SYLHET AGRICULTURAL UNIVERSITY
SYLHET

COURSE CURRICULA AND SYLLABI
Of
B. Sc. Ag. (Hons.) Degree

April 2008

FOREWORD

Preparation of Course Curricula and Syllabi at degree level especially of B.Sc.Ag. (Hons.) in any technological university is a difficult and laborious job. Moreover, under the present change and need of the millennium, specific emphasis on a particular subject can not always be emphasized. Besides, attention should always be given to learner's i. e. students so that they may not be overburdened with the load of repetition of subject matters. With that view in mind, some new arrangement with the modern subjects like Seed Science & Technology, Biotechnology and Environmental Science as compulsory subjects as well as Agribusiness Management and Language & Computer Science as elective subjects have taken into consideration in the curricula syllabi of the newly started Sylhet Agricultural University. Considering the topography of Sylhet and its neighbouring districts, new Courses like Hill and Haor Agriculture and Tea Technology have also been incorporated. In preparing the Course Curricula and Syllabi, maximum emphasis has been given on the Course Curricula and Syllabi of Bangladesh Agricultural University (BAU), Mymensingh as one of the mother institutes of Agricultural Sciences of this country.

As a dynamic process, Course Curricula and Syllabi should be updated regularly to keep pace with the modern world. In any technical education and professional training, Internship Program should be maintained for development of skilled manpower. Hence, like other technical education an Internship Program for the students of this University should be arranged at the end of B. Sc. Ag. (Hons.) Degree. In addition, a study tour should also be arranged for the undergraduate students at the end of Level 3 Semester 2 or Level 4 Semester 1. Ofcourse, it would be very befitting if a particular Semester covering 3-6 months could be designed with study tour along with Internship Program in this Course Curricula.

Recently, the Course Curricula layout and Syllabi of the Faculty of Agriculture, Sylhet Agricultural University (SAU) have been modified by the Course Curricula and Syllabi Committee as per suggestions of the Academic Council of SAU held on 6 January 2008 and 24 March 2008.

As Chairman of the Course Curricula and Syllabi Committee, SAU I would like to express my heartiest gratitude and thanks to the honourable members of the committee whose endless support and cooperation have made this gigantic task to be fruitful.

On be half of the committee, I would like to give special thanks to the honourable Vice Chancellor Prof. Dr. Md. Iqbal Hossain of Sylhet Agricultural University (SAU) to give us scope to serve this academic function.

Professor Dr. M. U. Ahmad
Chairman
Course Curricula and Syllabi Committee of B. Sc. Ag. (Hons.)
Sylhet Agricultural University

Course Curricula and Syllabi Committee of B. Sc. Ag. (Hons.) Degree

1.	Prof. Dr. Muyeen Uddin Ahmad Dept. of Plant Pathology Bangladesh Agricultural University (BAU) Mymensingh	Chairman
2.	Prof. Dr. M. Sultan Uddin Bhuiya Dept. of Agronomy BAU, Mymensingh	Member
3.	Prof. Dr. M. Abul Kashem Dept. of Agricultural Extension Education BAU, Mymensingh	Member
4.	Prof. Dr. M. Jahiruddin Dept. of Soil Science BAU, Mymensingh	Member
5.	Prof. Dr. Lutful Hassan Dept. of Genetics & Plant Breeding BAU, Mymensingh	Member
6.	Prof. Dr. Md. Azizul Haque Dept. of Entomology BAU, Mymensingh	Member
7.	Prof. Dr. Md. Golam Rabbani Dept. of Horticulture BAU, Mymensingh	Member
8.	Prof. Dr. Khondoker M. Nasiruddin Dept. of Biotechnology BAU, Mymensingh	Member
9.	Prof. M. Rashed Hasnath Former Registrar Sylhet Agricultural University (SAU) and presently Dean, Faculty of Agriculture SAU, Sylhet	Member Secretary

Course layout of B. Sc. Ag. (Hons.) Degree Programme Offered by the Faculty of Agriculture in 8 semesters of 4 academic levels (Years)

Course code No. & Course title				Credit hrs.	Course code No. & Course title				Credit hrs.
Level-1			**Semester-1**		**Level-1**			**Semester-2**	
AGRSS	111	:	Fundamentals of Agronomy (T)	2	AGRSS	121	:	Seed Science & Technology (T)	2
AGRSS	112	:	Introductory Agronomic Practices (P)	2	AGRSS	122	:	Seed Science & Technology (P)	2
SS	111	:	Introductory Soil Science (T)	2	BCHEM	121	:	Chemistry of Biomolecules (T)	2
SS	112	:	Introductory Soil Science (P)	2	BCHEM	122	:	Chemistry of Biomolecules (P)	2
HORT	111	:	Fundamentals of Horticulture (T)	2	CBOT	121	:	Plant Morphology, Embryology & Taxonomy (T)	3
HORT	112	:	Fundamentals of Horticulture (P)	2	CBOT	122	:	Plant Morphology, Embryology & Taxonomy (P)	2
FPM	111	:	Farm Mechanics (T)	2	AGEXT	121	:	Fundamental of Extension, leadership and Motivation (T)	3
FPM	112	:	Farm Mechanics (P)	2	AGEXT	122	:	Fundamental of Extension, leadership and Motivation (p)	2
AGECO	111	:	Agricultural Economics (T)	3	COMPS	121	:	Computer Science (T)	2
LAN	111	:	English Language (T)	2	COMPS	122	:	Computer Science (P)	1
					ARD	121	:	Rural Sociology (T)	2
			Total	**21**				**Total**	**23**
			Level-2 **Semester-1**					**Level-2** **Semester-2**	
AGRSS	211	:	Weed Science (T)	2	ENT	221	:	Fundamentals of Entomology (T)	3
AGRSS	212	:	Weed Science (P)	2	ENT	222	:	Fundamentals of Entomology (P)	2
SS	211	:	Soil Physics & Soil Chemistry (T)	3	PPATH	221	:	Fundamentals & Principles of Plant Pathology (T)	3
SS	212	:	Soil Physics & Soil Chemistry (P)	2	PPATH	222	:	Fundamentals & Principles of Plant Pathology (P)	2
HORT	211	:	Ornamental Horticulture and Plantation Crops (T)	2	CBOT	221	:	Plant Ecology (T)	3
HORT	212	:	Ornamental Horticulture and Plantation Crops (P)	2	CBOT	222	:	Plant Ecology (P)	2
AGEXT	211	:	Extension Communication and Group Approaches (T)	2	GPB	221	:	Cytology and Cytogenetics (T)	3
AGEXT	212	:	Data Collection, Processing and Report Writing (P)	2	GPB	222	:	Cytology and Cytogenetics (P)	2
BCHEM	211	:	Metabolism and Human Nutrition (T)	3	AGCHM	221	:	Nuclear, Agro-Industrial & water chemistry (T)	3
BCHEM	212	:	Metabolism and Human Nutrition (P)	2	AGCHM	222	:	Nuclear, Agro-Industrial & water chemistry (P)	2
			Total	**22**				**Total**	**25**
			Level-3 **Semester-1**					**Level-3** **Semester-2**	
HORT	311	:	Vegetables and Spice Crops (T)	3	AGRSS	321	:	Crop Husbandry (T)	3
HORT	312	:	Vegetables and Spice Crops (P)	2	AGRSS	322	:	Crop Husbandry (P)	2
GPB	311	:	Genetics (T)	3	SS	321	:	Soil Survey & Classification (T)	3
GPB	312	:	Genetics (P)	2	SS	322	:	Soil Survey & Classification (P)	2
AST	311	:	Agricultural Statistics (T)	3	ENT	321	:	Insect Ecology and Pest Management (T)	3
AST	312	:	Agricultural Statistics (P)	2	ENT	322	:	Insect Ecology and Pest Management (P)	2
AGCHM	311	:	Plant Nutrition, Pesticide and Environmental Chemistry (T)	3	PPATH	321	:	Diseases of Field Crops (T)	3
AGCHM	312	:	Plant Nutrition, Pesticide and Environmental Chemistry (P)	2	PPATH	322	:	Diseases of Field Crops (P)	2
AGROF	311	:	Principles of Agroforestry (T)	3	CBOT	321	:	Plant Physiology (T)	3
AGROF	312	:	Principles of Agroforestry (P)	2	CBOT	322	:	Plant Physiology (P)	2
			Total	**25**				**Total**	**25**
			Level-4 **Semester-1**					**Level-4** **Semester-2**	
ENT	411	:	Economic Entomology (T)	3	AGRSS	421	:	Crop Production and Farm Management (T)	3
ENT	412	:	Economic Entomology (P)	2	AGRSS	422	:	Crop Production and Farm Management (P)	2
PPATH	411	:	Diseases of Horticultural Crops and seed Pathology (T)	3	SS	421	:	Soil Microbiology and soil Fertility (T)	3
PPATH	412	:	Diseases of Horticultural Crops and seed Pathology (P)	2	SS	422	:	Soil Microbiology and soil Fertility (P)	2
AGEXT	411	:	Extension Organization Management (T)	3	HORT	421	:	Pomology (T)	3
AGEXT	412	:	Extension Program Planning and Outreach Program (P)	2	HORT	422	:	Pomology (P)	2
GPB	411	:	Plant Breeding (T)	3	BTECH	421	:	Plant Biotechnology (T)	3
GPB	412	:	Plant Breeding (P)	2	BTECH	422	:	Plant Biotechnology (P)	2
ENVSC	411	:	Management of Environment (T)	2	LAN	422	:	English Language (P)	1
ENVSC	412	:	Management of Environment (P)	2				Elective Course (two T of 2 + 2 cr)	4
			Faculty Study Tour Organized by Dean, Faculty of Agriculture, SAU, Sylhet.					.....Enclosure-1.....	
			Total	**24**				**Total**	**25**

Total Credit hrs. (T + P) : 112 + 78 = 190

Enclosure-1

Enclosure-1: List of available elective course in particular levels and semesters for B. Sc. Ag. (Hons.) Degree.

