

Year 1 : Term 2

Course Code	Course Title	Credit Hour
AG 1201	Seed Science and Technology -Theory	2.0
AG 1202	Seed Science and Technology - Lab	1.0
AG 1203	Introductory Soil Science -Theory	2.0
AG 1204	Introductory Soil Science - Lab	1.0
AG 1205	Fundamentals of Horticulture -Theory	3.0
AG 1206	Fundamentals of Horticulture - Lab	1.0
AG 1207	Chemistry of Biomolecules -Theory	2.0
AG 1208	Chemistry of Biomolecules - Lab	1.0
AG 1209	Agroforestry and Environmental Science -Theory	3.0
AG 1210	Agroforestry and Environmental Science - Lab	1.0
AG 1211	Agri Machinery -Theory	2.0
AG 1212	Agri Machinery - Lab	1.0
AG 1213	History of the Emergence of Independent Bangladesh -Theory	3.0
AG 1214	Course Viva	1.0
Total		24.0

Course code : AG 1201
Course title : Seed Science and Technology-Theory
Course type : Major
Number of credits : 2
Total marks : 100

Objectives

- Give the students a basic idea about seeds and features of seed quality
- Illustrate quality seed production techniques
- Provide knowledge about seed rate, storage and treatment
- Make the student understand the concept of seed germination, vigour and dormancy
- Impart knowledge about seed certification and marketing systems in Bangladesh

Course content

Introduction to Seed: Definition, importance, classification and structure, formation and development of seed.

Seed Quality: Attributes of quality seed. Importance of quality seed in crop production. Factors affecting seed quality during production and processing.

Seed Germination and Vigor: Definition and process of germination. Conditions necessary for germination. Concept of seed viability and vigour. Significance of seed vigor in crop production.

Seed Dormancy: Definition, kinds and causes. Importance of dormancy in crop production. Means of breaking seed dormancy.

Seed Rate: Concept, planting value of seed. Factors affecting seed rate.

Seed Crop Cultivation: Basic principles, methods of cultivation and harvesting of seed crop. Processing and grading of seed.

Principles of Seed Storage: Environmental factors affecting seed in storage. Types of storage facilities for seed. Safe conditions for seed storage. Factors affecting seed longevity deterioration. The processes involved in seed deterioration.

Seed Treatment: Objectives and procedures. Seed treating chemicals.

Seed Testing: Definition and Objectives. Seed Sampling Testing of seeds for moisture, purity, germination, viability and vigor.

Quality Control of Seed: Definition and Objectives. Seed certification procedure.

Role of National Seed Board, Seed Certification Agency in the quality control of seed. Present status of production and supply of seed in Bangladesh.

Learning outcomes

- Gain the basic concept of seeds and seed quality attributes
- Interpret the seed crop production techniques
- Explain seed rate, storage conditions and treatment techniques
- Describe seed germination, vigor and dormancy
- Familiarize with seed certification and marketing systems in Bangladesh

Teaching strategy: • Lecture • Question and answering • Tutorial

Assessment strategy: • MCQ • Quiz Short question • Essay type question

• Assignment

References

1. Agrawal, R. L. 2009. Seed Technology. Second Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India.
2. Basra, A.S. (ed.). 1995. Seed Quality: Basic Mechanisms and Agricultural Implications. Food Product Press, New York.
3. Basra, A.S. (ed). 2006. Handbook of Seed Technology. Haworth Press New York, USA.
4. Begley, J.D. and Black, M. 1994. Seed Physiology of Development and Germination. 2nd Edition, Springer- Verlag. London.
5. Copeland, L. O. and McDonald, M. B. 1995. Seed Science and Technology. 3rd Edition, Chapman & Hall, New York.
6. Copeland L.O. and McDonald, M.F. 2001. Principles of Seed Science and Technology – 4th Ed. Burgess Pub. Co., USA

7. Joshi, A. K. and Singh, B. D. 2005. Seed Science and Technology. Kalyani Publishers, New Delhi, India.

Course code	: AG 1202
Course title	: Seed Science and Technology -Lab
Course type	: Major
Number of credits	: 1
Total marks	: 100

Objectives

- Enable the students to identify and classify seeds of different field crops
- Demonstrate different seed structures
- Exhibit different seed sampling techniques
- Enable the student to perform the different seed quality tests
- Teach the students calculating seed rate of different crops
- Show seed crop cultivation technique



Course content

1. Identification of seed and preparation of seed album.
2. Study of structures of monocotyledonous and dicotyledonous seeds.
3. Techniques of seed sampling
4. Moisture test of seed
5. Purity test of seed
6. Germination test of seed
7. Viability test of seed
8. Vigor test of seed
9. Calculation of seed rate of crops.
10. Practicing seed grading.
11. Practicing seed treatment
12. Growing seed crop in students' individual plots/pots.

