuffs, average daily feed consumption of birds. Interactions of nutrients. Environmental temperature.

UNIT-III

(12 HRS)

Availability and cost of feed ingredients – method of formulating rations – square method, trial and error method, simultaneous equation method.

UNIT-IV

(12 HRS)

Computer method – trial and error formulation, linear programming package – procedure for use of linear programming. Selection of computer software and hardware for ration formulation.

UNIT-V

(12 HRS)

Steps in feed formulation – fixed minor ingredients, slack space – animal protein sources – level of cereal by-product – vegetable protein sources and energy sources – Metabolizable energy content – Mineral content – trace elements.

Text Book

1. Eiri Board of Consultants & Engineers. Handbook of Poultry Farming and Feed Formulations. Engineers India Research Institute, New Delhi
2. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution. Co., Lucknow.
3. Banday M. T., and Mondal S. S., 1999. Poultry Feeding & Nutrition. 1st Edition. Pixie Publication India (P) Ltd., Karnal

References

1. Leeson S., & Summers J. D., 2001. Scott's Nutrition of the Chicken. 4th Edition. University Books, Canada
2. Hurd M. Louis, 2003. Modern Poultry Farming. 1st Edition. International Book Distributing Company, Lucknow.

SEMESTER - I

4 – NUTRITIONAL DEFICIENCY DISEASES

Total Marks: 100

Total Hours: 60

Objectives:

To make the students to understand about the various nutritional deficiency diseases.

UNIT-I

(12 HRS)

Introduction to nutritional deficiency diseases and metabolic diseases - manifestations of deficiency, diagnosis and prevention.

UNIT-II

(12 HRS)

Nutritional deficiency diseases – Protein, Carbohydrate, Fat – physiological functions, manifestation of deficiency, diagnosis and preventive measures. Requirements and allowances, sources and availability.

UNIT-III

(12 HRS)

Vitamins deficiency – Fat soluble vitamins – Water soluble vitamins – manifestations of deficiency, diagnosis and prevention, requirements and allowances, sources and availability.

UNIT-IV

(12 HRS)

Mineral deficiency – Major minerals and Minor minerals – manifestations of deficiency, diagnosis and prevention, requirements and allowances, sources and availability.

UNIT-V

(12 HRS)

Metabolic diseases – Gout, Ascites, Fatty Liver Haemorrhagic Syndrome, Fatty Liver & Kidney Syndrome, cage layer fatigue and sudden death syndrome. Feed adulterant and toxicants.

Text Book

1. Eiri Board of Consultants & Engineers. Handbook of Poultry Farming and Feed Formulations. Engineers India Research Institute, New Delhi
2. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution. Co., Lucknow.
3. Banday M. T., and Mondal S. S., 1999. Poultry Feeding & Nutrition. 1st Edition. Pixie Publication India (P) Ltd., Karnal

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1. Leeson S., & Summers J. D., 2001. Scott's Nutrition of the Chicken. 4th Edition. University Books, Canada
2. Hurd M. Louis, 2003. Modern Poultry Farming. 1st Edition. International Book Distributing Company, Lucknow.

SEMESTER I

5 – FEED ADDITIVES

Total Marks: 100

Total Hours: 75

Objectives:

To make the student understand about the basic involved in identifying and adding feed additives in poultry feed.

UNIT I (15 HRS)

Introduction to feed additives – definition, different kinds of additives – nutritive and non-nutritive - Pellet binders and pelletability – advantages, other pelleting agents and inclusion levels, pelleting rate. Flavouring compounds.

UNIT II (15 HRS)

Non-nutritive additives - Enzymes – exogenous enzymes, NSP, lipase, Phytase. Beta glucans and arabinoxylans, barely and rye, Oligosaccharides and Proteases.

UNIT III (15 HRS)

Antibiotic and Growth Promoters – effects and usage – mode of action of antibiotics – list of antibiotics used as feed additives.

UNIT IV (15 HRS)

Antifungals, mold inhibitors and toxin binders – mold inhibitors, toxin adsorbants. Anticoccidials – Nicarbazin, Ionophores, Sulfur compounds. Anthelmintic drugs.