Course Code No. and Course Title

Level-4 Semester-2

AGRSS	423	:	Hill and Haor Agriculture (T)
SS	423	:	Soil Pollution (T)
CBOT	423	:	Tea Technology (T)
GPB	423	:	Special Plant Breeding (T)
HORT	423	:	Post-harvest Management of Horticultural Crops (T)
PPATH	423	:	Clinical Plant Pathology (T)
ENT	423	:	Insect Physiology (T)
AGEXT	423	:	Community Participation (T)
AGROF	423	:	Plant Biodiversity & Conservation (T)
AGCHM	423	:	Bio-energy Principles and Practices (T)

Note: Elective Course(s) shall be offered as per concerned BOS & the Faculty decisions with probable seat limitation.

Departmental Code

AGRSS	:	Department of Agronomy and Haor Agriculture
SS	:	Department Soil Science
CBOT	:	Department of Crop Botany and Tea Production Technology
GPB	:	Department of Genetics and Plant Breeding
HORT	:	Department of Horticulture
PPATH	:	Department of Plant Pathology and Seed Science
ENT	:	Department of Entomology
AGEXT	:	Department of Agricultural Extension Education
AGROF	:	Department of Agroforesty and Environmental Science
AGCHM	:	Department of Agricultural Chemistry
LAN	:	Basic Science and Language

CONTENTS

Department of Agronomy and Haor Agriculture

Department of Soil Science

Department of Crop Botany & Tea Production Technology

Department of Genetics and Plant Breeding

Department of Horticulture

Department of Plant Pathology & Seed Science

Department of Entomology

Department of Agricultural Extension Education

Department of Agroforestry & Environmental Science

Department of Agricultural Chemistry

Department of Basic Science & Language

Department of Agricultural Economics & Policy

Department of Agricultural and Rural Development

Department of Agricultural Statistics

Department of Farm Power & Machinery

Department of Computer Science & Engineering

Department of Plant and Environmental Biotechnology

Department of Biochemistry & Chemistry

Sylhet Agricultural University, Sylhet

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-1, Semester-1
Course No.: AGRSS 111
Course Title: Fundamentals of Agronomy (Theory)
Credits: 2 hrs

An Introduction to Agronomy: Concept, importance, scope and basic principles. Evolution of modern crop agriculture.

Agrometeorology: Concept, Weather and climate elements. Cropping seasons of Bangladesh and their characteristics. Rainfall and temperature pattern in Bangladesh and their influence on crop distribution.

Crops and Cropping: Agronomic classification of crops. Concept of cropping patterns, Crop rotation, and mono and multiple cropping.

Crop Geography: Distribution of crops in relation to climate and soil in world perspective. Agroecological zones of Bangladesh – their characteristics and crop suitability.

Tillage: Concept, objectives and types of tillage. Advantages and disadvantages of different types of tillage. Effect of tillage on soil characteristics and nutrient availability. Determinants of time, depth and number of ploughing. Characteristics of ideal tilth.

Crop Nutrition: Essential elements, their sources and forms of absorption. Function, deficiency symptoms and toxic effects of nutrient elements in crop plants. Manures and fertilizers: definition, characteristics, classification and nutrient contents. Preparation and preservation of manures. Methods of application of manures and fertilizers; their advantages and disadvantages. Soil fertility and productivity. Maintenance of soil productivity through agronomic manipulation.

Planting Practices: Concept, types of planting materials. Planting methods, depth and density and their determinants. Field conditions for sowing.

Intercultural Practices: Mulching, thinning, weeding, gap filling, earthing up – their concepts and objectives.

Irrigation and Drainage: Concept, methods; advantages and disadvantages.

Text and Reference Books

Das, P.C. 1997. Manures and Fertilizers. Kalyani Publishers. Ludhiana, New Delhi, Calcutta, 130p.

De, G.C. 1995. Fundamentals of Agronomy. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, Calcutta. 429p.

Mavi, H.S. 1974. Introduction to Agro-meteorology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.

Morachan, Y.B. 1993. Crop Production and Management. 2nd Edition (Reprint). Oxford & IBH Publishing Co., Pvt. Ltd. New Delhi, Bombay, Calcutta. 294p.

Simpson, K. 1986. Fertilizers and Manures. Longman Groups Limited, Hongkong.

Singh, S.S. 1996. Principles and Practices of Agronomy. 3rd Edition (Reprint). Kalyani Publishers. New Delhi.

Department of Agronomy and Hoar Agriculture
B.Sc. Ag. (Hons.) Level-1, Semester-1
Course No.: AGRSS 112
Course Title: Introductory Agronomic Practices (Practical)
Credits: 2 hr

1. Study of different farm implements- (a) identification, (b) practicing of different operations and (c) determination of their efficiency.
2. Identification of soil by finger feel method.
3. Identification of manures, fertilizers and studying their physical characteristics.
4. Computation of manures and fertilizers for different crops.
5. Preparation of compost.
6. Preservation of farm yard manure.
7. Raising a crop and studying its different growth phases.
8. Practicing weeding, thinning, mulching and earthing up.
9. Study on effect of plant nutrients – N,P,K on root and shoot growth and yield of a cereal crop in pot culture.
10. Study of different meteorological instruments.
11. Study of climatic pattern of Bangladesh.

Sylhet Agricultural University, Sylhet

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No.: AGRSS 121
Course Title: Seed Science & Technology (Theory)
Credits: 2 hrs

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 Vigour: Definition and process of germination. Conditions necessary for germination. Concept of seed viability and vigour. Significance of seed vigour 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 vigour.

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.

Text and Reference Books

McDonald, M.B. and Copeland, L. O. 1997. Seed Production: Principles and Practices. Chapman & Hall, New York.

Copeland, L.O. and McDonald, M.B. 1995. Seed Science and Technology. 3rd Edition. Chapman & Hall, New York.

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.

ISTA. 1999. International Rules for Seed Testing. 1999. Supplement to Seed Science and Technology. Vol. 27, pp. 27-32.

Bewley, J.D. and Black, M. 1994. Seed Physiology of Development and Germination. 2nd edition. Springer-Verlag, London

Sylhet Agricultural University, Sylhet

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No.: AGRSS 122
Course Title: Seed Science & Technology (Practical)
Credits: 2 hr

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.

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-2, Semester-1
Course No.: AGRSS 211
Course Title: Weed Science (Theory)
Credits: 2 hrs

Introduction to Weed: Definition, characteristics and classification. Agricultural and non -agricultural losses caused by weeds. Positive value of weed, brief account of the common weeds of Bangladesh with emphasis on the biology of major weeds.

Survival Mechanism of Weed: Propagation, dispersal and persistence.

Distribution of Weeds: Weed distribution in relation to soil, season, land topography, crop and crop production practices.

Crop-Weed Competition: Concept, critical period of weed competition and factors affecting crop-weed completion, competitive ability of weeds and the factors affecting it. Allelopathic effects of weeds on crops and vice-versa.

Weed Management: Concept and principle of integrated weed management. Weed eradication. Cultural, biological and herbicidal methods of weed control- their advantages and disadvantages. Classification, formulation and mode of action of herbicides. Methods of herbicides application. Factors affecting the foliage and soil applied herbicides. Herbicide selectivity and factors affecting it. Herbicidal weed control in major crops, viz. rice, jute, wheat, cotton and sugarcane. Toxic symptoms of herbicides in weeds and crops. Effects of herbicide on environment.

Text and Reference Books

Aldrish, R.J. 1984. Weed-crop ecology- Principles in Weed Management. Breton Publishers, Massachusetts, U.S.A.

Alteri, M.A. and Liebman, M. 1988. Weed Management in Agroecosystem : Ecological Approaches, CRC Press, Inc. Boca Raton Florida, U.S.A.

Auld, B.A. and K.U. Kim. 1996. Weed Management in Rice. Published by FAO, Rome, Italy.

Grafts, A.S. and Robbins, W.W. 1973. Weed Control. Tata-McGraw-Hill Publishing Co. Ltd., New Delhi, 669p.

Griffiths, W. 1990. Weed Guide. Published by Schering Agriculture, Nottingham Road, Stapleford, Nottingham NG98AG, U.K.

Gupta, O.P. and Lamba, P.S. 1978. Modern Weed Science. Today and Tomorrow's Printers and Publishers, Desh Bandhu Gupta Road, New Delhi.

Hance, R.J. and Holy, K. 1990. Weed Control Hand Book: Principles (8th Edition). Blackwell Scientific Publication, Oxford.

Holm, L.G.; Doll, J., Holm, E., Pancho, J. and Herberger, J.P 1977. The Worlds Weeds: Distribution and Biology. University Press of Hawaii, Honolulu.

Hill, T.A. 1977. The biology of weeds. Studies in Biology. No. 79, Edward Arnold, London.

Herberger, J.P.1997. World weeds: Natural histories and distributions. Wiley, New York, U.S.A.

Labrada, R.; Caseley, J.C. and Parker, C. 1994. Weed Management for developing countries. Published by FAO, Rome, Italy.

Morita, H. 1997. Handbook of Arable weeds in Japan- For correct identification. Published by Kumiai Chemical Industry Coo. Ltd., Taitoh-ku, Tokyo 110, Japan.

Zimdahl,, R.L. 1980. Weed-crop competition- a review. International Plant Protection Centre, Oregon State University, Cornallis, Oregon, U.S.A.

