

NATIONAL UNIVERSITY



Syllabus For Post Graduate Diploma (PGD) in Farming Technology

Effective from the Session: 2022-2023

NATIONAL UNIVERSITY
 Syllabus for Post Graduate Diploma (PGD) on
 Farming Technology
 Session 2022-2023

Paper Code	Paper Title	Credits
Semester – 1		
817001	Farm and Machineries Management	4
817003	Principles and Practices of Crop Production	4
817005	Soil and Fertility Management	4
817007	Commercial Horticulture	4
817009	Organic Farming	4
Semester – 2		
827011	Fish Farming	4
827013	Dairy and Poultry Production	4
827015	Pest and Disease Management	4
827017	Food Processing and Marketing	4
827018	Internship + Viva	4
Total		40

NATIONAL UNIVERSITY
Center for Post Graduate Studies, Training and Research
Life and Earth Science Group
Syllabus for Post Graduate Diploma (PGD) on
Farming Technology
Session 2022-2023

Rationale

The post-graduate diploma on “Farming Technology” under Life and Earth Science Group is a program of one year consisted with two semesters which will enable the graduates to learn about farming technologies including farm and machineries management, organic farming, horticulture, aquaculture, dairy and poultry farming, integrated management of pest, soil and nutrition management, quality control and value addition in agricultural and farm products.

Scope of the Program

The diploma holders can start a career as a professional in a certain field of farming technologies. The learners will get practical knowledge in a field of interest, which will greatly improve their career prospects as well as income potentiality. They will be encouraged to be an entrepreneur in their own field. They can start a specific farm on agriculture, horticulture, fish, dairy and poultry, and farm machineries management and also many more businesses associated with farming. They will also become a skill manpower to start a career in both public and private sectors.

Salient features of the program

1. The course of study for the Post Graduate Diploma (PGD) on Farming Technology under Life and Earth Science Group shall extend over two semesters in one academic year.
2. Each student will have to take 10 courses. To become eligible for the degree, the student must secure at least 50% marks in each course. Each course will have a weightage of 4 credits (3 credits for course work and 1 credit for practical work)
3. The marks will be distributed in each course as follows: Final Examination 40%, Mid-term Examination 20%, Practical Examination 35% and Attendance 5%. The question of Mid-term Examination and practical will be arranged by the concerned course teacher during the coursework period.
4. The theory course for every 60 marks will have 45 lectures of 1 hour each in a semester of 6 months and there must be at least 15 practical classes of minimum 2 hours for each course.
5. Learning activities for this class will include, but not limited to, instructor’s guided discussions, lectures, individual and group presentations, assignments and tests. Students’ participation in class learning activities will be highly encouraged. Critical thinking approach to solve agricultural/ biological farming issues will be emphasized.

6. Regular attendance in all classes is expected of all students. A student whose continuous, unexcused absences exceed the number of hours the class is scheduled to meet per week may be treated as dropped out student. For online courses, students who fail to complete required activities for two consecutive weeks may be considered to have excessive absences and may be dropped.
7. Any kind of modifications on terms and conditions will be determined as per regulations of the National University regarding PGD courses.

The following courses will be offered for (PGD) on Farming Technology

Program details

Semester	No. of Theory Courses	Marks for Theory and practical	Viva	Total Marks	Total Credit
1 st	5	$(75 + 25) \times 5 = 500$		500	20
2 nd	4	$(75 + 25) \times 4 = 400$		400	16
	Industrial/farm attachment	75	25	100	04
Total				1000	40

PGD on Farming Technology

DETAILED SYLLABUS

1st semester

Paper Code: 817001		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Farm and Machineries Management		

1. Farm Technology

- i. Concept, definition, types and economic principles of farming.
- ii. Integrated Farming system, urban farming and roof gardening.

2. Farm Management

- i. Factors and principles of farm enterprises and its technical and economical involvement.
- ii. Farm site selection, structure, layout and establishment.
- iii. Farm machineries management

3. Irrigation and Drainage

- i. Concept of irrigation, and types of water application methods.
- ii. Selection of appropriate methods of irrigation, advantages, and disadvantages.
- iii. Selection of irrigation pumps and wells, their uses, maintenance and trouble shooting.
- iv. Drainage: basic idea of drainage, basic design criteria, and methods.

4. Precision Farming

- i. Geo-informatics: definition, concepts, tools, and techniques in Precision Agriculture.
- ii. Global Positioning System (GPS), Remote sensing concepts and their application, and use of geospatial technology (Apps) in agriculture.
- iii. Sensor technology, precision monitoring, and evaluation of farming practices.

5. Farm Mechanization

- i. Concepts and terms of agricultural mechanization. Present status and constraints in Bangladesh. Mechanization and agricultural productivity, custom hiring practice of machines, and poverty alleviation. Farm mechanization policy of Bangladesh.
- ii. Classification of farm tools and machineries:
Crops: Tillage implements, transplanters, seed-drill machine, sprayers, and harvesters.
Poultry and livestock: Foggers, milking machine and parlors, trimmers, and sensors for automation.
Aquaculture: Aerators, feed mixing and feeding semi automation related machineries.