Learning outcomes

- Identify and classify seeds of different field crops
- Familiarize with different seed structures
- Perform different seed sampling techniques
- Test seeds for different quality attributes
- Calculate seed rate of different crops
- Raise seed crops

Teaching strategy: • Lecture • Demonstration • Lab work • Field Visit

Assessment strategy: • Sample identification • Illustration • Oral examination • Exercise

References

1. McDonald, M.B. and Copeland, L. O. 1997. Seed Production: Principles and Practices. Chapman & Hall, New York.
2. Copeland, L.O. and McDonald, M.B. 1995. Seed Science and Technology. 3rd Edition. Chapman & Hall, New York.
3. Basra, A.S. (ed.). 1995. Seed Quality: Basic Mechanisms and Agricultural Implications. Food Product Press, New York. Hampton, J.G. and Tekrony, D.M. (eds.). 1995. Handbook of Vigour Test Methods. 3rd Edition. International Seed Testing Association, Zurich, Switzerland.
4. ISTA. 1999. International Rules for Seed Testing. 1999. Supplement to Seed Science and Technology. Vol. 27, pp. 27-32.
5. Bewley, J.D. and Black, M. 1994. Seed Physiology of Development and Germination. 2nd edition. Springer-Verlag, London
6. STA. 1999. International Rules for Seed Testing. 1999. Supplement to Seed Science and Technology. Vol. 27. pp. 27-32.
7. Nema, N. P. 1989. Principles of Seed Certification and Testing. Allied Publishers Limited. Ahmedabad, Bangalore, Bombay, Calcutta, Hyderabad, Lucknow, Madras, New Delhi, India.
8. Sen, S. and Ghosh, N. 2008. Seed Science and Technology. Kalyani Publishers, Ludhiana, New Delhi, Hyderabad, Kolkata, India.

Course code	: AG 1203
Course title	: Introductory Soil Science-Theory
Course type	: Major
Number of credits	: 2
Total marks	: 100

Objectives

- Discuss soil composition and their functions.
- Describe soil genesis and explain importance of different soil properties.
- Explain the functions of plant nutrients, compositions of manures and fertilizers.
- Identify and classify the soil organisms involved in soil fertility.

Course content**Soil genesis**

Concept of soil, major components of soil
 Rocks and minerals - classification and properties
 Weathering – physical and chemical weathering
 Soil forming factors – climate, biosphere, parent material, relief and time
 Soil forming processes – laterization, podzolization and calcification
 Soil profile

Soil physical properties

Soil particles - classification and properties
 Soil texture – classification and importance
 Soil structure – genesis, classification and importance
 Soil density - particle density and bulk density
 Soil porosity – factors and importance of soil porosity
 Soil air – composition and importance
 Soil colour – causes and importance
 Soil water – Classification and importance
 Soil temperature – factors and importance of soil temperature

Soil pH

Concept of soil pH
 Grouping of soils according to pH values

Plant nutrients

Criteria for essentiality, available forms, macro and micronutrients, and functions.
 Soil fertility and soil productivity.
 Manure and fertilizer - kinds and composition.

Soil organisms

Classification of soil organisms
 Bacteria, fungi and algae – classification and functions
 Earthworms - habitats and functions

Learning outcomes

- Explain soil and its components
- Describe rocks and minerals and their weathering processes, soil forming processes and factors
- Illustrate and evaluate soil genesis and soil formation
- Interpret soil physical properties and processes and their significance in crop production
- Classify soil pH and explain its significance in crop production
- Describe essential plant nutrients, their functions and sources
- Categorize soil organisms and select beneficial organisms

Teaching strategy: • Lecture • Question and answering • Tutorial

Assessment strategy: • MCQ • Short question • Essay type question
 • Assignment



References

1. Alexander, M. 1977. Introduction to Microbiology. John Wiley & Sons Inc., New York.
2. Baver, L.D., Gardner, W. H. and Gardner, W.R. 1972. Soil Physics, 4th edition. John Wiley & Sons. Inc., New York.
3. Biswas, L.D., and Mukherjee, S.K. 1991. Text book of Soil Science. Tata McGraw-Hill Pub. Ltd., New Delhi.
4. Brady, N.C. and Weil, R.R. 2006. The Nature and Properties of Soils. Thirteen edition Pearson Education Pvt. Ltd. New Delhi, India.
5. Foth H.D. 1991 Fundamentals of Soil Science. 8th edition, Willey and Black, USA.
6. Miller, R.W. and Donahue, R.L. 1990. Soils- An Introduction to Soils and Plant Growth. Prentice Hall Inc. USA.
7. Subba Rao, N.S. 1987. Advances in Agricultural Microbiology. Oxford and IBH Pub. Co., New Delhi.

Course code	: AG 1204
Course title	: Introductory Soil Science -Lab
Course type	: Major
Number of credits	: 1
Total marks	: 100

Objectives

- Provide knowledge about hands-on practice of soil properties.
- Impart practical skill of collecting soil samples and measuring soil quality attributes.
- Identify fertilizers, rocks and minerals that are involved in soil genesis.
- Distinguish beneficial soil organisms that are involved in soil fertility and crop productivity.