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-2, Semester-1
Course No.: AGRSS 212
Course Title: Weed Science (Practical)
Credits: 2 hr

1. Identification of weeds and weed seeds/propagules.
2. Preparation of weed herbarium.
3. Study of life cycle and morphology of major weeds- (a) grass, (b) sedge and (c) broadleaf weeds.
4. Study on identification of herbicides and study of their physical characteristics.
5. Calibration of a sprayer
6. Herbicide calculation.
7. Spraying of non-selective, pre-emergence and post-emergence herbicides in crop field to study their effect on crop and weed
8. Weed survey in major crops of SAU farm and determination of importance value of weeds.

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-3, Semester-2
Course No.: AGRSS 321
Course Title: Crop Husbandry (Theory)
Credits: 3 hrs

Crop Growth Factors: Factors affecting growth, development and yield of crops.

Water Management: Water use efficiency under irrigated farming. Water management in dry land farming. Irrigation scheduling.

Fertilizer Management: Balanced fertilization. Fertilizer management in relation to varietal characteristics, growth phases, cropping systems and irrigation.

Organic Matter Management: Maintenance and replenishment of organic matter in soil. Concept of organic farming.

Management of Stress: Moisture, drought and flood; cold, heat, salinity and alkalinity stress and their management for crop production.

Production Technology of Crops: Origin, climate and soil requirements, characteristics of species and cultivars, cultivation practices, post-harvest operations and cost of production of the following crops:
Cereal crops: Rice, wheat, maize, barley and millets.
Sugar crops: Sugarcane and sugarbeet.
Pulse crops: Lentil, mungbean, grasspea, pea, chickpea, pigeonpea and blackgram.
Narcotic crops: Tobacco.
Green manuring crops: Dhaincha, sunnhemp and cowpea.

Text and Reference Books

Arakeri, H.R. and Donahue, R. 1988. Conservation and Water Management, Oxford and IBH Pub. Co. Pvt. Ltd. Calcutta, Bombay and New Delhi, India.
Kipps, M.S. 1978. Production of Field Crops. 6th Edition. Tata McGraw-Hill Publishing Company Ltd. New Delhi, India.
Martin, J.H.; Leonard, W.H. and Stamp, D.L. 1976. Principles of Field Crop Production. 3rd Edition, McMillan Pub. Co. Inc., New York.
Mudaliar, V.I.S. 1984. Principles of Agronomy. 5th Edition. The Bangalore Printing and Publishing Co., Ltd. Mysore Road, Bangalore 18, India.
Seizwo, M. 1967. Crop Science in Rice. Theory of Yield Determination and its application. Fuji Pub. Co. Tokyo.
Shyte, R.O. 1980. Crop Production Environment. Faber and Faber Ltd. 24, Russel Square, London, W.C.I.
Thakur, C. 1979. Scientific Crop Production. Volume 1 and II. 3rd Edition. Metropolitan Book Co. Ltd. I. Netaji Subhash Maeg, New Delhi 11002, India.
Yawalkar, K.S.; Agarwal, J.P. and Bokde, S. 1981. Manures and Fertilizers. Agri-Horticulture Publication House, Nagpur-440010, India.

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-3, Semester-2
Course No.: AGRSS 322
Course Title: Crop Husbandry (Practical)
Credits: 2 hrs

1. Study of plant density on the growth and yield of a crop grown in students' plot.
2. Preparation of nurseries for raising seedlings of rice and tobacco.
3. Practicing different methods of planting sugarcane.
4. Practicing irrigation scheduling for a crop.
5. Raising a green manure crop and its incorporation in the soil.
6. Evaluation of the effect of different moisture stresses on the growth and yield of a crop grown in pot.
7. Computation of production cost of crops included in Course No. Agron. 321

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No.: AGRSS 421
Course Title: Crop Production and Farm Management (Theory)
Credits: 3 hrs

Production Technology of Crops: Origin, climate and soil requirements, characteristics of species and cultivars, cultivation practices, post-harvest operations and cost of production of the following crops.
Fibre Crops : Jute, cotton, sunnhemp and kenaf
Oil Crops: Mustard, sesame, groundnut, soybean, linseed, sunflower, safflower and castor.
Beverage Crops- Tea, coffee.
Forage crops- Maize, sorghum, grasspea, cowpea, napier grass and guinea grass.
Quality Control of Crops: Factors affecting the quality of crops. Agronomic means of improving quality of crops.
Land use and Crop Statistics in Bangladesh: Categories of land use system, area, production, and yield of crops of Bangladesh over time.
Farm Planning and Management: Factors to be considered for the establishment of a farm. Farm layout and farm budgeting. Farm record keeping. Principles of selection of farm enterprises.
Cropping Scheme: Utility and principles of preparation.
Agro-ecosystem: Concept, system properties, determinants, types, resources, characteristics of farming systems of Bangladesh.
Cropping Systems: Concept and determinants.

a) Multiple cropping: Objective, types, advantages and disadvantages.
b) Crop rotation: Planning of crop rotation
c) Crop diversification: Concept, importance, present status and future strategy in Bangladesh.
d) Crop intensification: Concept, importance, and limitations.
e) Cropping patterns of Bangladesh and possibilities of their improvement.

Crop Calendar: Objectives, utility, procedure of preparation.
Crop Evaluation: Crop yield estimation, crop cutting experiment, crop reporting, and crop forecasting.

Text and Reference Books

Beneke, R.R. 1966. Managing the Farm Business. John Wiley and Sons, Inc. New York, London, Sydney.
Chatterjee, B.N.; Maiti, S. and Mandal, B.K. 1989. Cropping System (Theory and Practice) Second Ed. Oxford and IBH Publishing Co. Pvt. New Delhi, Bombay, Calcutta, 345p.
Efferson, J.M. 1953. Principles of Farm Management. McGraw-Hill Book Co., New York.
Hedges, T.R. 1969. Farm Management Decision. Prentice Hall, Inc. Englewood Cliffs. London.
Hoque, M.Z. 1984. Cropping Systems in Asia. On-Farm Research and Management. IRRI, Philippines.
Kipps, M.S. 1978. Production of Field Crops. 6th Edition. Tata McGraw-Hill Publishing Company Ltd. New Delhi, India, 790p.
Kundu, D.; Basak, K.C. and Sarker, P.D. 1959. Jute in India. Indian Central Jute Committee, Calcutta, India.
Martin, J.H., Leonard, W.H. and Stamp, D.L. 1967. Principles of Field Crop Production. 3rd Edition. McMillan Pub. Co. Inc: New York. 1118p.
Quddus, M.A. 1985. Bangladesher Khadya Shasya O Arthakari Phsaal. Bangla Academy, Dhaka. 403p.
Thakur, C. 1979. Scientific Crop Production. Vol. I and II.3rd Edition Metropolitan Book Co. Pvt. Ltd. 1, Netaji Subhash Marg, New Dehli-110002, India.

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No.: AGRSS 422
Course Title: Crop Production and Farm Management (Practical)
Credits: 2 hrs

1. Project paper: Conducting a simple experiment to study the effect of agronomic practices on crop production and to prepare a project report.
2. Study of farm records and their maintenance.
3. Preparation of cropping scheme.
4. Laying out an agricultural farm.
5. Conducting crop cutting experiment.
6. Preparation of a crop report.
7. Computation of production cost of crops included in Course No. Agron. 421.
8. Preparation of crop rotation schedules.
9. Study of land utilization and crop statistics of Bangladesh.
10. Study of major cropping patterns of Bangladesh in relation to climatic parameters.

Department of Agronomy and Hoar Agriculture
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No.: AGRSS 423
Course Title: Hill and Haor Agriculture (Theory- Elective)
Credits: 2 hrs

Introduction, scope and limitations of hill agriculture. Agro-climatic features of hilly areas of Bangladeshi and their suitability for agricultural production. Cropping systems used in hills with special reference to contour, terracing and Jhum cultivation techniques. Techniques used for soil and moisture conservation in hilly areas. Nutrient management system in hill agriculture with special emphasis on organic matter and nutrient recycling, application of different mulches, hedge row system of planting etc. Tree fruit production and pasture development in hill agriculture. Special features of crop species suitable for hilly regions with their cultivation practices specially tree fruits, timber plants and pasture.

Haor Agriculture: Concept of haor, basic features of haor. Problems and prospects of haor agriculture.

Edaphic and climatic condition of haor areas: land type, physiography, temperature, rainfall, wind water depth, duration of stagnancy, flash flood.

Crop Production and Management in haor areas: Crops and varieties, cropping patterns, planting and harvesting time, intercultural operations, fertilizer and water management and pest management.

References

Martens K (eds.). 1994. A Basic Guide to Understanding the Environmental Impacts of Rural Roads on the Wetlands of Bangladesh, CARE Bangladesh, Dhaka.

Bangladesh Center for Advanced Studies and Nature Conservation Movement. 1994. Wetlands of Bangladesh, BCAS, Dhaka.

Nishat A, Hussain Z, Roy M K and Karim A. (eds.). 1993. Fresh Waterwetlands in Bangladesh-Issues and Approaches for Management, IUCN, Dhaka.

Kabir M H and Amin S M N. 2007. Tanguar Haor. A Diversified Freshwater Wetland. Academic Press and Publishers Library, Dhaka.

Roy A K D. 2009. Wetland Management Valuation: The Sundarbans Perspective for Participatory Forestry. Academic Press and Publishers Library, Dhaka.

Choudhury M A. 2009. Protecting Bangladesh from Natural Disasters. Academic Press and Publishers Library, Dhaka.