Practical

- i. Study of the historical progress of farm mechanization in Bangladesh.
- ii. Application different farming related apps and techniques.
- iii. Identification of different farm related machineries.
- iv. Inspection and study of farm related machineries.

Books recommended

1. Beneke, R.R. 1955. Managing the Farm Business. John Wiley and Sons. Inc. New York, London.
2. Kent D. Olson. 2004. Farm Management – Principles and Strategies. Iowa State University Press.
3. Ronald D. K. and W. M. Edwards. 2004. Farm Management. 6th Edition. McGraw-Hill, Inc. (Chapters 1-14).

4. Hedges, T.R. 1969. Farm Management Decision. Prentice Hall, Inc. Englewood Cliffs. London.
5. Michael, M. and T. P. Ojha. 1978. Principles of Agricultural Engineering (Vol. I & II). Jain Brothers (New Delhi).
6. Hunt, D. 1983. Farm Power and Machinery Management. Iowa State University Press, Iowa.
7. Jain, S. C. and C. R. Rai. 1980. Tractor Engine Maintenance and Repair. Tata McGraw Hill Publishing Company limited, New Delhi.
8. Hansen, V. E., O.W. Israelsen and G. E. Stringham. 1993. Irrigation Principles and Practice. John Wiley & Sons.
9. Aziz, M. A. 1967. A Text Book of Estimating and Costing. Zohri Pub. Dhaka.

Paper Code 817003		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Principles and Practices of Crop Production		

1. General Principles of Crop Production

- i. Crops, their types and classification
- ii. Crop production process and maximizing photosynthesis utilizing below(soil) and above(atmosphere) ground resources.
- iii. Soil preparation, seed and sowing, post sowing-tillage, water management, nutrient management, plant protection measures, harvesting, threshing and storage.

2. Cropping Systems

- i. Concepts, types of cropping systems (mono cropping, intensive cropping, mixed and inter-cropping system with their advantages and disadvantages, agroforestry, hydroponics and Sarjonsystem)
- ii. Agro Ecological Zones (AEZs) of Bangladesh
- iii. Crop rotation & crop calendar.

3. Role of Climate and Weather in agriculture

- i. Cropping seasons and their characteristics
- ii. Climate vs weather, impact of climatic factors on crop production, weather forecasting and agricultural productivity.
- iii. Modification of crop microclimate
- iv. Climate change and climatic variability; causes of climate change and its impact on crop production.

4. Production Technology of Different Field Crops

- i. Cereals: rice, wheat, maize
- ii. Pulses: lentil, mungbean, chickpea
- iii. Oil seeds: mustard, soybean, groundnut
- iv. Sugar crops: sugarcane
- v. Fiber crops: jute, cotton
- vi. Beverage Crops: tea

5. Seed Technology

- i. Seed production, processing and storage
- ii. Health and viability: genetic, physical, physiological

6. Weed Management

- i. Definition, classification and importance of weeds
- ii. Principles and methods of weed control and management.
- iii. Uses of herbicides, weedicides and machineries in weed management.

Practical

- i. Identification of field crops.
- ii. Study of different farm implements (a) identification, (b) practicing of different farm operations and (c) determination of their efficiency.
- iii. Identification of soil feature by finger feel method.
- iv. Identification of manures, fertilizers and studying their physical characteristics.
- v. Computation of soil use based fertilizer recommendation for different crops.
- vi. Preparation and preservation of compost / farm yard manure.
- vii. Practicing different methods of manures and fertilizers application.
- viii. Raising a crop and studying its different growth phases.
- ix. Practicing weeding, thinning, gap-filling, mulching and earthing up.
- x. Purity analysis of seeds and germination test.
- xi. Study on effect of plant nutrients – N, P, K on crop growth and yield in pot culture.
- xii. Identification of different meteorological instruments and their uses; Study of climatic pattern of Bangladesh.
- xiii. Field visit.

Recommended Reading material:

1. Chatterjee, B.N., Maiti, S. and Mandal, B.K. 1989. Cropping Systems (Theory and Practice) Second Ed. Oxford and IBH Publishing Co. Pvt. New Delhi, Bombay, Calcutta, 345p.
2. Hoque, M.Z. 1984. Cropping Systems in Asia. On-Farm Research and Management. IRRI, Philippines.
3. Martin, J.H. R.P. and Waldren, Stamp, D.L. 2006. Principles of Field Crop Production 4th Ed. The McMillan Co., New York.
4. Wolfe, T.K. and Kipps. M. S. 2004. Production of Field Crop: A Textbook of Agronomy. McGraw Hill Book Co. New York.
5. Hoque, M.Z. 1984. Cropping Systems in Asia. On-Farm Research and Management. IRRI, Philippines.
6. De, G.C. 1989. Fundamentals of Agronomy. Oxford & IBH Publishing Co., New Delhi.