UNIT V (15 HRS)

Antioxidants – fat oxidation, composition of ethoxyquin. Carotenoids – Chlorophyll, Xanthophyll, Beta carotene derivatives. Probiotics, yeasts, odour and fly control, tolerances, toxicity and feed withdrawal of additives.

Text Book

1. Eiri Board of Consultants & Engineers. Handbook of Poultry Farming and Feed Formulations. Engineers India Research Institute, New Delhi
2. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution. Co., Lucknow.
3. Banday M. T., and Mondal S. S., 1999. Poultry Feeding & Nutrition. 1st Edition. Pixie Publication India (P) Ltd., Karnal

References

1. Sreenivasaiiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi
2. Leeson S., & Summers J. D., 2001. Scott's Nutrition of the Chicken. 4th Edition. University Books, Canada

3. Hurd M. Louis, 2003. Modern Poultry Farming. 1st Edition. International Book Distributing Company, Lucknow.

SEMESTER - I

PRACTICAL – I

Total Marks: 100

Objectives:

To understand the student aware about the feeds and feeding procedures required in poultry feed mills and farms.

1. Feed mill visit – Sampling techniques for ingredients and finished feed
2. Feed ingredients – Physical evaluation of quality
3. Feed ingredients sample – Energy sources, Vegetable protein sources, and Animal Protein sources
4. Feed mill visit – Feed formulation and feed manufacturing
5. Feed mill visit – types & forms of feeds— mash, pellet & crumble
6. Feed proximate analysis (Demo)
7. Feed proximate analysis (Demo)
8. Feed proximate analysis (Demo)
9. Feed proximate analysis (Demo)
10. Additives used in poultry feed (Demo)
11. Farm visit – Feed storage and distribution methods in farm level
12. Farm visit – Feeding methods
13. Calculation – Feed Conversion Ratio (FCR)
14. Nutritional deficiency diseases (Demo)
15. Feed registers maintained in the farm

SEMESTER II

6 – LAYOUT AND DESIGNING OF FEED MILL

Total Marks: 100

Total Hours: 60

Objectives:

To make the student understand about the layout and designing of feed mill.

UNIT I (15 HRS)

Feed Mill Layout and design – criteria in selection of site, geographical measures in construction, legal issues and business process.

UNIT II (15 HRS)

Essentials of feed milling – primary minimum requirements – developed and fenced land, building for warehousing, building of plant, building of laboratory and workshop, building of boilers and power generating sets.

UNIT III (15 HRS)

Other requirements – housing facilities for workforce, weigh bridge, plant and machinery, electric power supply room, water pump room, canteen, etc. Ingredient storage room, separation and cleaning room, packaging area.

UNIT IV (15 HRS)

Selection and location of Silo – Different types of Silo for storage of grains, corn. Placement of tanks – water, soya oil, rice bran oil, etc. Capacity and location of Silo for storage of prepared feed materials.

UNIT V (15 HRS)

Raw material storage area, mixing and grinding area, Feed storage area, Feed milling equipment and their arrangements, Computer operating room set up. Packaging and labelling area. Feed bag loading area.

Text Book

1. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution. Co., Lucknow.
2. Banday M. T., and Mondal S. S., 1999. Poultry Feeding & Nutrition. 1st Edition. Pixie Publication India (P) Ltd., Karnal.

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1. Sreenivasaiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi.
2. Leeson S., & Summers J. D., 2001. Scott's Nutrition of the Chicken. 4th Edition. University Books, Canada
3. Eiri Board of Consultants & Engineers. Handbook of Poultry Farming and Feed Formulations. Engineers India Research Institute, New Delhi.

SEMESTER – II

7: FEED MANUFACTURING TECHNOLOGY

Total Marks: 100

Total Hours: 75

Objectives:

To make the students understand about the feed processing and manufacturing technology involved in feed mill.

UNIT-I (15 HRS)

Introduction – reasons for the feed processing - methods of grain processing – classification on the basis of structure, thermal treatment and chemical treatment.

UNIT-II (15 HRS)

Different methods of grain processing – cracking or dry rolling, crimping, crumbles, popping, micronizing, grinding, roasting, water soaking, sprouting, boiling and baking.