Department of Soil Science
B. Sc. Ag. (Hons.) Level-1, Semester-1
Course No. SS 111
Course title: Introductory Soil Science (Theory)
Credit- 2 hrs

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

Soil physical properties
Soil particles - classification and properties, Stokes' law
Soil texture - classification and importance
Soil structure - genesis, classification and importance
Soil density - particle density, bulk density and soil porosity
Soil air - composition and importance
Soil colour - causes and importance
Soil consistency- forms, swelling and shrinkage of soil

Soil organic matter
Sources, composition, effect on soil properties, humus formation and C/N ratio

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

Plant nutrients
Essential nutrients, criteria for essentiality, sources, available forms and functions
Manure and fertilizer- kinds and composition
Soil fertility and soil productivity

Text and Reference Books
Alexander, M. 1977. Introduction to Soil Microbiology. John Wiley & Sons Inc., New York.
Baver, L.D., Gardner, W. H. and Gardner, W.R. 1972. Soil Physics, 4th edition. John Wiley & Sons. Inc., New York.
Biswas, L.D., and Mukherjee, S.K. 1991. Text book of Soil Science. Tata McGraw-Hill Pub. Ltd., New Delhi. Brady, N.C. and Weil, R.R. 2002. The Nature and Properties of Soils. Pearson Education Pvt. Ltd. New Delhi. India.
Kohnke, H. 1968. Soil Physics. McGraw Hill Book Comp., NewYork.
Miller, R.W. and Donahue, R.L. 1990. Soils- An Introduction to Soils and Plant Growth. Prentice Hall Inc. USA. Thomson. L.M. and Troeh, F.R. 1978. Soils and Soil Fertility. McGraw Hill, New York.

Department of Soil Science
B. Sc. Ag. (Hons.) Level-1, Semester-1
Course No. SS 112
Course title: Introductory Soil Science (Practical)
Credit- 2 hr

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 by 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. Gram staining of bacteria

Text and Reference Books

Klute, A. 1986. Methods of Soil Analysis, Part 1, Amer. Soc Agron., Madison, Inc. Pub., Wis., USA

Page, A. L., Miller, R.H. and Keeney, D.R. 1982. Methods of Soil Analysis, Part 2 . Amer. Soc Agron., Madison, Inc. Pub., Wis., USA

Seeley, H. W. and Van Demark, J.J. 1975. Microbes in Action. A Laboratory Manual of Microbiology D. B. Taraporavala Sons Co. Pvt. Ltd. India

Tyler, M. E. and Milam, J. R. 1969 Basic Bacteriology Laboratory Manual. Dept of Bacteriology, University of Florida.

Department of Soil Science
B. Sc. Ag. (Hons.) Level- 2, Semester- 1
Course No. SS 211
Course title: Soil Physics & Soil Chemistry (Theory)
Credit- 3 hrs

Soil water: Classification, soil water constants, soil water potentials, capillary rise of water, hydrologic cycle, methods of measuring soil moisture. Infiltration- factors and methods of measurement, Hydraulic conductivity factors and methods of measurement, Darcy's law Evapotranspiration (ET) - factors and methods of measurement

Soil temperature: Importance and factors, thermal properties of soils, heat flow equation, management of soil temperature

Tillage and puddling: Plough pan formation and effects on soil and crops

Soil erosion and conservation: Types and factors of soil erosion, universal soil loss equation. Purpose and techniques of soil conservation

Soil colloids: Classification and properties of inorganic and organic colloids

Silicate clays: Nomenclature, classification and basic structures of clays, characteristics of kaolinite, mica, smectite, vermiculite, chlorite and interstratified minerals

Ion exchange: Charge development in soil colloids, colloids, cation exchange, base saturation. Mechanism of nutrient uptake by plants

Soil reaction: Causes of soil acidity and alkalinity. Buffering capacity of soil, soil pH and nutrient ability, Liming - liming materials, effects on soil properties, mechanism of soil pH change

Submerged soils: Characteristics and electrochemical properties, formation of nitrous oxides and methane gases Soil pollution: Causes, effects and remedial measures

Text and Reference Books

Brady, N.C. and Weil, R.R. 2002. The Nature and Properties of Soils. Pearson Education Pvt. Ltd. Delhi, India.
Dixon, J .B. and Wood S.B. 1989. Minerals in Environments 2nd Edition. Soil Sci. Soc Amer. Madison. Wis., USA
Greenland, D.J. and Hayes, M.H.B. 1981. The Chemistry of Soil Processes. John Wiley & Sons
Hillel, D. 1980. Fundamental of Soil Physics Acad. Press. New York, USA.
Marshall, C.E. 1964. The Physical Chemistry and Mineralogy of Soils, John Wiley & sons. New York. USA.
Michael A.M. 1978. Irrigation- Theory and Practice, Vikas Publishing House Pvt. Ltd. New Delhi, India
Miller, R.W. and Donahue, R.L. 1990. Soils- An Introduction to Soils and Plant Growth. Prentice Hall Inc. USA.
Mishra, P.C. 1989. Soil Pollution. Asia Pub. House, India

Department of Soil Science
B. Sc. Ag. (Hons.) Level-2, Semester-1
Course No. SS 212
Course title: Soil Physics & Soil Chemistry (Practical)
Credit- 2 hrs

1. Determination of soil water by gravimetric method
2. Determination of maximum water holding capacity of soil
3. Determination of soil moisture content at field capacity
4. Determination of soil water by tensiometer method
5. Determination of soil water infiltration by double ring infiltrometer method
6. Determination of hydraulic conductivity of saturated soil by constant head method
7. Determination of cation exchange capacity of soil by sodium saturation method
8. Determination of soil pH by glass electrode pH meter
9. Determination of lime requirement of soil
10. Determination of soil organic carbon by wet oxidation method

Text and Reference Books

Klule, A. 1986. Methods of Soil Analysis, Part 1 Amer. Soc. Agron., Inc. Pub. Madison, Wis., USA

Singh, R A. 1997. Soil Physical Analysis . Varun Exports. India

Singh, D. Chhonkar, P. K. and Pandey, R .N. 1999. Soil Plant Water Analysis- A Methods Manual. ICAR, New Delhi

Jackson, M. L. 1962. Soil Chemical Analysis Prentice Hall. New York

Department of Soil Science
B. Sc. Ag. (Hons.) Level-3, Semester-2
Course No. SS 321
Course title: Soil Survey & Classification (Theory)
Credit- 3 hrs

Soil survey: Purpose, kinds and methods of soil survey, soil survey work plan, base maps, conventional symbols, map legends, mapping and report preparation

Geographic Information System: Concept, components and uses in agriculture

Soil classification
Concept, purposes and principle
Soil Taxonomy and FAO system; diagnostic horizons soil temperature and moisture regimes, nomenclature and descriptions of different categories of Soil Taxonomy. Equivalence of Bangladesh soils with Soil Taxonomy and FAO Systems Characteristics of dominant Soil Series of Bangladesh.

Soils of Bangladesh
Genesis
Geology- Geological time scale, Tertiary sediments, Madhupur Clay and Recent alluvium
Geomorphology- hills, terraces and flood plains
General Soil Types - characteristics
Agro ecological Zones (AEZ)- principles of AEZ classification descrip6on of different AEZs.
Problem soils- extent and characteristics of saline soil, acid sulphate soil, peat soil and degraded rice soil

Land use classification

Criteria for land evaluation

Land capability classification of Bangladesh

Text and Reference Books

Brammer, H 1996. The Geography of the Soils of Bangladesh University Press Ltd., Dhaka, Bangladesh
Dent. D. and Yong, A. 1981, Soil Survey and Land Evaluation George Allen and Unwin Pub. Ltd., London
FAO report. 1988. Land Resources Appraisal of Bangladesh for Agricultural Development, Agro-ecological Regions of Bangladesh, Report-2.
Greenland, D.JJ and Lal, R. 1977. Soil Conservation and Management in the Humid Tropics. Wiley & Sons Inc. New York.
Hussain, M.S 1992, Soil Classification with Special Reference to the Soil of Bangladesh. University Dhaka
USDA, 1973. Soil Taxonomy- A Basic System of Soil Classification for making and interpreting Soil Surveys. National Bureau of Soil Survey and Land Use Planning (ICAR), New Delhi.

Department of Soil Science
B. Sc. Ag. (Hons.) Level-3, Semester-2
Course No. SS 322
Course title: Soil Survey & Classification (Practical)
Credit- 2 hrs

1. Identification of soil textual types by finger feel method
2. Particle size analysis of soil by hydrometer method
3. Determination of soil colour by Munsell's colour chart
4. Determination of soil pH by BAU Soil Testing Kit
5. Determination of N, P and K in soil by BAU Soil Testing Kit
6. Determination of carbonate and bicarbonate of soil by differential titration method
7. Determination of electrical conductivity of soil by conductivity meter
8. Study of soil profile
9. Field study and preparation of soil survey report 10. Evaluation of land for major crops

Text and Reference Books

Hesse , P. R. 1994. Textbook of Soil Chemical Analysis Varun Exports, India
Jackson, M.L. 1962. Soil Chemical Analysis. Prentice Hall, New York.
Klute, A. 1986. Methods of Soil Analysis, Part 1. Amer. Soc. Agron., Inc. Pub. Madison, Wis., USA
Page, A. L., Miller, R.H. and Keeney, D.R. 1989. Methods of Soil Analysis, Part 2. Amer. Soc. Agron., Inc Pub. Madison, Wis., USA.