Paper Code 817005		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Soil and Fertility Management		

Soil

- i. Modern concept of soil and its constituents
- ii. Soil formation: Soil forming factors and Weathering
- iii. Soil pH/Soil Reaction
- iv. Soil physical properties: Soil texture, Soil structure. Bulk density, particle density, Porosity, Soil color
- v. Broad physiographic units of Bangladesh
- vi. Essential soil nutrients: Criteria and classification

Fertility Management

- i. Definition, types of soil fertilizer
- ii. Factors affecting soil fertility, maintenance of soil fertility.
- iii. Fertility status of Bangladesh soil
- iv. Soil Microbes and their functions
- v. Organic and inorganic (chemical) fertilizers, their functions and usage

Practical

- i. Identification of different soil textural class by finger feel method.
- ii. Determination of soil pH by glass electrode pH meter.
- iii. Identification of different types of manures and fertilizer.
- iv. Microbial population enumeration in soil

Suggested Readings

1. Brady, N. and Ray, R W. The nature and properties of soils
2. Daniel, H. Introduction to soil physics
3. Alexander, M. Introduction to soil Microbiology
4. Samuel, L. T. Soil Fertility and Fertilizer
5. Turk, M. and Foin. Fundamentals of Soil Science
6. Gupta, P. K. Hand Book of Soil, Fertilizer and Manure
7. Gupta, P. K. Manures and Fertilizer and Manure

Paper Code 817007		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Commercial Horticulture		

1. Define Horticulture; Present status and its contribution in national GDP. Concept of commercial Horticulture and its scope in Bangladesh.
2. Types of different horticultural crops and their importance in human nutrition.
3. Principles of commercial nursery establishment, its management and propagation technique of horticultural crops.
4. Micro-propagation and its prospects in commercial Horticulture.
5. Production technology of and Quality control of commercially important and export oriented fruits, vegetables, spices, plantation crops and mushroom.
6. Commercially important flowers production, processing and shelf life extension technology.
7. Post-harvest Technology and value addition in horticultural crops.
8. Packaging, transportation, marketing and value chain of horticultural crops.
9. Entrepreneurship development in Horticulture sector: its scope and challenges in Bangladesh.

Practical

1. Layout of an ideal nursery and seed bed preparation.
2. Demonstration of different propagation techniques in diversified horticultural crops.
3. Identification of different horticultural crops
4. Maturity indices and harvesting methods of horticultural crops.
5. Estimation of production cost and benefit cost ratio (BCR) of some commercially important horticultural crops.
6. Training on Mushroom cultivation, its multiplication and processing technology.
7. Preparation of packaging materials for quality control during processing, transport and marketing of different horticultural crops.
8. Study tour / Field visit of an ideal commercial nursery or orchard.

Suggested readings

1. Adams, C.R., K.M. Bamford and M.P. Early. 1993. Principles of Horticulture (2nd edn.). Linacre House, Jordan Hill, Oxford.
2. Bose, T.K., S.K. Mitra and M.K. Sadhu. 1986. Propagation of Tropical and Sub-Tropical Horticultural Crops. NayaProkash, Calcutta.
3. Davidson, H., R. Mecklenburg, and C. Peterson, 1994. Nursery management: Administration and culture (3rd edition), Englewood cliffs, N.J. Prentice- Hall.
4. Mondal, M.F.2000. Nursery and Plant Propagation (in Bangla). Mrs. AfiaMondal, BAU Campus, Mymensingh.
5. Thompson, A. K. 2003. Fruits and Vegetables: Harvesting, Handling and Storage (Second edition). Blackwell Publishing Ltd. Oxford, UK.
6. Bose, T.K. and L.P. Yadav. 1989. Commercial Flowers. NayaProkash, Calcutta.
7. Bose, T.K., R.S. Maiti, R.S. Dhua and P. Das. 1999. Floriculture and Landscaping. NayaProkash Calcutta.
8. Chattopadhyay, P. K., T. K. Bose and V. A. Parthasarathy. 2006. Plantation Crops. Vol. 1. NayaUdyog, Calcutta.
9. Jack E. Ingles. 2001. Ornamental Horticulture: Science Operations and Management. Delmar Cengage Learning; 3rd Revised edition.
10. Kumar, N; J.B.M.M.A. Khader, P. Rangaswami and I. Irulappan.2000. Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants. Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi.
11. Shanmugavelu, K. G., N. Kumar and K. V. Peter. 2002. Production Technology of Spices and Plantation Crops. Agrobios.
12. Bose, T.K. and M.G. Som. 1990. Vegetable Crops in India. NayaProkash, Calcutta.
13. Singh, P. and B. Asati. 2008. Seed Production Technology of Vegetables. Daya Publishing House.
14. Hassan, M. K. 2010. A Guide to Postharvest Handling of Fruits and Vegetables. Department of Horticulture, Bangladesh Agricultural University, Mymensingh-2202. National Food Policy Capacity Strengthening Programme (NFPCSP).
15. A Handbook on Postharvest Management of Fruits & Vegetables, P.Jacob John 2008. Baya publishing House, Delhi.