Course content

1. Precautions to be taken while working in the laboratory
2. Collection and preparation of soil samples
3. Identification of different rocks and minerals
4. Determination of particle density of soil volumetric flask method
5. Determination of bulk density of soil by core sampler method
6. Estimation of soil porosity
7. Identification of different fertilizers
8. Techniques of sterilization
9. Motility test of bacteria by hanging drop method
10. Identification of bacteria by Gram staining method

Learning outcomes

- Describe safety measures to conduct laboratory analysis
- Collect and process soil samples for quantifying soil density and porosity
- Identify rocks, minerals and fertilizers
- Demonstrate agents of sterilization
- Isolate, identify and classify bacteria
- Demonstrate bacterial movement

Teaching strategy: • Lecture • Tutorial • Self study/e-learning

Assessment strategy: • MCQ • Short question • Essay type question
 • Assignment

References

1. Alexander, M. 1977. Introduction to Soil Microbiology. John Wiley & Sons Inc., New York.
2. Baver, L.D., Gardner, W.H. and Gardner, W.R. 1972. Soil Physics, 4th edition. John Wiley & Sons. Inc., New York.
3. Biswas, T.D. and Mukherjee, S.K. 1991. Textbook of Soil Science. Tata McGraw-Hill Pub. Comp. Ltd., New Delhi.
4. Brady N.C. 1999. The Nature and Properties of Soils. Varun Exports, India.
5. Kohnke, H. 1968. Soil Physics. McGraw Hill Book Comp., New York.
6. Miller, R.W. and Donahue, R.L. 1990. Soils-An Introduction to Soils and Plant Growth. Prentice Hall Inc., USA.
7. Seeley, H.W. and Van Demark, J.J. 1975. Microbes in Action. A Laboratory Manual of Microbiology. D.B. Taraporvala Sons Co. Pvt. Ltd., India.
8. Subba Rao, N.S. 1987. Advances in Agricultural Microbiology. Oxford and IBH Pub. Co., New Delhi.
9. Tamhane, R.U., Motiramani, D.P., Bali, Y.P. and Donahue, R.L. 1970. Soils-Their Chemistry and Fertility in Tropical Asia. Prentice Hall of India Pvt. Ltd., New Delhi.
10. Thomson, L.M. and Troeh, F.R. 1978. Soils and Soil Fertility. McGraw Hill, New York

Course code : AG 1205

Course title : Fundamentals of Horticulture-Theory

Course type : Major

Number of credits : 3

Total marks : 100

Objectives

- Provide knowledge on nursery management
- Explain the different methods of plant propagation
- Understand crop husbandry and postharvest management

Course content

Introduction to horticulture: Definition, history, branches, importance and scope of horticulture.

Principles and practices in horticulture: Planting methods and raising of seedlings, soil and land preparation, plant spacing, manure and fertilizer application, irrigation and drainage, intercultural operations.

Nursery management: Definition, types, Objectives, establishment and management of nursery and its structures, calendar of nursery activities.

Propagation of horticultural crops: Definition, importance, methods and techniques, advantages and disadvantages, use of growth regulators in propagation.

Training and pruning: Concept, *Objectives*, principles, types, methods and their effects on plant structure and bearing.

Harvesting and handling of horticultural crops: Harvesting, sorting, grading, packaging, transportation and marketing of horticultural crops.

Learning outcomes

- Describe the history, branches, importance and scope of horticulture
- Explain the principles and practices including planting methods, raising of seedlings and different intercultural operations
- Apply the skills of different nursery management and propagation practices
- Demonstrate training and pruning in horticulture
- Harvest and postharvest handling of different horticultural crops

Teaching strategy: • Lecture • Group discussion • Video clip

Assessment strategy: • MCQ • Short question • Essay type question • Pop quiz

References

1. Adams, C.R., K.M. Bamford and M.P. Early. 1993. Principles of Horticulture (2nd edn.). Linacre House, Jordan Hill, Oxford. (5th edition, 2011 available).
2. Bose, T.K., S.K. Mitra and M.K. Sadhu. 1986. Propagation of Tropical and Sub-tropical Horticultural Crops. Naya Prokosh, Calcutta. (1991 available).
3. Davidson, H.R. Meckienburg, and C. Peterson, 1994. Nursery management: Administration and culture (3rd edition), Englewood cliffs, N.J. Prentice-Hall.
4. Hartmann, H.T., D.E. Kester and F.T. Davies Jr. 1990. Plant Propagation: Principle and Practices. Prentice-Hall, International editions. (7th edition, 2001 available).
5. Mondal, M.F. 2000. Nursery and Plant Propagation (in Bangla). Mrs. Afia Mondal, BAU Campus, Mymensingh.
6. Prasad, S. and U. Kumar, U. 1999. Principles of Horticulture. Agro Botanica, New Delhi.
7. Thompson, A. K. 2003. Fruits and Vegetables: Harvesting, Handing and Storage (Second edition). Blackwell Publishing Ltd. Oxford, UK.

Course code	: AG 1206
Course title	: Fundamentals of Horticulture -Lab
Course type	: Major
Number of credits	: 1
Total marks	: 100

Objectives

- Describe the skills on modern nursery management
- Demonstrate the techniques of plant propagation
- Demonstrate seedbed preparation
- Hands-on practice of different planting and harvesting methods

Course content

1. Layout of a nursery.
2. Identification and use of nursery equipments.
3. Methods of planting horticultural crops.
4. Preparation of seedbed and nursery bed.
5. Practices on potting, depotting and repotting.
6. Propagation practices of different horticultural crops.
7. Pruning and training of important horticultural crops.
8. Practicing different methods of application manure and fertilizer.
9. Practices on different intercultural operations.
10. Harvesting methods of horticultural crops.
11. Visit to an agricultural nursery/farm and preparation of report.