Department of Soil Science
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. SS 421
Course title: Soil Microbiology and Soil Fertility (Theory)
Credit- 3 hrs

Soil microbes
Abundance, distribution and functions in soil Microbial interactions in soil

Biofertilizer
Symbiotic and non-symbiotic N_2- fixation
Biofertilizers- types and importance
Mycorrhiza- types and importance

Nutrient availability in soils
Nitrogen- occurrence, mineralization, immobilization, mechanisms of N loss, N cycle
Phosphorus and potassium- occurrence, fixation and availability
Sulphur- occurrence, mineralization and immobilization
Zinc and boron- occurrence and availability

Manure and fertilizer application
Principles and methods of manure and fertilizer application; Fertilizer use efficiency Economics of fertilizer use

Soil fertility evaluation
Methods of soil fertility evaluation
Soil testing, fertilizer trial, critical limits, fertilizer recommendation

Soil fertility problems in Bangladesh
Soil fertility problems- organic matter depletion, nutrient mining, unbalanced use of fertilizers, acidification
Soil fertility management- manuring, liming and IPNS

Text and Reference Books

Brady, N.C. and Weil, R.R. 2002. The Nature and Properties of Soils. Pearson Education Ptv. Ltd. New Delhi, India,
Elsan, J. V. D., Trevors, J. T. and Elizabeth, M. H. W. 1997. Modern Soil Microbiology.Marcel Dakker.
Havlin, J. L , Beaton, J. D., Nelson, W.L., and Tisdale, S.L. 1999. Soil Fertility and Fertilizers. Prentice Hall, Upper Saddle River, New Jersey
Mengel, K. and Kirkby, E.A. 1987. Principles of Plant Nutrition. Int. Potash Inst. Pub. Switzerland.
Miller, R,W. and Donahue, R.L. 1990. Soils: An Introduction to Soils and Plant Growth. Prentice Hall Inc., USA.
Stevenson, F. J.1985. Cycles of Soils- Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients. Wiley & Sons Inc., New York.
Subba Rao.N, S.1984. Biofertilizers in Agriculture. Oxford and IBH Pub. Co. Pvt. Ltd. New Delhi. Thomson, L. M. and Troeh, F. R. 1978, Soils and Soil Fertility. McGraw Hill, New York.

Department of Soil Science
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. SS 422
Course title: Soil Microbiology and Soil Fertility (Practical)
Credit- 2 hrs

1. Determination of total N in soil by Kjeldahl method
2. Determination of available P in soil by modified Olsen method
3. Determination of available K in soil by ammonium acetate extraction method
4. Determination of available S in soil by calcium chloride extraction method
5. Determination of available Zn in soil by DTPA extraction method
6. Techniques for culturing bacteria
7. Isolation and authentication of Rhizobium from legume root nodules
8. Preparation of Rhizobium inoculants
9. Total count of bacteria in rhizobial inoculant
10. Isolation and identification of Azotobacter in soil by Brown method
11. Preparation of cyanobacterial inoculant

Text and Reference Books

Hesse , P.R. 1994. Textbook of Soil Chemical Analysis. Varun Exports, India
Jackson, M.L. 1962. Soil Chemical Analysis. Prentice Hall, New York.
Klute, A. 1986. Methods of Soil Analysis, Part 1. Amer. Soc. Agron., Inc. Pub. Madison, Wis., USA
Page, A.L., Miller, R.H. and Keeney, D.R. 1989. Methods of Soil Analysis, Part 2. Amer. Soc. Agron., Inc. Pub. Madison. Wis., USA.
Singh, D. Chhonkar, P.K. and Pandey, R.N. 1999. Soil Plant Water Analysis-A Methods Manual. ICAR, New Delhi.
Seeley, H.W. and Van Demark, J.J. 1975. Microbes in Action. A Laboratory Manual of Microbiology. D.B. Taraporavala Sons Co. Pvt. Ltd., India.

Department of Soil Science
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. SS 423
Course title: Soil Pollution (Theory-Elective)
Credit- 2 hrs

Concept of pollution
Hazards soil pollution
Soil pollution in Bangladesh
Sources and extent of soil pollution
Toxic organic pollutants, behavior in soil, effects of pesticides on soil organisms
Toxic inorganic substances,
Potential hazards of chemicals in sewage sludge and city wastes
Redionuclides in soil
Remedial measures of soil pollution

Text and Reference Books

Agrawal, S. B. and Agrawal. M. 2000. Environmental Pollution and Plant Responses. CRC Press. UK
ASA. 1990. Impact of Carbon Dioxide, Trace Gases and Climate Change on Global Agric. ASA Especial Pub. No. 53, USA.
ASA. 1993. Agricultural Ecosystem Effects on Traces Gases, and Global Climate Change ASA Special Pub.No.55, USA.
Kudesia, V. P. 1990 Pollution, Pragati Prakashani, India
Mishra, P. C. 1989. Soil Pollution. Asia Pub. House, India
Rahman, A. A. Huq, S., Huq, S., Haider, R, and Jansen, F. 1992. Environment and Development in Bangladesh. Bang. Cent. Adv. Stud., Dhaka.
Tan, K.H. 2000. Environmental Soil Science, 2nd edition, Revised and Expanded. Marcel Dekker USA & Canada.

Sylhet Agricultural University, Sylhet

Department of Crop Botany and Tea Production Technology
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No. CBOT 121
Course Title: Plant Morphology, Embryology and Taxonomy (Theory)
Credit: 3 hrs

External morphology of the following crops:

1) Mustard, 2) Jute, 3) Tobacco, 4) Groundnut, 5) Cotton, 6) Onion, 7) Rice, 8) Wheat, 9) Tea, 10) Rubber and 11) Betel leaf.

Cell: Concept, structures and ultra-structures of protoplasmic components of cell, functions of important organelles.

Cell wall: Components and composition of cell wall, patterns of thickening, cell wall organization, plasmodesma, pit- structures of simple and bordered pits and their functions, primary pit field.

Tissue: Concept, classification and morphology of meristematic, simple, vascular and secretory tissues, structures and their functions, tracheary elements and sieve elements, vascular bundles and major types, tissue systems- epidermal, procambial & vascular, epidermal appendages. Variations of different tissues in response to stresses and their defense mechanisms against insect pests and diseases.

Primary structure: Concept of primary growth, structures of root and stem of monocot and dicot plants, structures of isobilateral and dorsiventral leaves.

Secondary structure: Concept of normal and anomalous secondary growth, activities of typical vascular cambium, formation of periderm and its functions.

Anatomy of field crops: 1) Rice, 2) Sugarcane, 3) Jute, 4) Cucurbit, 5) Mustard and 6) Lentil.

Embryology: Concept of sporogenesis and gametogenesis in cryptogams, microsporogenesis and microgametogenesis, megasporogenesis and megagametogenesis, pollination, fertilization, parthenogenesis, development of embryo, endosperm, seed and fruit, in-vitro fertilization and embryo culture.

Taxonomy: Introduction, concept of taxon and botanic nomenclature, principles and systems of plant classification.

Distinguishing characters of the following families:

1) Gramineae, 2) Leguminosae, 3) Solanaceae, 4) Cucurbitaceae, 5) Compositae, 6) Umbelliferae, 7) Rutaceae, 8) Anacardiaceae, 9) Moraceae, 10) Orchidaceae and 11) Palmaceae.

Economically important plants: Fibre, oil, timber, medicinal, rubber, narcotic and beverage yielding plants & their products of economic importance.

Text and Reference Books

BDmyd, †gvt Avãyj, 1966, Dw™¢` åYZË¡, †K›`ªxq evsjv Dbœqb †evW©, XvKv|
Carlquist, S. 1961. Comparative plant anatomy. Holt, Rinehart and Winston, New York.
Cobley, L.S. 1956. Introduction to botany of tropical crops. Longmans, London.
Cutter, E.G. 1971. Plant anatomy: experiment and interpretation. Edward Arnold, London.
Cutter, E.G. 1978. Plant anatomy. Vol. 1&2. Edward Arnold, London.
Dutta, A.C. 1975. Botany for degree students. 4th Ed. Oxford Univ. Press, Calcutta.
Eames, A.J. and MacDaniels, L.H. 1949. An introduction to plant anatomy. McGraw-Hill, New York.
Esau, K. 1965. Plant anatomy. John Wiley, New York.
Esau, K. 1977. Anatomy of seed plants. John Wiley, New York.
Fahn, A. 1967. Plant anatomy. Pergamon Press, Oxford.
Gupta, R.K. 1961. Text book of systematic botany. 5th ed. Atea Ram Pub., Delhi.
Hill, A.F. 1952. Economic botany. 2nd ed., McGraw-Hill, New York.
Maheshwari, P. 1950. An introduction to the embryology of angiosperms. McGraw-Hill, New York.
Ohtani, J. 2000. Wood micromorphology. Hokkaido Univ. Press, Sapporo, Japan.
Pandey, B.P. 2000. Economic botany. 6th ed. S. Chand & Co., New Delhi.
Pandey, B.P. 2001. Plant anatomy. Chand and Co., Delhi.
Popham, R.A. 1966. Laboratory manual for plant anatomy. C.V. Mosby, Saint Louis.
Purseglove, J.W. 1963. Tropical crops. Vol. 1&2. Longmans, London.
Rendle, A.B. 1967. The classification of flowering plants. Vol. 1&2. Cambridge Univ. Press, Cambridge.
Sivarajan, V.V. 1991. Introduction to the principles of plant taxonomy. 2nd ed. Cambridge.

Department of Crop Botany and Tea Production Technology
B. Sc. Ag.(Hons.) Level-1, Semester-2
Course No. CBOT 122
Course Title: Plant Morphology, Embryology and Taxonomy (Practical)
Credit: 2 hrs

External morphology of the following crops and their relatives: Mustard, onion, groundnut, lentil, brinjal, jute, cotton, cucurbit, sunflower, rice, wheat, maize, sugarcane, coriander, mango, guava, jackfruit, pineapple.

Slide preparation: Sectioning, staining and mounting, temporary and semi-permanent slides, demonstration of microtome and maceration techniques.