Paper Code 817009		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Organic Farming		

1. Types of farming (advantages and disadvantages of each system): Pure Organic Farming- definition, concept & benefits; integrated farming system (combination of organic and inorganic); Mixed farming.
2. Organic farming: introduction; needs; benefits; principles; developing organic farms; important steps & methods; social aspects.
3. Organic fertilizers: introduction; need; benefits; preparation of organic fertilizer; integrated plant nutrient Management.
4. Plant Nutrients: Name of plant nutrients; Functions of nutrients in plant growth and development.
5. Sources of nutrients for organic farming: Organic manure-FYM / Rural compost, City compost, Oil cakes, Animal wastes, Vermicompost, Trico compost etc.; Green Manure-Green Manure with Leguminous crops in crop rotation; In-situ incorporation of crop Residues-Benefits; Liquid Manure.
6. Organic crop management: Field crops; Vegetables; Fruits; Flowering plants; Plantation crops.

7. Principles of organic pesticides: Integrated pest and disease managements; production; application; bio-pesticides-types and production.
8. Principles of organic food standards and certification: harvesting, storage, quality control, certification, labeling and accreditation, trade, supply chain management, value addition.

Practical

- i. Preparation of organic fertilizers and organic pesticides.
- ii. Organic field visit, survey and report preparation.

Suggested readings

1. Dahama, A. K. 2005. Organic farming for sustainable agriculture, Agrobios Publication, Jodhpur.
2. Palanippan, S.P. and Anandurai, K. 1999. Organic Farming - Theory and Practice. Scientific Publishers, Jodhpur.
3. Sharma, A.K., Handbook of Organic Farming.
4. Singh, R.P. Sustainable Development of Dry-land Agriculture in India.
5. Thapa, U. and Tripathi, P. 2006. Organic Farming in India, Problems and Prospects.
6. Reddy, S. R. Principles of Organic Farming, Kalyani Publishers, New Delhi.
7. Palanippan, S. P and Annadurai Organic Farming (Theory and Practice), Scientific Publishers, New Delhi.
8. Subbarao, N. S. Bio-fertilizers in Agriculture and Forestry.
9. Khosia, R. Bio-fertilizers and Biocontrol Agents for Organic Farming.

2nd Semester

Paper Code: 827011		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Fish Farming		

1. Basic information on fish and fisheries; Introduction to Aquaculture; aquaculture of fin-fish and shell-fish in Bangladesh; Biology of commercially important culture species.
2. Extensive (Traditional and Improved), Semi-intensive and Intensive fish culture.
3. Common breeding methods; Brood stock management; Seed production; Fry and fingerlings nursing and transportation; Challenges in breeding and seed production.
4. Selection of sites and species for fish farming; Design & Construction of ponds, pond preparation, water quality Management.
5. Concepts of feed ingredients and raw materials, Nutritional composition, Feed formulation, feeding methods.
6. Sanitation and Fish Health, Common fish Diseases, Prevention and Control of Fish diseases.
7. Cage Culture, Pen-culture, Poly-culture, Culture in rice fields and Culture in running water
8. Modern culture Method (Bio-floc method and RAS (Re-circulating aquaculture systems), Aquamimicry, Bottom Clean and IPRS)).
9. Application of Microbes (probiotics) and mechanization in intensified aquaculture.
10. Shellfish Aquaculture (Shrimp, Prawn Soft shell farming and Crab fattening).
11. Harvesting and post-harvest Technology, Processing and preservation of fish, Cold Chain, Storage and transportation. HACCP, Post-harvest quality control.
12. Marketing, Supply and Value Chain Management and Entrepreneurship development in aquaculture
13. Socio-economic aspects of aquaculture: Benefits and problems associated with fish farming

Practical

- i. Pond preparation,
- ii. Hatchery visit;
- iii. Visit to Bio-flock IPRS, Aquamimicry RAS
- iv. Fish feed formulation and application
- v. Measurement of water quality Parameters
- vi. Value chain management
- vii. Visit to fish processing industry.

Suggested READINGS

1. Aquaculture Engineering. Applied Science Publishers Ltd., Ripple Road, Darking, Essex IG 11 OSA, England, U.K.
2. Aquaculture. Elsevier Scientific Publishing co., P.O. Box 211, Amsterdam, 1000 AE, Netherlands.
3. Aquaculture Magazine. Achill River Corp., P.O. Box 2329, Asheville, North Carolina, 28802, USA.
4. Aquatic Sciences and Fisheries Abstracts (ASFA). Fisheries Information, Data and Statistics Service, FAO, Fisheries Dept. via delle Terme di Caracalla, 00100 Rome, Italy.