Learning outcomes

- Prepare layout of a nursery
- Identify and use of nursery equipments
- Practice planting methods and intercultural operations
- Prepare seedbed and nursery bed
- Practice potting, de-potting and repotting
- Conduct propagation practices of different horticultural crops
- Operate harvesting of different horticultural crops using various methods

Teaching strategy: • Lecture • Demonstration and individual practice •
Group discussion • Video clip

Assessment strategy: • MCQ • Short question • Essay type question • Pop quiz

References

1. Acquaah, G. 2008. Horticulture: Principles and Practices. Prentice Hall; 4 edition.
2. Bakhshai, J.C., D.U. UPPAL and H.N. Khajuria. 1997. (2nd edn.). The Prunning of Fruit Trees and Vines. Kalyani Publishers. India.
3. Bose, T.K., S.K. Mitra and M.K. Sadhu. 1986. Propagation of Tropical and Sub-tropical Horticultural Crops. Naya Prokosh, Calcutta. (1991 available).
4. Edward, R. and C. S. 2010. Introductory Horticulture. Delmar Cengage Learning; 8th Revised edition. 5 Maxwell Drive, Clifton Park, NY 12065-2919.
5. Hartmann, H.T., D.E. Kester and F.T. Davies Jr. 1990. Plant Propagation: Principle and Practices. Prentice- Hall, International editions. (7th edition, 2001 available).
6. Mondal, M.F.2000. Nursery and Plant Propagation (in Bangla). Mrs. Afia Mondal, BAU Campus, Mymensingh.
7. Sharma, S. K. 2010. Postharvest Management & Processing of Fruits & Vegetables. New India Publishing Agency.

Course code	: AG 1207
Course title	: Chemistry of Biomolecules -Theory
Course type	: Major
Number of credits	: 2
Total marks	: 100

Objectives

- Provide knowledge on sources and classification of biomolecules
- Explain properties and biochemical functions of biomolecules
- Construct structure of bimolecules

Course content

Carbohydrates: Occurrence, definition, classification, physical and chemical properties. Chemistry of monosaccharides and disaccharides. Composition and chemical linkages of polysaccharides with special reference to starch, cellulose and cell-wall polysaccharides.

Proteins: Definition, classification, physical and chemical properties. Amino acid composition of peptides and proteins. Hydrolysis of proteins, Reactions of amino acids. Amino acids as ampholytes. Isoelectric point. Protein structure. Plant proteins - leaf, seed and cereal proteins.

Lipids: Definition, classification, chemical and physical properties. Fatty acid composition of fats. Chemical reactions of fatty acids. Edible oils and their characteristic fatty acid composition. characterization of fats. Oils and waxes. Phospholipids with special reference to lecithin and cephalin. Phospholipids and glycolipids as membrane components.

Nucleic acids: Occurrence, composition, classification and structural features.
Chemical and physical properties. Important functions of nucleic acids.

Enzymes: Definition, classification and chemical nature of enzymes. Concept of coenzymes and prosthetic groups. Mode of action of enzymes. Factors affecting enzymatic reaction. Enzyme specificity and inhibition with special reference to plant proteolytic enzymes. Concept of active centre. Principle of enzyme assay.

Vitamins: Classification and biochemical functions.

Plant Hormones: Classification and biochemical functions.

Learning outcomes

- Classify different bimolecular bimolecules
- List the sources and biological function different bimolecules
- Describe the physical and chemical properties of bimolecules
- Compare and contrast among various bimolecules
- Determine the structure of unknown bimolecules
- Construct Algometric-/polymeric forms of various bimolecules

Teaching strategy: • Lecture • Group discussion • Video clip • Exercise
• Assignment

Assessment strategy: • Gap filling • Short question • Essay type question
• Multiple choice • Assignment

References

1. Conn, E.E. and Stumpf, P. K. 1987. Outlines of Biochemistry. 5th edition. John Wiley and Sons, New York.
2. Devlin, T.M. 2002. Textbook of Biochemistry. 5th edition. John Wiley and Sons, Inc. USA.
3. Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H. and Martin, K.C. 2016. Molecular Cell Biology. 8th edition. W. H. freeman and company. New York.
4. Murray, R.K. 2002. Harper's Biochemistry. 25th edition. McGraw Hill. Printed in Singapore.
5. Nelson, D.L. and Michael, M.M. 2017. Lehninger Principles of Biochemistry. 7th edition. W. H. freeman and company. New York.
6. Stryer, L. 1995. Biochemistry. 4th edition. W. H. freeman and company. New York.
7. Voet, D and Voet, J.G. 1995. Biochemistry. 2nd edition, John Wiley and Sons, New York

Course code	: AG 1208
Course title	: Chemistry of Biomolecules -Lab
Course type	: Major
Number of credits	: 1
Total marks	: 100

Objectives

- Prepare common laboratory solutions
- Identify and quantify various bimolecular
- Analyze enzymatic activity

Course content

1. Preparation of buffer solutions and determination of pH.
2. Determination of PKA value.
3. Colour tests of carbohydrates.
4. Colour tests of proteins.
5. Preparation of esters and solubility tests for fats.
6. Preparation of starch and detection of amylase activity,
7. Determination of vitamin C
8. Proximate analysis: Moisture, fat, protein, crude fibre and ash.