Demonstration of the following:

i. Nucleus, nucleolus, plastids, compound middle lamella, primary wall, secondary wall, thickening of cell wall;

ii. Parenchyma, collencyma, sclereid, fibre and secretory cells both in transverse and longitudinal sections/macerated materials;

iii. Tracheid, vessel, wood fibre, wood parenchyma, sieve cell, sieve tube, companion cell, bast fibre and epidermal appendages and

iv. Structure of anther, pollen grain, pollen germination, hand pollination technique, ovary, ovule and placenta.

v. Internal structures of isobilateral and dorsiventral leaves.

Identification: Monocot and dicot seeds and their seedlings.

Anatomy of field crops: Stem and root of maize, rice, cucurbit, groundnut, countrybean and jute; leaves of monocot and dicot plants.

Preparation of herbarium sheet

Department of Crop Botany and Tea Production Technology
B. Sc. Ag.(Hons.) Level-2, Semester-2
Course No. CBOT 221
Course Title: Plant Ecology (Theory)
Credit: 3 hrs

Climate and weather: Concept, classification of climates with their influence on crop.
Agro-climatological parameters: Concept, fundamentals of ecology, ecological factors- biotic, abiotic and edaphic; light- quality, quantity and duration, effects on vegetation, solar radiation and light environment; temperature- minimal, optimal and maximal temperature for different categories of plants, night and day temperature, and adaptation to temperature, modification; water- significance, cycles, forms of water and precipitation, causes and effects of droughts, dry-wind, dust, storms and hails on crop production; wind- effect on vegetation, wind profiles, modification of wind environment.
Adaptation of plants to water: Hydrophytes, xerophytes, mesophytes, halophytes, heliophytes and sciophytes.
Ecosystems: Structures, components, functions of natural and cultivated ecosystems, energy and its flow, nutrient cycles.
Plant succession: Causes, formation of vegetation, process and types- hydrosere, xerosere, lithosere, psamosere.
Phytogeography: Principles, major vegetation regions of Bangladesh and World, agro-ecological zones (AEZ) of Bangladesh and crop suitability.
Ecology of some important crops: Rice, wheat, sugarcane, jute, cotton, tea, tobacco, important vegetables, fruits, pulses and oils.
Halophytes and Mangrove vegetation: Concept, distribution, characters, succession in coast.
Plant diversity and conservation: Concept, causes of diversity losses, methods of conservation and management, and national conservation policy (NCP).
Biotic relation: Types, interrelationship among biotic factors, vegetation and crop production, principles of crop-weed association.
Micro- and macro-environment: Concept, components, microclimate manipulation and improvement of crop production.
Environmental pollution: Types, causes, atmospheric gases, green house effects- causes and remedies, effects and control of environmental pollution.

Text and Reference Books

Ambasht, R.S. and Ambasht, P.K. 1999. Environment and pollution. 3rd ed. CBS Pub., New Delhi.
Chang, J.H. 1971. Climate and agriculture. Aldine Pub., Chicago.
Deshmukh, I. 1986. Ecology and tropical biology. Blackwell, Oxford.
Dimond, J. and Case, T.J. 1980. Community ecology, Harper & Row, New York.
Hall, D.O., Scurlock, J.M.O., Bolhar-Nordenkampf, H.R., Leegood, R.C. and Long, S.P. 1993. Photosynthesis and production in a changing environment: A field and laboratory manual. Chapman and Hall, U.K.
Hunt, R. 1982. Plant growth curves: The functional approach to plant growth analysis. Edward Arnold, London.
Jackson, I.J. 1982. Climate, water and agriculture in tropics. Longman, London.
Kumar, H.D. 1995. General ecology. Vikas Pub. House, New Delhi.
Levit, J. 1980. Response of plants to environmental stresses, Academic Press, New York.
Odum, E.P. 1971. Fundamentals of ecology. Saunders, Philadel.
Rosenberg, N.J. 1985. Microclimate: The biological environment. John Wiley, New York.
Rosenberg, N.J.; Blad, B.L. and Verma, S.B. 1983. Microclimate: The biological environment. John Wiley, New York.
UNESCO. 1987. Mangroves of the asia and pacific: status and management, technical report of the UNDP/UNESCO research and training pilot programme on mangrove ecosystems in asia and the pacific. UNESCO, Paris.
Wilson, O.E. 1988. Biodiversity. Nat. Acad. Press, Washington, DC.

Department of Crop Botany and Tea Production Technology
B. Sc. Ag.(Hons.) Level-2, Semester-2
Course No. CBOT 222
Course Title: Plant Ecology (Practical)
Credit: 2 hrs

i. Study of adaptive features of different ecological plant types e.g. mesophytes, xerophytes, hydrophytes, halophytes, heliophytes and sciophytes.
ii. Field visit to different agro-ecological zones (AEZ) of Bangladesh.
iii. Study of biotically related plants.
iv. Methods of ecological survey of plant communities and field study of plant habitats.
v. Experiments on flow of energy in agro-ecosystem on light, heat transfer and radiant energy
vi. Experiments on crop-weed association and mulches, and their effects on crop production
vii. Ecophysiological aspects of data collection and interpretation.

Department of Crop Botany and Tea Production Technology
B. Sc. Ag.(Hons.) Level-3, Semester-2
Course No. CBOT 321
Course Title: Plant Physiology (Theory)
Credit: 3 hrs

Plant water relationship: Concept and measurement of water potential, absorption mechanisms, path of absorption and water movement, factors affecting absorption, theories of ascent of sap, water loss phenomenon in leaf and other plant parts, mechanisms of opening and closing of stomata, stomatal conductance, factors affecting evapotranspiration and its significance in crop production.
Photosynthesis: Photosynthetic apparatus, light and dark reactions, photosynthetic pathways and their significance, factors essential for photosynthesis, photosynthesis-transpiration compromise.
Respiration: Types, mechanisms, importance, relationship of carbohydrate metabolism to other compounds, factors affecting respiration, controlling measures for photorespiration, relationship between respiration and growth.
Carbon fixation by crop canopies: Canopy structure, leaf area index and dry matter (DM) production, strategies for maximizing solar energy utilization.
Transport and partitioning of assimilates: Nature of solution in phloem transport, mechanism, phloem loading and unloading, source-sink relationships, assimilate partitioning and harvest index.
Growth regulators: Classification, effects of phytohormones (auxins, gibberellins, cytokinins and others) on growth and development in field and in vitro plants.
Seeds and germination: Structure and chemical composition, sources of assimilate and maturation, stored seed reserves and its control; dormancy- causes, releases and its significance.
Growth and development: Concept, factors affecting growth, determinate and indeterminate growth, growth correlation and growth dynamics, vegetative and reproductive growth, plant growth and yield analyses techniques.
Flowering and fruiting: Transition to flowering, photoperiodism, thermoperiodism, flower induction, minimum age, photoinductive cycles, night breaks, factor modifying photoinduction, fruiting- fruitset, seed growth and ripening.
Stress physiology: Types, nature of injury, causes, mechanisms and survival measures to overcome.

Text and Reference Books

Bewley, J.D. and Black, M. 1994. Seeds: Physiology of development and germination. 2nd ed. Plenum Press, New York.
Datta, S.C. 1994. Plant physiology. Wiley Eastern Ltd., Calcutta, India.
Fosket, D.E. 1994. Plant growth and development. Academic Press Inc. California.
Gardner, F.P., Pearce, R.B. and Mitchell, R.L. 1985. Physiology of crop plants. Iowa State Univ. Press, USA.
Goldsworthy, P.R. and Fisher, N.M. 1984. The physiology of tropical field crops. John Wiley, New York.
Hans, M. 1984. Class experiments in plant physiology. George Allen & Unwin Pub. Ltd., London.
McDonald, M.B. and Copeland, L.O. 1989. Seed science and technology: Laboratory manual. Iowa State Univ. Press, USA.
Mohr, H. and Schopfer, P. 1994. Plant physiology. Springer, Berlin.
Pandey, S.N. and Sinha, B.K. 1986. Plant Physiology. Vikas Pub. House Pvt. Ltd., New Delhi.
Pundey, S.N. and Sinha, B.K. 1972. Plant physiology. Vikas Publishing House Pvt. Ltd., New Delhi.
Salisbury, F.B. and Ross, C.W. 1986. Plant physiology. Wadsworth Pub. Co., USA.
Salisbury, F.B. and Ross, C.W. 1986. Plant physiology. Wadworth Pub., USA.

Department of Crop Botany and Tea Production Technology
B. Sc. Ag.(Hons.) Level-3, Semester-2
Course No. CBOT 322
Course Title: Plant Physiology (Practical)
Credit: 2 hr

Experiments to demonstrate- osmosis, plasmolysis, transpiration and ascent of sap.

a) Measurement of water potential in plant tissues.
b) Study of distribution and abundance of stomata in different types of leaves.
c) Study of anatomical structures of leaves in C_3, C_4 and CAM plants.
d) Experiments to demonstrate photosynthesis and respiration.
e) Experiments on plant pigments: separation, quantification and stability index.
f) Demonstration of crop research in the Field Laboratory of Crop Botany Department
g) Estimation of dry matter (DM) production, leaf area (LA), leaf area index (LAI), light interception measurement.
h) Techniques of crop growth and yield analysis.
i) Experiments on ecophysiological aspects of imbibition and germination of seeds, methods of breaking seed dormancy.
j) Demonstration of the effects of different stresses on growth and yield in crops.
k) Demonstration of the effects of different PGRs on growth and yield in crops.

Sylhet Agricultural University, Sylhet

Department of Crop Botany &Tea Production Technology
B. Sc. Ag. (Hons.) Level-4 Semester-2
Course No. CBOT 423
Course Title: Tea Technology (Theory-Elective)
Credit: 2 hrs

01. **Distribution**

02. **Growth and development**: Habitat of tea plants, Tea seed, Roots, Cropping and Varietal characteristics.