Barton, M. (2006). *Bond's Biology of Fishes* (3rd ed.). Belmont, CA: Thomson Brooks/Cole.ii.

Bone, Q., & Moore, R. H. (2008). *Biology of Fishes* (3rd ed.). New York, NY: Taylor &

Francis.

5. Bamidgeh. Fish Breeders Association. Nir David, 19 150, Israel.
6. Fish Farming International. A. J. Highway Publications Ltd., Heighway House, 87 Blackfriars Rd, London SE 1 9HB, UK (monthly from 1982)
7. Freshwater and Aquaculture Contents Tables. (FACT) FAO, Fisheries Dept., Fisheries Information, Data and Statistics Service, 00100, Rome, Italy.
8. Pisciculture Franchise. Syndicate des Pisciculture - Salmon culteurs de France. 11 rue Milton, Paris 75009, France
9. Progressive Fish Culturist. American Fisheries Society, 5410 - Grosvenor Lane, Bethesda, Md 20014, USA.
10. Helfman, G. S. (2010). *The Diversity of Fishes: Biology, Evolution and Ecology* (2nd ed.). Oxford: Wiley-Blackwell

Paper Code: 827013		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Dairy and Poultry Production		

Dairy Production

1. **Introduction:**History and characteristics of major dairy breeds. Factors involved in establishing dairy farm. Site selection for an ideal dairy farm.
2. **Methods of selection of dairy animals:** Individual selection – pedigree selection – progeny testing – family selection.
3. **General dairy farm practices:** Identification, dehorning, castration, exercising, grooming, weighing, farm records – maintenance.
4. **Mammary system and milking:** Structure and function of mammary system, milk secretion and milk letdown. Methods of milking – manual –mull hand – knuckling – stripping. Milking procedure practices for quality milk production.
5. **Housing** and reproduction– loose housing, stanchion barn - advantages of each system; Reproductive system of dairy animals. Male and female reproductive system.
6. **Feeding of dairy animals:** Feed nutrients required by animal body, feed resources for milk production, nutritive value. Computation of balanced rations for dairy cows, heifers and calf. Silage making for dairy cattle. Treating low quality roughage using urea.
7. **Diseases of dairy animals:** Common diseases in dairy animals; prevention and control. Maintenance of hygiene and sanitation at dairy farm premises.
8. **Dairy farm planning:** Layout and prospects for successful dairy operation. Feeding, housing and management of dairy cows, calves and heifers. Planning for year-round feeds, fodder supply; management skills for land, labour and business.
9. **Beef Fattening:** Importance of feed fattening; Steps and time of beef fattening; Selection of animal for beef fattening; Feeding: Concentrate mixture; preparation of Urea Molasses Straw (UMS); Management and marketing of beef cattle.
10. **Forage crops:** Sorghum, Maize. Guinea grass, Napier, cowpea, cluster bean and Para grass.

Poultry Production

- 1. Introduction:** Origin, domestication and distribution of different poultry breeds. Prospects and problems of poultry production in Bangladesh.
- 2. Broiler production and management:** Development of broiler and broiler industry. Statistics of broiler and poultry meat production. Commercial broiler management: Brooding, ration formulation and feeding, watering, lighting and other management practices. Organic broiler production. Bio-security: Concept and measures. Cleaning and disinfection of poultry houses and equipment. Steps in processing live broilers, dressing yields and cut up parts. Factors affecting profit and loss in broiler production. Marketing systems and marketing of live and dressed broilers.
- 3. Layer production and management:** Contribution of layers towards egg production in Bangladesh, description of egg producing breeds and strains. Factors affecting in establishment of a layer farm, Daily activities of a layer farm. Layer production system- brooding, feeding, lighting, litter management. Hatchery management- selection of hatching eggs, hatching of eggs by broody hens, sanitation of incubator and hatchery building, candling, transferring of pedigree and general eggs from setter to Hatcher, sexing baby chicks, culling, packaging and transportation of baby chicks. Vaccination, debeaking, dubbing, toe clipping and wing banding.
- 4. Management of parent stock:** Development and concept of pure line; Grand parent management: Brooding, lighting, beak trimming, selection, water and feed management, body weight control. Grading of parent stock and post grading management.
- 5. Housing:** Different housing system for broiler, layer and parent stock. Housing environment, materials and equipment. Types of litter materials.
- 6. Diseases of poultry:** Prevention and control of common poultry diseases. Vaccination and medication for poultry.
- 7. Ducks and Specialized Fowl Production:** Origin, domestication, geographical distribution of ducks and other fowls. Problems and prospects of rearing duck, quail, geese, pigeon, guinea fowl, turkey in Bangladesh. Production and management of ducks, quail pigeon and turkey.