Learning outcomes

- Prepare various types of solutions
- Determine the pH of a solution
- Identify unknown biomolecules in plant sample
- Test the solubility of fats in various solvents
- Assess the activity of enzymes on their substrates
- Quantify various biomolecules and nutrients in plant samples

Teaching strategy: • Lecture • Demonstration• Practice • Assignment

Assessment strategy: • Quiz • Experiment • Assignment

References

1. Principle of Biochemistry, Albert L. Lehninger 2nd Edition. Kalyani Publishers. Ludhiana, New Delhi, 1994.
2. Biochemistry, Lubert Stryer, Published by S.K. Jain for CBS Publishers and Distributors, 485 Jain Bhawan, Bhola Nath Nagar, Delhi, India, 1986.
3. Harper's Review of Biochemistry. David W. Martin, Jr. Peter A. Mayes, Victor W. Rodwell and Davy' K. Granner. 20th Edition, 1983. Lange Medical Publication. Drawer L. Los, Altos, California, USA, 1983.
4. Outlines of Biochemistry, Eric E. Conn, Paul K. Stumpf, George Brueming and Roy, H. Doi. John Wiley and Sons, New York, 1995 (5th edition).

5. Text Book of Biochemistry. Edward S. West, Wilber R. Todd, Haward S. Mason and John T. Van Bruggan. 4th Edition, 1966. The Macmillan Company. Collier-Macmillan Ltd. London, 1966.
6. An introduction to practical Biochemistry. Davit T. Plummer. Tata McGraw-Hill Publishing Company Limited, New Delhi, 1995.
7. Biochemistry Laboratory Manual. F. M. Strong. WM.C. Brown Company Publishers, USA, 1965.
8. Biochemistry Laboratory Techniques. Sterling Chaykin. Wiley Eastern Private Limited, New Delhi, 1970.
9. Biochemical Calculations. How to Solve Mathematical Problem in General Biochemistry. Irwin H. Segel. John Wiley and Sons, Inc. New York, 1968.
10. Experimental Biochemistry. A Laboratory Manual. Gerald Litwack. John Liley and Sons. Inc, New York, 1960.

Course code	: AG 1209
Course title	: Agro forestry and Environmental Science-Theory
Course type	: Major
Number of credits	: 3
Total marks	: 100

Objectives

- Acquaint students with the concepts, components and attributes of agro forestry.
- Distinguish conventional forestry, social forestry and agro forestry.
- Understand the integrated production systems with multiple components.
- Realize the significant role of trees towards soil and water conservation.
- Analyze cost-benefit and economic aspects of different agro forestry systems.
- Develop skills to design appropriate agro forestry model for rural development and nature conservation.

Course content

Introduction: Concept, scope and benefits of agro forestry, present status of forest resources in Bangladesh. Possible improvement of present land use system in coastal area through sustainable agro forestry practices.

Classification of agro forestry system: Components and structures of agro forestry and social forestry systems, their classification and inter linkages with other farming systems.

Agro forestry species and their compatibility: Woody (trees and shrubs) and non-woody (annual crops) species suitable for agro forestry systems, characteristics of agro forestry species; species compatibility and adaptability in different agro ecological zones with special reference to salinity, drought, marshy and degraded lands.

Agro forestry management technique: Various regeneration systems and nursery management, plantation and replanting systems, development of wastelands and establishment of trees through agro forestry systems, management of trees and other components.

Agro forestry Production technique: Introduction to agrisilvicultural, silvopastoral, agro silvopastoral and multistoried tree production techniques, hill cultivation-SALT practice and its different models.

Agro forestry products their uses and economic of agro forestry Systems: Harvesting of fuel, fodder, timber and crops; processing and preservation of agro forestry products, marketing systems.

Bangladesh environment: Environment of Bangladesh, its degradation and management. Agricultural practices for environmental sustainability.

Learning outcomes

- Explain agro forestry, forestry and social forestry with their characteristics, benefits and
- attributes.
- Categorize agro forestry practices; suggest appropriate agro forestry practices for different land
- types with suitable MPTS.
- Demonstrate tree management techniques
- Determine tree-crop interaction effect and Land Equivalent Ratio (LER)
- Design agro forestry practices for erosion control and reclaiming degraded soil
- Analyze marketing channel and cost-benefit of agro forest products

Teaching strategy: • Lecture • Field visit • Video clip • Assignment

Assessment strategy: • MCQ • Short question • Essay

- Project

References

1. Bandyopadhyay, A.K. 1997. A textbook of Agro forestry with Applications. Vikas Publishing House Pvt. Ltd, New Delhi.
2. Dwivedi, A.P. 1992. Agro forestry- Principles and Practices. Oxford and IBH Pub. Co., New Delhi.
3. Jha, L.K. 1995. Advances in Agro forestry. APH Publishing Corporation, New Delhi.
4. Nair, P.K.R. 1993. An Introduction to Agro forestry. ICRAF, Nairobi.
5. Haque, M.A. (ed.) 1996. Agro forestry in Bangladesh. VFFP, BAU, Mymensingh and SDC, Dhaka.
6. Ong, C.K. and P.A. Huxley. 1999. Tree-crop Interactions: A Physiological Approach. CABI Publishing.
7. Young, A. 2000. Agro forestry for Soil Management. 2nd Edition, CABI Publishing.

Course code	: AG 1210
Course title	: Agro forestry and Environmental Science -Lab
Course type	: Major
Number of credits	: 1
Total marks	: 100

Objectives

- Identify and describe common Multipurpose Trees and Shrubs (MPTS) used in Agro forestry in the tropics and subtropics.
- Demonstrate above and below ground tree-crop interactions.
- Design an ideal agro forestry nursery and seedlings/saplings growing techniques.
- Determine and analyze the growth and biomass yield of trees.
- Assess and interpret land use problems and socioeconomic conditions when designing different agro forestry practices.