03. **Climate and soil**: Climatic factors, Soil characteristics and topography and Soil properties and Characteristics of good soil.

04. **Propagation of tea**: Nucleus clone plot, Nursery site, Nursery bad, Ploy bag culture, Selection of shoot for cuttings, Preparation of cuttings, Planting of cutting, Hardening the plants, Grafting, Preparation of root stock and scions, Bud grafting and Propagation through seed.

05. **Planting tea and Management**: Preparation of land, Drainage, Layout, Staking and spacing, Planting materials, Planting pit, Planting time, Green manuring crops, Cover crops and grasses, Gap filling, Weeding, Shade, Drought, Drought control measures, Mulching and Erosion.

06. **Replanting and Rehabilitation Procedures**: Reasons of replanting, Meaning of rehabilitation, Rehabilitation procedures, Period of rehabilitation and Stages involved in soil rehabilitation.

07. **Nutrition of tea and fertilizer programme**: Importance of nutrient elements, Deficiency symptoms, Fertilizer progrmme, Source, Nutrient and calculation and application of NPK, NPK contents in organic matter.

08. **Pruning and Harvesting**: Pruning objectives, Young tea, Mature tea, Medium pruning, Iodine test, Measures necessary during pruning, Harvesting and Flushing.

09. **Pests and their control**: Status of pests: Insects, Diseases, Weeds, Pesticides and their formulations, Hail damage, Pest management, Planning, Pest survey/monitoring report, Assessment of crop loss, Effect of pesticides and Biological control.

10. Processing of tea: General, Composition of fresh tea shoot, Polyphenols, Enzymes, Caffeine, Theaflavins and thearubigins, Ash, Chlorophylls, Quality of tea, Leaf analysis, Orthodox processing, Natural withering, Trough withering, Rolling, Role breaker, Rotorvane, CTC, Lawrie tea processing, Fermentation, Drying or Firing, Dryer output, Sorting, Grades, Storage, Green and other forms of tea, Tea bag, Tea waste and Food value of tea.

11. **Packing and Trade**: Tea chests, Palleting, Tea tasting, Tea tasting procedure, Blending and Marketing

Text and Reference Books

Ball, S. 1994. Cultivation and Manufacture of Tea in Chaina.

Chaudhury, M.S.H. 1985. Tea Growing. Ananda Printers, 166, Arambagh, Motijheel Circular Road, Dhaka-1000.

Eden, T. 1958. Tea. Second Ed. Longman Green and Co. Ltd.

Harler, C.R. 1964. The Culture and Marketing of Tea. Third Ed. Oxford Univ. Press.

Harler, C.R. 1970. Tea Manufacture. Oxford Univ. Press.

Department of Genetics and Plant Breeding
B. Sc. Ag. (Hons.) Level-2, Semester-2
Course No. GPB 221
Course Title: Cytology and Cytogenetics (Theory)
Credit: 3 hrs

01. Plant cell constituents of genetic importance
02. Principal events of mitosis and meiosis in diploid organisms
03. Morphological structure of eukaryotic chromosomes and their nomenclature, Prokaryotic chromosomes and their characteristics
04. Euchromatin, heterochromatin, allocycly and heteropyconosis
05. Special types of chromosomes: Polytene chromosome, Lambrush chromosome, B-chromosome, Sex chromosome, Iso-and Telocentric chromosomes, Diplo chromosome.
06. Karyotipe: Characteristics, variation and its role on speciation.
07. Chemical organization of chromosomes.
08. Effects of different types of physical and chemical agents on chromosomes.
09. Structural changes of chromosomes, their meiotic behaviour and cytogenetic consequences.
10. Numerical changes of chromosomes, their meiotic behavoour and cytogenetic consequences.
11. Genome and individual chromosome identification-

a) Banding patterns for identification of chromosomes: Q bands, C and N bands, G bands and R bands.
b) In situ hybridization with DNA probes: FLuorescence and Genomic in situ hybridization and their practical applications in crop improvement.

12. Cytogenetics of wheat in relation to

a) Origin and distribution of polyploid wheats and related species
b) Genomic relationship of the phylo9geneticallys related species.

Text Books

Perry, J. and Appels, R. 1998. Chromosome structure and Function, Plenum press, New York and London.
Verma, P. Verma, P. S. and Agarwal, V. K. 1998. Cytology. S. Chand & Co. Ltd. Ram Nagar, New Delhi.
Gupta P. K. 2003. Genetics 3rd ed. Rastogi Publication Meerut, India.
Gupta, P. K. 1995. Cytogenetics, 1st ed. Rastogi, India.

Reference Books

Brown W. V. 1972. A. Text Book of Cytogenetics. C. V. Mosby Pub., St. Loise, USA.
Burns, G. W. 1980. The Science of Genetics 4th ed. Macmillan publishing co. Inc. New York.
Sharma, A. 1991. Chromosomes, Oxford & IBH Pub. Co. New Delhi.
Sharma, A. K. and Sharma, A. 1980. Chromosome Technique theory and practice 3rd ed. Butterworthes, London.
Gupta, A. K. 1977. (ed). Procedings of the 1st national Seminar on Genetics and Wheat Improvement, Ludhiana, February, 22-23, 1977. Oxford & IBH Pub. Co. New Delhi.
Gurdev, S. K. 1973. Cytogenetics of Aneuploids. Academic Press, Inc. New, York.
Reitz, L. P. and Quaisenberry, K. S. (ed) 1967. Wheat and Wheat Improvement. American Society of Agronomy, Madison, Wisconsin.
Reley, H. P. 1967. Introduction to Genetics and Cytogenetics, Hafner Pub. Co. Inc. New York.
Sharma, A. K. and Sharma, A. 1980. Chromosome Technique- theory and practice 3rd ed. Butterworthes, London.
Sharma, A. 1991. Chromosome. Oxford & IBH Pub. Co. New Delhi.
Swanson, C. P.; Merz. Y. and Young, W. J. 1987. Cytogenetics prentice Hall Press. London.

Department of Genetics and Plant Breeding
B. Sc. Ag. (Hons.) Level-2, Semester-2
Course No. GPB 222
Course Title: Cytology and Cytogenetics (Practical)
Credit: 2 hrs

Study of mitosis in onion root tip cells

Study of meiosis in the pollen mother cells of onion/maize

Effect of chemical agents on onion/garlic root tip chromosomes.

Effect of physical agents on onion/garlic root tip chromosomes.

Demonstration of C and N. banding

Department of Genetics and Plant Breeding
B. Sc. Ag. (Hons.) Level-3, Semester-1
Course No. GPB 311
Course Title: Genetics (Theory)
Credit: 3 hrs

01. Introduction: Historical background, development and scope of genetics
02. Basis terms related to genetic studies.
03. Mendel and his laws of inheritance: Mendel and his experiments, genetic nomenclature of Mendelian characters, Law of segregation and independent assortment, secrets of Mendel's success.
04. Modifications of Mendel's ratios:
    a) Modification of monohybrid cross due to partial dominance, co-dominance and heterodominance.
    b) Modification of dihyrbid cross due to allelic and non-allelic geen interaction.
05. Physical basis of heredity: Chromosome theory of inheritance, experimental evidence to prove that genes are situated on chromosomes.
06. Linkage and crossing over: Concept, genetic nomenclature of linked genes, linkage is an exception of independent assortment, mechanism and theories of crossing over, significance of crossing over, genetic map using three point text cross progeny.
07. Multiple alleles: Concept, genetic nomenclature of multiple alleles, test of multiple alleles self-incompatibility in flowering plants, pseudoalleles.
08. Quantitative inheritance: Qualitative and quantitative characters and their differences, genetic nomenclature of quantitative characters, multiple factor hypothesis with reference to inheritance of quantitative characters.
09. Gene: Classical and modern concept, evidence of DNA as genetic material, molecular structure of DNA, model's of DNA replication, function of gene in protein synthesis, RNA as genetic material.
10. Sex determination: Classification, mechanism of sex determination, sex-linked genes in plants and animals, inheritance of sex-linked, sex-limited and sex-influenced characters.
11. Mutation: Concept, classification of mutation, molecular basis of mutation, types of mutagens and their effects, detection of mutation, significance of mutation.
12. Extra-nuclear inheritance: Features, difference between nuclear and extra-nuclear inheritance, cytoplasmic inheritance with special reference to male sterility, maternal effect.

Book Recommended

Burns, G. W. 1980. The Science of Genetics. 4th ed. Macmilliam Publishing Co. Inc. New York.
Gupta, P. K. 2003. Genetics. 3rd ed. Rastogi Publication, Meerut, India.
Jain, H. K. 2000. Genetic Principles, concepts and implications. Oxford and IBH Publishers Co. Pvt. Ltd. New Delhi.
Singh, B. D. 2001. Fundamentals of Genetics 3rd ed. Kalyain Publishers New Delhi-110002.
Sinnott, E. W.; Dunn, L. C> and Dobhansky, T. 2003. Principles of Genetics. Tata McGraw Hill Publishing Co. Ltd. New Delhi.
Stickberger, M. W. 1990. Genetics, 3rd ed. Macmillian Publishing Co. New York.
Verma, P. S. and V. K. Agarwal, 1998. Genetics. 8th ed. S. Chand and Co. Ltd. New Delhi.