Practical

1. Identification of feed ingredients for dairy and poultry.
2. Preparation of silage for dairy cattle.
3. Preparation of Urea Molasses Straw (UMS).
4. Ration formulation for dairy cows.
5. Treatment of low quality roughage using urea.
6. Identification of different breeds of dairy and poultry.
7. Ration formulation for poultry.
8. Debeaking of poultry.
9. Identification of fertile and non-fertile eggs.
10. Setting of eggs and monitoring other activities in an incubator.

Suggested readings

১. মোস্তফা. এ. এইচ. এম., ১৯৯৪। খামাণ্ডেহাঁসমুরগিপালন ও রোগব্যাধিরচিকিৎসা, বাংলাএকাডেমী, ঢাকা।
২. হোসেন, মো., ১৯৯৪। ব্যবহারিক পোল্ট্রি বিজ্ঞান, বাংলাএকাডেমী, ঢাকা।
৩. হোসেন, এস.এস. এবং কে.জি. মোস্তফা, ১৯৮৫। ব্যবহারিক কৃত্রিমপ্রজনন, প্রকাশকবাংলাএকাডেমী, ঢাকা।
৪. রহমান, আ. (১৯৮৫)। মুরগি ও অন্যান্য পাখির রোগতত্ত্ব (প্রথম খণ্ড), বাংলাএকাডেমী, ঢাকা।

৫. রহমান, আ. (১৯৮৫)। মুরগি ও অন্যান্য পাখির রোগতত্ত্ব (দ্বিতীয় খন্ড), বাংলাএকাডেমী, ঢাকা।
৬. রহমান, আ. (১৯৮৫)। গৃহপালিতপশুরসংক্রামকরোগতত্ত্ব (প্রথম খন্ড), বাংলাএকাডেমী, ঢাকা।
৭. রহমান, আ. (১৯৮৫)। গৃহপালিতপশুরতাত্ত্বিক রোগতত্ত্ব (দ্বিতীয় খন্ড), বাংলাএকাডেমী, ঢাকা।
৮. রহমান, আ. (১৯৮৯)। গবাদিপশুরঅপুষ্টিজনিত রোগব্যাদি, বাংলাএকাডেমী, ঢাকা।
৯. রহমান, আ. ন. ম. আ. (১৯৯৬)। কোয়েলপালন, পড়া, ঢাকা, বাংলাদেশ।
১০. রহমান, আ. ন. ম. আ. (১৯৯৭)। শহরে পোল্ট্রি পালন, রোদ্দুর, ঢাকা, বাংলাদেশ।
১১. লতিফ মো. আ., ১৯৯৪। ব্রয়লারউৎপাদন, বাংলাএকাডেমী, ঢাকা।
১২. সামাদ, এম. এ. (১৯৯৩)। পোল্ট্রি পালন ও চিকিৎসাবিদ্যা, লিরিক-এপিকপ্রকাশনী, ময়মনসিংহ।
১৩. সামাদ, এম. এ. (১৯৯৬)। পশুপালন ও চিকিৎসাবিদ্যা, লিরিক-এপিকপ্রকাশনী, ময়মনসিংহ।
১৪. মিঞা, আ. সা. (১৯৭৬)। গৃহপালিতপশুরপ্রজননসংকট ও ব্যাদি, বাংলাএকাডেমী, ঢাকা।
১৫. আলীএবং হোসেন, এস.এস., পশুপালন ও কৃত্রিমপ্রজনন, পাইওনীরপ্রিন্টিং এন্ড প্যাকেজিং, ১৮, গঙ্গাদাস গুহ রোড, ময়মনসিংহ।
16. Ahmed, Z. and T.S. Islam, 1987. Training Manual on Artificial Insemination.
17. Ahuja, S. D., 1990. *Quail Husbandry*, Indian Council of Agricultural Research, New Delhi, India.
18. Artificial Insemination and Farm Establishment. Bangladesh Open University
19. Banargy, G.C. 1990. A Textbook of Animal Husbandry, Seventh edition. Oxford & IBH publishing Company Private Limited.
20. Batty, J. (1981). *Poultry Keeping*, Saiga Publishing Co. Ltd., Surrey, UK.
21. Batty, J., 1980. *Pictorial Poultry Keeping (Third ed.)*, Spur Publication, UK.
22. Blood, D. C., Radostits, O. M., Henderson, J. A., Arundel, J. H. and Gay, C. E. (1983). *A Textbook of Diseases of Cattle, Sheep, Pigs, Goats and Horses (6th Ed.)*, ELBS, BailliereTindall, Pitman Press Ltd, Great Britain.
23. Coutts, G. S. (1981). *Poultry Diseases Under Modern Management*, Siaga Publishing Co. Ltd., Surrey UK.
24. Chatrabarhi, A. 1993. Handbook of Animal Husbandry Sciences. Kalyani Publ., New Delhi.
25. Dairy India Year Book. 2007. P.R. Gupta Publ., New Delhi.
26. Dalton, D.C 1987. An introduction to practical animal breeding. ELBS. 2nd edition London. 182 PP.
27. Das, S. K. 1994. *Poultry Production*, CBS Publishers and Distributors, India.
28. Hafez, E.S.E., 1980. Reproduction in farm animals. Fourth edition, Lee and Febiger London, 627 PP.
29. Hawksworth, D., 1988. *British Poultry Standards*, Butterworth Group, UK.
30. Kumar, H.D. 2003. Modern concepts of Biotechnology. Vikas Publ. House Pvt. Ltd., New Delhi.
31. Livestock Diseases & Their Prevention. Bangladesh Open University
32. McNitt, J. I., 1983. *Livestock Husbandry Techniques*, English Language Book Society, UK.
33. Moreng, R. E. and J. S. Avens, 1985. *Poultry Science & Production*, Reston Publishing Company Inc., Virginia, USA.
34. Panda, B. and S. C. Mohapatra, 1989. *Poultry Production*, Indian Council of Agricultural Research, India, p. 63.
35. Poultry Husbandry & Hatchery Management. Bangladesh Open University.