Course content

1. Identification of MPTS and their plant parts
2. Demonstration of tree crop interactions and their combined productivity
3. Preparation of nursery for raising sapling
4. Plantation under different systems
5. Root and shoot management of trees and shrubs under agro forestry systems
6. Study of roots spread and root mass of trees in co fields.
7. Determination of growth and biomass yield of trees and other components
8. Field visit (Any suitable area of Bangladesh) to observe agro forestry, social forestry and forestry activities and preparation of report individually.

Learning outcomes

- Identify multipurpose trees and shrubs (MPTS) in different categories, their diversified uses and mode of propagation.
- Describe the possible tree-crop interactions and their effect measurement in integrated farming system
- Design and calculate the required material for an ideal forest nursery to raise tree seedlings/saplings.
- Describe tree management techniques maximizing the farm productivity.
- Determine tree growth and calculate its tentative timber volume and price.
- Develop agro forestry model for the different land category.
- Categorize conventional forestry, agro forestry and social forestry activities.

Teaching strategy: • Lecture • Field visit • Video clip • Demonstration

Assessment strategy: • MCQ • Identification • Assignment • Observation
• Experiment

References

1. Bandyopadhyay, A.K. 1997. A text book of Agroforestry with Applications. Vikas Pub. House Pvt. Ltd. New Delhi.
2. Chundawat, B.S. and S.K. Gautam. 1993. Textbook of Agro forestry. Oxford and IBH Pub. Co., New Delhi.
3. Dwivedi, A.P. 1992. Agro forestry-Principles and Practices. Oxford and IBH Pub. Co., New Delhi.
4. Jha, L.K. 1995. Advances in Agro forestry. APH Publishing Corporation, New Delhi.
5. Nair, P.K.P. 1993. An Introduction to Agro forestry. ICRAF, Nairobi.
6. Alam, M.K.; F.U. Ahmed and S.M.R. Amin (eds.). 1997. Agro forestry: Bangladesh Prospective. APAN, NAWG and BARC., Dhaka. Haque, M.A. (ed.) 1996. Agro forestry in Bangladesh. VFFP, BAU, Mymensingh and SDC. Dhaka.
7. Huxley, P.A. 1999. Tropical Agro forestry. Blackwell Sciences.
8. Khan, M.S. and M.K. Alam. 1996. Homestead Flora of Bangladesh. BARC, IDRC, SDC, Dhaka.
9. Ong, C.K. and P.A. Huxley. 1999. Tree-crop Interactions: A Physiological Approach. CABI Publishing.
10. Young, A. 2000. Agro forestry for Soil Management. 2nd Edition, CABI Publishing.

Course code	: AG 1211
Course title	: Agri Machinery -Theory
Course type	: Minor
Number of credits	: 2
Total marks	: 100

Objectives

- Provide knowledge on heat engine, agricultural machineries, and pumps.
- Explain and analyze the field and economic performances of engine, agricultural.
- machineries, and pumps.
- Describe estimation of small construction cost in the field of agriculture.

Course content

Introduction: Farm mechanization and its scope and importance in Bangladesh, Sources of farm power and their status.

Engine: Definition of engine and their classification, major component of engine, engine terminology, engine systems, maintenance of engine.

Farm machinery:

- a. Tillage, crop planting and plant protection machinery, repair and maintenance of farm machinery.
- b. Importance of drying and classification of dryers.

500 -

†

c. Irrigation and its importance in Bangladesh. Methods of irrigation, irrigation efficiency. Classification of pumps and introduction to pumps commonly used in Bangladesh.

Building materials: Introduction to common building materials: brick, sand, cement and timber. Estimation of simple building structures.

Learning outcomes

- Identify status, benefits and constraints of agricultural mechanization in Bangladesh.
- Explain different types of engine, their systems and troubleshooting.
- Illustrate different tillage implements, crop establishment, harvesting, threshing &
- drying machineries.
- Evaluate field and economic performance of different types of agricultural machineries.
- Describe irrigation methods, irrigation efficiency, pump selection and cost analysis.
- Estimate material and cost of a simple agricultural construction.

Teaching strategy: • Lecture • Discussion • Demonstration by video • Question & answer • Self Study • Case Studies • Practice & Group Studies

Assessment strategy: • Question & answer • Assignment • Quiz • Observation

References

1. M. Michael and T. P. Ojha (1978). Principles of Agricultural Engineering (Vol. I & II). Jain Brothers (New Delhi).
2. Donnel Hunt (1983). Farm Power and Machinery Management. Iowa State University Press, Iowa.
3. S. C. Jain and C. R. RAI. (1980). Tractor Engine Maintenance and Repair. Tata McGraw Hill Publishing Company limited, New Delhi.
4. V. E. Hansen, O.W. Israelsen and G. E. Stringham (1993). Irrigation Principles and Practice. John Wiley & Sons.
5. M. A. Aziz (1967). A Text Book of Estimating and Costing. Zohri Pub., Dhaka.

Course code	: AG 1212
Course title	: Agri Machinery -Lab
Course type	: Minor
Number of credits	: 1
Total marks	: 100

Objectives

- Demonstrate different types of heat engine, agricultural machineries, and pumps.
- Impart knowledge and skills to select, repair and maintenances of engine, agricultural machineries, and pumps.