UNIT-III (15 HRS)

Different methods of grain processing – reconstitution, steam rolling, steam flaking, pressure cooking and flaking, extrusion, extrusion cookers, exploding, pelleting and gelatinization of starch.

UNIT-IV (15HRS)

Particle size – shape of ground feed particles, measurement of particle size, determination of particle size in a ground feed stuff, determination of modulus of uniformity of a ground feed using 250 g sample.

UNIT-V (15 HRS)

Physical properties of micro-ingredients to be mixed in the compounded feed, processing for the proper distribution of some feed micro-ingredients during mixing, feed mixing time in a mixer, determination of feed mixing efficiency of a mixer.

Textbooks

1. Pathak Nityanand, 2010. Text book of feed processing technology. 1st Edition. IBDC Publishers, Lucknow, UP.
2. Narahari D., and Kumararaj R., 2008. Handbook of Applied Broiler Production. 1st Edition. Poultry Punch Publication (I) Pvt. Ltd., New Delhi, India.
3. NIIR Board of Consultants & Engineers. Preservation of Meat and Poultry Products. 1st Edition. Asia Pacific Business Press Inc., New Delhi.

Reference Books

1. Sreenivasaiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi
2. Bell D. Donald and Weaver D. William Jr., 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt. Ltd., Noida.
3. Taneja. V. K. and Trivedi. T. P., 2011. Handbook of Animal Husbandary. 3rd Edition. Indian Council of Agricultural Research (ICAR), Chandu Press, New Delhi.

SEMESTER II

8 – FEED MILLING EQUIPMENTS

Total Marks: 100

Total Hours: 75

Objectives:

To make the student to understand about various feed milling equipment and their uses in poultry feed mill.

UNIT-I

(15 HRS)

System of Milling-batch system-equipment used: feed grinder, hammer mill, feed mixing, vertical mixers, feed mixing time in a mixer, determination of feed mixing efficiency of a mixer.

UNIT-II

(15 HRS)

Equipment used for feed grinding – hand moved stone mill, hammer mill, attrition and burr mills, and roller mills. Feed mixing – hand mixing, mechanical mixing. Feed grinding- types of hammer mills, energy (electricity) requirement of hammer mills, points to be considered for selection of an efficient grinder and purpose of feed grinding.

UNIT-III

(15 HRS)

Standard sieves and procedure of sieving for the determination of fineness of grinding. Description of sieving set, procedure of sieving, sieve shaker, methods of size reduction of feeds- cutting, crushing, shearing, impact grinding.

UNIT-IV

(15 HRS)

Volumetric system: advantages and disadvantages, building and layout, site of mill, staff requirement, cleaning equipment, mixing fats and molasses in rations, objectives of pelleting/agglomeration. Batch weighing, grinding, mixing, pelleting and other processing operation.

UNIT-V

(15 HRS)

Crumbling, Flaking, Popping, and Extrusion – Processing of oil seeds – pelleting technology – Particle size reduction technology. Pelleting of feeds –steps in the preparation of hard pellets, advantages of feed pelleting. Feed milling equipment-elevators, conveyors, bin, and boiler.

Textbook

1. Pathak Nityanand, 2010. Text book of feed processing technology. 1st Edition. IBDC Publishers, Lucknow, UP
2. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution. Co., Lucknow.
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3. Eiri Board of Consultants & Engineers. Handbook of Poultry Farming and Feed Formulations. Engineers India Research Institute, New Delhi.

SEMESTER II

9 – QUALITY CONTROL-NATIONAL AND INTERNATIONAL REGULATIONS

Total Marks: 100

Total Hours: 75

Objectives:

To make the student understand about the basic principles involved in quality control in poultry feed mills.

UNIT I

(15 HRS)

Introduction – physical characteristics of the feed ingredients – soundness of the grains and seeds, dampness or sensible moisture content in the feed, colour, odour and texture of the ingredient.

UNIT II

(15 HRS)

Physical evaluation – presence of cake formation and extent of cooking, presence of extraneous materials in the feed, and infestation (insect or fungal). Chemical composition of the feed ingredients.

UNIT III

(15 HRS)

Sampling of feeds – objective of feed sampling, sampler, number of sampling and processing of samples for dispatch to laboratory for analysis.