Paper Code: 827015		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Pest and Disease Management		

Pest Management

- i. Ecological concepts of Pests and Integrated Pest Management (IPM)
- ii. Principles, philosophy and guidelines of IPM
- iii. Types of pests
- iv. Biology and nature of damage of major insect pests of crops and domestic animals
- v. Economic damage (ED), Economic Injury Level (EIL) and Economic threshold (ET), and their Utility
- vi. Component of IPM: cultural practices, physical, mechanical and legal control; biological control; plant resistance and chemical control
- vii. Hazards in the use of pesticides;
- viii. IPM strategies in cereals, vegetables, fruits, stored product and farm animals

Disease Management

- i. Concept of Disease: What is disease, Causal agents of disease- Biotic vs abiotic, Significance of disease.
- ii. Pathogenesis: Parasitism and pathogenicity, Chain of events in disease development; disease cycle.
- iii. General principles of plant diseases management: avoidance, exclusion, eradication, protection and therapy, immunization and resistance.
- iv. Ecology, survival and mode of spread of plant pathogens: fungi, bacteria, viruses and nematodes.
- v. Major diseases in crops, fish and animals, and their management.
- vi. Measurements of Bio-security and litter.
- vii. Infectious (fungal, bacterial, virus, nemic) disease of plant, fish livestock and poultry.
- viii. Disease sampling and diagnosis.
- ix. Preventive measure (Disposal of dead birds, manure and litter materials).
- x. Vaccination for parent stock and brood.
- xi. Destruction of alternate host, vector, inoculum reservoir and modification of aquatic environment Disposal of dead birds, manure and litter materials; Prevention and control.
- xii. Use of physical and biological agent for controlling diseases.
- xiii. Curative measure (chemical control of disease-causing agents).

Practical

Pest Management

- i. Monitoring and Diagnosis of the plant health problems.
- ii. practicing of various cultural/ mechanical control of insect pests.
- iii. Study on the biological control agents used against different insect pests.
- iv. Study on chemical control: formulations, label information, methods of application and safety information.
- v. Preparation, calculation and calibration of pesticides for field and farm application.
- vi. Development of IPM program for target pest of crops and farm animals.

Disease Management

- i. Techniques for diseased sample collection for isolation of pathogen.
- ii. Preparation of different media for isolation of major pathogens.
- iii. Isolation and identification of pathogens associated with plants, fish and animals.
- iv. Virulence characterization of pathogen.
- v. Efficacy of antibiotics against major pathogens.
- vi. Vaccination and medication practices in livestock and poultry animals.