Course content

1. Study of common hand tools, identification and use of major parts of engine.
2. Study of fuel system, ignition system, cooling and lubrication system.
3. Power transmission system of C.I. and S.I. engines.
4. Operation of farm machineries.
5. Practical problems on construction materials and estimation.

Teaching strategy: • Lecture • Discussion • Demonstration • Demonstration by video
 • Question & answer • Self Study • Case Studies • Practice & Group Studies
 • Assignment

Assessment strategy: • Question & answer • Assignment • Quiz • Observation

Reference

1. A.M. Michael & T.P. Ojha. Principles of Agricultural Engineering (Vol. I & II). Jain Brothers (New Delhi) 1978
2. Donnel Hunt. Farm Power and Machinery Management. Iowa State University Press, Iowa, 1983.
3. S.C. Jain and C.R. RAI. Tractor Engine Maintenance and Repair. Tata McGraw Hill Publishing Company Limited, New Delhi. 1980.
4. V.E. Hansen, O.W. Israelsen & G.E. Stringham. Irrigation Principles & Practice. John Wiley & Sons. 1993.
5. Aziz, M.A, 1967: A Text Book of Estimating and Costing Zohri Pub., Dhaka.
6. Aziz, M.A. 1990: A Text Book of Engineering Materials. Book Center, Dhaka.

Course code : AG 1213

Course title : History of the Emergence of Independent Bangladesh – Theory

Course type : Non-Major/ Major

Number of credits : 3

Total marks : 100

ভূমিকা : স্থানীয় বাংলাদেশের অভ্যন্তরের ইতিহাস-পরিষি ও পরিচিতি (Introducing History of the Emergence of Independent Bangladesh and its Scope)

১. দেশ ও জনগোষ্ঠীর পরিচয় (Description of the Country and its People)
 ভূ-প্রকৃতির বৈশিষ্ট্য ও প্রভাব (Geographical Features and its Influence) নৃতাত্ত্বিক গঠন(Ethnical Composition)
 গ. ভাষা (Language)
২. উপ-মহাদেশের বিভক্তি ১৯৪৭, পাকিস্তান রাষ্ট্রের কাঠামো, বৈষম্য, ভাষা আন্দোলন এবং আইয়ুব ও ইয়াহিয়া খানের শাসনামল (১৯৫৮-১৯৭১) (Partition of the Sub-Continent 1947, Structure of Pakistan, Disparity, the Language Movement and the Rule of Ayub-Yahia Khan (1958-1971))
 ক. লাহোর প্রস্তাৱ, ১৯৪০ (Lahore Resolution, 1940)
 খ. পাকিস্তান সৃষ্টি, ১৯৪৭(The creation of Pakistan 1947)
 গ. কেন্দ্রীয় ও প্রদেশীক কাঠামো (Central and Provincial Structure)

ঘ. অর্থনৈতিক, সামাজিক ও সাংস্কৃতিক বৈষম্য (Economic, Social and Cultural Disparity)

ঙ. পাকিস্তানের অপশাসন ও গণতান্ত্রিক রাজনীতির সংগ্রাম (Misrule of Pakistan and Struggle for Democratic Politics)

চ. ভাষা আন্দোলন : পটভূমি ও ঘটনা প্রবাহ (The Language Movement : Context and Phases)

ছ. হক-ভাসানী-সোহরাওয়ার্দীর যুজ্ফুন্ট, ১৯৫৪ সালের নির্বাচন ও পরিণতি (United Front of Haque-Vasani-Suhrawardi : Election of 1954 and its Consequences)

জ. আইয়ুব খানের ফামতা দখল ও শাসনের বৈশিষ্ট্য (রাজনৈতিক নিপীড়ন, মৌলিক গণতন্ত্র, ধর্মের রাজনৈতিক ব্যবহার) [Ayub Khan's Rise to Power and Characteristics of His Rule (Political Repression, Basic Democracy, Islamisation)]

ঘ. আইয়ুব খানের পতন ও ইয়াহিয়া খানের শাসন, এক ইউনিট বিলুপ্তিরণ, সর্বজনীন ভোটদিকার, এলএফও (Fall of Ayub Khan and Yahia Khan's Rule, Abolition of One Unit, Universal Suffrage, LFO)

৩. জাতীয়তাবাদের বিকাশ, স্বাধিকার আন্দোলন (Rise of Nationalism and the Movement for Self-Determination)

ক. শেখ মুজিবুর রহমানের -দফা ৬ আন্দোলন (The Six Point Movement of Sheikh Mujibur Rahman)

খ. ৬-দফা আন্দোলনের প্রতিক্রিয়া, শুরুত্ব ও তাৎপর্য (Reactions, Importance and Significance of the Six Point Movement)

গ. আগরতলা মামলা, ১৯৬৮ (The Agartala Case, 1968)

ঘ. ছাত্রদের ১১-দফা আন্দোলন (Students' 11-Points Movement)

ঙ. ১৯৬৯-এর গণঅভ্যুত্থান (The Mass-Upsurge of 1969)

৪. ১৯৭০ সালের নির্বাচন, অসহযোগ আন্দোলন ও বঙ্গবন্ধুর স্বাধীনতা ঘোষণা (Election of 1970, Non-cooperation Movement of March 1971 and the Declaration of Independence by Bangabandhu)

ক. নির্বাচনের ফলাফল এবং তা মেনে নিতে কেন্দ্রের অস্বীকৃতি Election(Result and Central's Refusal to Comply)