UNIT IV

(15 HRS)

Collection and storage of reference samples of different ingredients, procedure of microscopic examination of feed samples to be tested, identification with the use of chemicals and reagents and preparation of report.

UNIT V

(15 HRS)

Tests and analysis of collected samples and detection of aflatoxins. International and National regulations – GMP, HACCP, AFIA, U. S. Poultry & Egg Association, OSHA, FDA, EPA and other standard protocols.

Text Book

1. Pathak Nityanand, 2010. Text book of feed processing technology. 1st Edition. IBDC Publishers, Lucknow, UP
2. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution. Co., Lucknow.
3. Banday M. T., and Mondal S. S., 1999. Poultry Feeding & Nutrition. 1st Edition. Pixie Publication India (P) Ltd., Karnal.

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1. Sreenivasaiyah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi.
2. Leeson S., & Summers J. D., 2001. Scott's Nutrition of the Chicken. 4th Edition. University Books, Canada
3. Eiri Board of Consultants & Engineers. Handbook of Poultry Farming and Feed Formulations. Engineers India Research Institute, New Delhi.

SEMESTER II

10 – BIOSECURITY IN FEED MILLS

Total Marks: 100

Total Hours: 75

Objectives:

To make the student aware about the safety and biosecurity measures taken in poultry feed mill.

UNIT I (15 HRS)

Biosecurity – Proactive measures to minimize entry of infection vs agents, feed mill premises – feed mill fencing – disinfectant, pits, personnel management and restriction of movement – Locational – Conceptual (Isolation), Structural and Operational (Sanitation) Biosecurity in feed mill.

UNIT II (15 HRS)

Biosecurity concepts – barriers surrounding feed mill – inner and outer barrier. Biosecurity safeguard – preventive measures against clinical and subclinical pathogens.

UNIT III (15 HRS)

Biosecurity risk control measures – personal and visitor entry – wash room, bath room, foot dip and dress changing room. Prohibition of entry – non-essential, unwanted personnel and trespassing.

UNIT IV (15 HRS)

Biosecurity measures – disinfection procedures – for an effective biosecurity cover, floor washing, ceiling washing, air duct cleaning, dust removal –blow out. Approved disinfectant with concentration and Fumigation.

UNIT V (15 HRS)

Rodent and Vector control in Biosecurity – *Salmonella* species, Fowl Cholera and *E. coli* spreading, insect control in biosecurity – mosquito, dark beetle. Wild Bird control, Ventilation, Water and Temperature management.

Text Book

1. Pathak Nityanand, 2010. Text book of feed processing technology. 1st Edition. IBDC Publishers, Lucknow, UP
2. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution. Co., Lucknow.

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2. Leeson S., & Summers J. D., 2001. Scott's Nutrition of the Chicken. 4th Edition. University Books, Canada
3. Eiri Board of Consultants & Engineers. Handbook of Poultry Farming and Feed Formulations. Engineers India Research Institute, New Delhi.

SEMESTER II

PRACTICAL II

Total Marks: 100

Objectives:

To make the student understand about the feed milling technology.

1. Feed mill layout and design (Demo)
2. Feed mill operations – flow chart
3. Different methods of grain processing (Demo)
4. Feed Processing by Physical method
5. Feed Processing by Chemical method
6. Feed mill visit – Milling equipment
7. Feed mill visit – pelletizer
8. Parameters for quality control – soundness, dampness, colour, odour, texture and infestation (insect and fungal)
9. Water sample – qualitative and quantitative assessment
10. Biosecurity risk control measures – foot dip preparation and vehicle spray usages
11. Disinfection procedures – floor, side walls and ceiling washing
12. Disinfection procedures – Fumigation procedures
13. Rodent, vector and insect control in feed mill
14. Feed mill visit
15. Feed mill visit

SEMESTER II

IN-PLANT TRAINING AND VIVA VOCE

Total Marks: 100

DIRECTIONS

- Students are allocated at different sectors of Poultry Industries located at different places of India. They will be assigned under a Feed mill supervisor in their location and will be doing the practical training work for a period of three months.
- The students should have complete attendance for the period of their in-plant training which will be sent by the Manager from their location.
- After three months the students will prepare a report which will be evaluated by the Faculty at the SIPM along with External Examiner.