Suggested Readings

1. Cook, A.A. 1978. Diseases of Tropical and Sub-tropical vegetables and other plants. Hanfer, New York, USA.
2. Agrios, G.N. 2000. Plant Pathology, 4th Edition Academic Press, Singapore.
3. Boyce. J. S. 1961. Forest Pathology. 3rd ed. McGraw Hill Book Co
4. Stakman, C. and J.G. Harrer, 1957. Principles of Plant Pathology. The Ronald Press Company, New York, USA.
5. Cooke. B.M., Jones, G. D. and Kaye, B. 2006. The Epidemiology of Plant Diseases. Springer Science & Business Media
6. Flint, L. M. and R. van den Bosch. 1981. Introduction to Integrated Pest Management. Plenum Press, New York.
7. Integrated Pest Management for Cole Crops and Lettuce, Univ. of Calif. Publ. No. 3307, 112 pp.
8. Chadniwala, K. M. 2003. Bacterial Diseases in Plants. Anmol Publications Pvt. Ltd. New Delhi, India.
9. Aneja, K. R. 2005. Experiments in Microbiology, Plant Pathology and Biotechnology. 4th Edition. New Age International Publishers, New Delhi, India.
10. Mehrotra, R.S. 1980. Plant Pathology, Tata Mc Grow Mill Pub. Co. New Delhi.
11. Metcalf, R. L., and W. Luckman (eds). 1975. Introduction to Insect Pest Management. John Wiley & Sons, New York.
12. Norris, R. F., Cowell-Chen, E.P. and Kogan, M. 2003. Concepts in Integrated Pest Management. Prentice Hall, Upper Saddle River, New Jersey.
13. Pedigo, L.P. 1999. Entomology and Pest Management. Upper Saddle River. New Jersey. Prentice Hall
14. Rangaswami, G. 1998. Diseases of Crop Plants in India. Prentice Hall of India Pvt.Ltd., New Delhi.
15. Rao, V., Umamaheswari, R., Naidu, P. and Sabitri. 2004. Integrated Insect Pest Management. Agrobios, India.
16. Hussain, S. I. and T. A. Khan, 1988. Nematode Diseases of Plant. A Falcon Book from Cosmo Publishing. New Delhi, India.
17. Singh, R.S. 1998. Plant Diseases. Oxford & IBH Publication, New Delhi.
18. Ullah, M. S., Hossain, M. A., Jahan, M., Sarker, M. A. and Hamim, I. 2021. A field guide of major insect pests and diseases. of different crops in Bangladesh. Bangladesh Agricultural University Extension Centre (BAUEC), Bangladesh. PP 500. ISBN: 978-984-35-041-7 [Supported by Food and Agriculture Organization of the United Nations (FAO)]
19. Cranston, R. Weed control: An Introductory Manual.

Paper Code: 827017		Credits: 4	Class Hours: (45+15)= 60hrs.
Paper Title	Food Processing and Marketing		

Food processing

- i. Scope, principles and application of food processing techniques
- ii. Food borne diseases and personal hygiene management.

Preservation

- i. Processing technology of fruit, vegetables, spices, cereals and legumes crops.
- ii. Processing and Preservation of fruit juices, squashes, Jam, jelly, marmalade, pickles, chutney, dried fruits / vegetables.
- iii. Processing and preservation of vegetables (tomato juice, tomato puree, paste, ketchup and sauce, chili pickles).
- iv. Processing and preservation of tea, coffee and nut.
- v. Processing technology of animal foods-Meat, Fish Poultry
- vi. Food Packaging and quality: Definitions: Importance; Types of packaging materials and packages; Packaging materials for fresh and processed food products; Eco-friendly packaging. Introduction to GMP, HACCP, TQM. Product information, labelling and consumer awareness.
- vii. Transportation, grading and standardization, storage and warehousing, processing and value addition.

Marketing

- i. Concept, methods, principles and regulation of agricultural marketing.
- ii. Buying and selling price discovery and price determination, market information, financing for marketing, risk management
- iii. ICT application in agricultural marketing.
- iv. Supply chain and Value Chain in Agricultural product.
- v. Entrepreneurship Development: Rural Entrepreneurship and Rural Marketing.

Practical

1. Identification of common food borne diseases and microorganisms.
2. Preservation of tomato juice for future use.
3. Preparation of tomato pulp and ketchup.
4. Solar drying of fruits and vegetables.
5. Preparation and processing of jam, jelly and marmalade.
6. Preparation of pickles.
7. Preparation of drinks, juice and squash by using seasonal fruits and vegetables.
8. Preservation of fruits pulp and concentrate for future use.
9. Deep fry Products-Chips / Crackers / Fresh fry / Chicken fry.
10. Preparation of sour and sweet yoghurt (Card) from fresh milk.
11. Preparation of fermented vinegar.
12. Cheese preparation from fresh milk, Margarine processing.
13. Processing curry powder (Meat /Fish / Chicken).
14. Processing spicy seasoning for snacks
15. Visit a modern cold storage, industrial visit and report writing.

Suggested Readings

1. Bawa. A.S, Raju, P. S. Chauhan O. P. 2013. Food Science. New India Publishing agency.
2. Frazier & Foster Food Microbiology, Burgess Publisher
3. Crosby, N. T. Food Packaging Materials, published by Applied Science
4. Roday, S. 2011. Food Science, Oxford publication.
5. Srilakshmi, B. Food science, New Age Publishers, 2002
6. Richard C., McDowell, D. and Kirwan, M. J. Food Packaging Technology.
7. Day, F. T. Packaging of Food Beverages-
8. Frank A. Paine, A Handbook of Food Packaging, Blackie Academic
9. Sharma, S. K. 2010. Postharvest Management & Processing of Fruits & Vegetables. New India Publishing Agency.

Paper Code: 827018		Credits: 4	Duration: 30 days
Paper Title	Internship		
	Viva Voce		

- i. Industrial/Farm attachment on specific area of interest.
- ii. Presentation on Report
- iii. Viva Voce