খ. অসহযোগ আন্দোলন, বঙ্গবন্ধুর ৭ই মার্চের ভাষণ, অপারেশন সার্চলাইট (The Non-cooperation Movement, the 7th March Address, Operation Searchlight)

গ. বঙ্গবন্ধুর স্বাধীনতা ঘোষণা ও গ্রেফতার Declaration(of Independence by Bangabandhu and His Arrest)

ঘ. স্বাধীনতার ঘোষণাপত্র ও বাংলাদেশ সরকার গঠন (The Proclamation of Independence and the Formation of Bangladesh Government)

৫. মুক্তিযুদ্ধ ও স্বাধীন বাংলাদেশের প্রতিষ্ঠা (The War of Liberation and Formation of Independent Bangladesh)

ক. স্বতঃস্ফূর্ত প্রাথমিক প্রতিরোধ ও সংগঠিত প্রতিরোধ (মুক্তিফৌজ, মুক্তিবাহিনী, গেরিলা ও সমুখ যুদ্ধ [The Spontaneous Early Resistance and Subsequent Organized Resistance (Mukti Fouj, Mukti Bahini, Guerillas and the Frontal Warfare)])

খ. গণহত্যা, নারী নির্যাতন, শরণার্থী (Genocide, Repression of Women, Refugees)

গ. মুক্তিযুদ্ধে প্রচার মাধ্যম (স্বাধীন বাংলা বেতার কেন্দ্র, বিদেশি প্রচার মাধ্যম ও জনমত গঠন) [Publicity Campaign in the War for Liberation (Swadhin Bangla Betar Kendra, the Campaigns Abroad and Formation of Public Opinion)]

৪. দখলদার বাহিনী, শান্তি কমিটি, আল-বদর, আল-শামস, রাজাকার বাহিনী, রাজনেতিক দল ও দেশীয় অন্যান্য সহযোগীদের স্বাধীনতা বিরোধী কর্যকা- ও বৃক্ষজীবী হত্যা (The Anti-Liberation Activities of the Occupation Army, the Peace Committee, AL-Badar, Al-Shams, Rajakars, Pro-Pakistan Political Parties and Pakistani Collaborators, Killing of the Intellectuals)
৫. পাকিস্তানে বন্দী অবস্থায় বঙ্গবন্ধুর বিচার ও বিশ্ব প্রতিক্রিয়া (Trial of Bangabandhu in Pakistan and Reaction of the World Community)
৬. মুক্তিযুক্ত ভারতের অবদান ও আন্তর্জাতিক সম্প্রদায়ের ভূমিকা (The Contribution of India in the Liberation War and the Role of International Communities)
৭. মৌখিক বাহিনী গঠন ও বিজয় (Formation of Joint Command and the Victory)
৮. বঙ্গবন্ধুর স্বদেশ প্রত্যাবর্তন (Homecoming of Bangabandhu)
৯. সংবিধান গঠন (Formation of the Constitution)
১০. যুক্ত বিপ্লবত দেশ পুনৰ্গঠন (Reconstruction of the War Ravaged Country)
- ট. স্বাধীনতা বিরোধীদের ঘড়্যবন্ধ ও বঙ্গবন্ধুর হত্যা (Conspiracy of the Anti-Liberation Activists and the Murder of Bangabandhu)

সহায়ক এছাবতি

A A K Niazi Karachi	: <i>The Betrayal of East Pakistan</i> , Oxford University Press, 1998.
Anthony Mascarenhas Archer K Blood <i>American Diplomat</i> , Dhaka	: <i>The Rape of Bangladesh</i> , New Delhi : Vikas, 1971. : <i>The Cruel Birth of Bangladesh : Memoirs of an UPL</i> , 2002.
Sucheta Ghosh Calcutta	: <i>The Role of India in the Emergence of Bangladesh</i> , Minerva Associates Pvt. Ltd., 1983.
এইচ টি ইমাম গোলাম মুরশিদ গোলাম মুরশিদ নীহাররঞ্জন রায় বেলাল মোহাম্মদ মন্দদুল হাসান মওদুদ আহমেদ মুনতাসীর মামুন মোঃ মাহবুব রহমান শেখ মুজিবুর রহমান সৈয়দ আতিকুল ইসলাম ও অন্যান্য সৈয়দ আলোয়ার হোসেন হাম্মন-অর-রশিদ	: বাংলাদেশ সরকার ১৯৭১ : মুক্তিযুদ্ধ ও তারপর : একটি নির্দলীয় ইতিহাস : হাজার বছরের বাঙালি সংস্কৃতি : বাঙালীর ইতিহাস, আদি পর্ব : স্বাধীন বাংলা বেতার কেন্দ্র : মূলধারা ৭১ : শেখ মুজিবুর রহমানের শাসনকাল : স্বাধীন বাংলাদেশের অভ্যন্তরের ইতিহাস : বাংলাদেশের ইতিহাস, ১৯৪৭-১৯৭১ : অসমাঞ্ছ আজীবনী : স্বাধীন বাংলাদেশের অভ্যন্তরের ইতিহাস : বাংলাদেশের স্বাধীনতা যুক্তে পরাশক্তির ভূমিকা : বাঙালির রাষ্ট্রিক্ষণ ও স্বাধীন বাংলাদেশের অভ্যন্তর