Department of Genetics and Plant Breeding
B. Sc. Ag. (Hons.) Level-3, Semester-1
Course No. GPB 312
Course Title: Genetics (Practical)
Credit: 2 hr

01. Introduction to practical genetics: Demonstration and maintenance of parents, F1 and F2 generation plants in the Genetics and Plant Breeding experimental farm.
02. Problems on monohybrid cross: Complete dominance, partial dominance and co-dominance
03. Problems on dihybrid cross: Complete dominance, partial dominance and co-dominance
04. Problems on trihybrid cross: Complete dominance
05. Problems on gene interaction: Non-epistatic gene interaction and episatic gene interaction.
06. Problems on chi-square test: Collecting data from F2 and test cross progeny of monohybrid and dihybrid crosses from the GPB experimental farm to perform Chi-square test for goodness of fit to Mendelian and Non Mendelian ratios.
07. Problems on linkage and crossing over: Using two and three point test cross.
08. Problems on quantitative inheritance: Collection of data from genetic populations such as P1, P2, F1 and F2 to sutyd quantitative inheritance.

Book Recommended

Burns, G. W. 1980. The Science of Genetics. 4th ed. Macmilliam Publishing Co. Inc. New York.
Gupta, P. K. 2003. Genetics. 3rd ed. Rastogi Publication, Meerut, India.
Jain, H. K. 2000. Genetic Principles, concepts and implications. Oxford and IBH Publishers Co. Pvt. Ltd. New Delhi.
Singh, B. D. 2001. Fundamentals of Genetics 3rd ed. Kalyain Publishers New Delhi-110002.
Sinnott, E. W.; Dunn, L. C> and Dobhansky, T. 2003. Principles of Genetics. Tata McGraw Hill Publishing Co. Ltd. New Delhi.
Stickberger, M. W. 1990. Genetics, 3rd ed. Macmillian Publishing Co. New York.
Verma, P. S. and V. K. Agarwal, 1998. Genetics. 8th ed. S. Chand and Co. Ltd. New Delhi.

Department of Genetics and Plant Breeding
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. GPB 411
Course Title: Plant Breeding (Theory)
Credit: 3 hrs

01. **Principle and basic topics:** Scope and goal of plant breeding, recent trends in plant breeding, mechanism of self and cross pollinations, genetic significance of pollination methods, Evolution
02. of crop plants, centres of origin and diversity, conservation and management of plant genetic resources.

03. **Genetic basis of crop improvement:** Factors limiting genetic improvement of crop plants. Population structure and gene frequency; effects of genes in quantitative inheritance; heritability and its role on genetic advance; hybrid vigour, inbreeding depression, male sterility and self incrompatibility phenomena and their causes.

04. **Hybridization:** Objectives, types procedure and consequences of hybridization

05. Plant Breeding methods:
   a) For self- pollinated crops- Mass selection, Pure-line selection pedigree, single seed descent, bulk population and backcross methods
   b) For cross-pollinated crops- mass selection, recurrent selection, development of hybrid and synthetic varieties.
   c) For vegetatively propagated crops-clonal selection after hybridization, mutation and polyploidization
   d) Heritability: Types, estimation and role in genetic advance
   e) Heterosis breeding- types and measurement of heterosis, commercial exploitation, techniques of hybrid seed production.
   f) Mutation breeding- induction and utilization of mutants in crop improvement.
   g) Polyploid breeding- induction and use of auto and allo-polyploids.
   h) Stress breeding- Biotic-disease and Insect-Abiotic resistance; Drought and Salinity

06. Application of biotechnology and genetic engineering in crop improvement
   a) Tissue culture- techniques and requirements. micropropagation, embryo culture, anther culture, pollen culture, somatic embryogenesis and somatic hyridization, Cryopreservation and storage of germplasm
   b) Recombinant DNA technology- Cloning and selection of recombinants

07. **Variety release and seed production:** Principles and practices relating to evaluation and release of new crop varieties, seed legislation, seed certification and seed testing.

Books Recommended

Text Books

Old R. W. and Primrose. S. B. 1994. Principles of Gene Manipulation- An introduction to Genetic Engineering. Backwell Scientific Publications. London. 5th Edition.
Poehlman, J. M. and Sleeper, D. A. 1995. Breeding Field crops, Panima Pub. Cor., New Delhi
Primorose, S. B. 1987. Modern Biotechnology, Backwell Scientific Pub., London.
Sharma, J. R. 1994. Principles and Practice of Plant Breeding. Tata McGraw-Hill Pub., New Delhi.
SIngh, B. D. 2000. Plant Breeding, Kalyani Publishers, India.

Reference Books

Allard, R. W. 1960. Principles of Plants Breeding, John Wiley and Sons, Inc. New Your.

Bhojwani, S. S. and Razdan, M. K. 1983. Plan Tissue Culture: Theory and Practice. Elsevier Science Pub Amsterdam.

Bhuiya, M. S. R. 1999. Udvid Projanan. 2nd edn. Bangla Academy, Dhaka (In Bangla).

Chopra, V. L. 1989. Plant Breeding: Theory and Practices. Oxford and IBH Pub. New Delhi.

Chopra, V. L. and Nasim. A. 1990. Genetic Engineering and Biotechnology. Oxford and IBH Pub., New Delhi.

David, W. R. 1995. Pollination of Cultivated Plants in the Tropics, FAO, Fome

Falconer, D. S. and Mackay, T. F. C. 1996. Introduction to Quantitative Genetics. Longman Essex, UK.

Gamborg, O. L. and Phillips, G. C. 1995. Plant cell, tissue and organ culture, Fundamental methods, Narosa Pub. House, New Delhi.

Ferhr, W. R. and Hadley, H. H. 1980. Hybridization in Crop Plants. American Soc. Agron. & Crop Sci. Soc. America, Madison.

IPGRI. 2000. Cryopreservation of Tropical Plant Germplasm-Current Research Progress and Application. Florent Engelmann and Hiroko. Takagi, Rome.

Islam, M. A. 1998. Udvid Projanan. Private Pub., BAU, Mymensingh (In Bangla).

Primrose, S. B. 1987. Modern Biotechnology, Backwell Scientific Pub. London.

Chawla, H. S. 2004. Introduction to Plant Biotechnology, Science Publisher, 2nd edition.

Jain, H. K. 2000. Genetic Principles, concepts and implications. Oxford and IBH Publishers Co. Pvt. Ltd. New Delhi.

Ram, H. H. 2003. Crop Breeding and Genetics. Kalyani Publishrs, Ludhiana, India.

Singh, P. 2004. Biometrical Techniques in Plant Breeding, Kalyani Publishers, Ludchiana, India.

Department of Genetics and Plant Breeding
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. GPB 412
Course Title: Plant Breeding (Practical)
Credit: 2 hrs

01. Hybridization techniques: Floral biology, pollination system and crossing techniques in crop plants, such as rice, wheat, maize, tomato, beans, peas, groundnut, mustard and jute.

02. Demonstration of field experiments:
    a) Demonstration of parental, hybrid and segregating populations and data collection
    b) Demonstration of breeding research activities in the GPB experimental farm

03. Statistical analysis of plant breeding and genetic experiments
    a) Estimation of proportion of homozygotes in successive generations under Oligocene and polygenic situation.
    b) Data analysis for variety testing and other experiments, using a RCB design-anova, test of significance and mean separation.
    c) Plant characters association- correlation and regression analysis.
    d) Estimation of heterosis, heritability and no. of genes controlling quantitative characters.

04. Tissue culture: Prerequisites of tissue culture preparation of tissue culture media, sterilization techniques and handling of equipment related to tissue culture, and demonstration of embryo culture.

Department of Genetics and Plant Breeding
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. GPB 423
Course Title: Special Plant Breeding (Theory-Elective)
Credit: 2 hrs

01. Status of breeding achievements of important field crops in Bangladesh: rice, wheat, maize, jute, sugarcane, mustard, groundnut, soybean, lentil, chickpea and tomato.
02. Breeding for hybrid variety in self- pollinated crops: System of pollination control. Development, selection, and maintenance of parental lines, production of single cross and double cross hybrids, significance and problems.
03. Breeding systems and their implication in plant breeding: significance of breeding system, natural mating system- features and consequences, merits and demerits of selfers and out breeders, mode of pollination and rate of gene flow.
04. Genotype Environment Interaction and Adaptation: Genotypes, environments and adaptability, mechanisms of adoption, significance of G X E interaction and adoption.
05. Mutation in crop improvement: Handling of mutagenized materials, factors influencing mutation spectrum, prospects and limitation of mutation breeding.
06. Polyploid in crop improvement: Polypolids in nature, artficial induction of polyploids, its application in crop improvement, prospects and limitations of polyploid breeding
07. Haploidy in crop improvement: Haploids in nature, induction of haploids and doubled haploids, their application in crop impartment, prospects and limitations.
08. Wide hybridization: Objectives, barriers, application in crop improvement-alien addition, alien substitution and transfer of segment of chromosomes, transfer of cytoplasm, prospects and limitations.
09. Apomixis: Origin induction and its application in crop improvement.
10. Seed production and maintenance of crop varieties: Kinds of seeds & seed production practices; control of seed quality, seed processing, storage and distribution; maintenance of crop varieties.
11. Participatory Plant Breeding System; Plant Breeders' rights: Requirements, farmer's privilege, breeders' exemption, benefit and disadvantages from PBR.

Book Recommended

Bhuiya, M. S. R. 1999. Udvid Projanan. 2nd edn. Bangla Academy, Dhaka (In Bangla).Bhuiyan, M. S. R. 2012. Plant genetic resources of Bangladesh. Plant Breeding and Genetics Society of Bangladesh

Chopra, V. L. 1989. Plant Breeding: Theory and Practices. Oxford and IBH Pub., New Delhi

Dana, S. 2001. Plant Breeding. Naya Udyog, India

Gupta, S. K. 2008. Plant Breeding. Agribios, India

Sharma, J. R. 1994. Principles and Practice of Plant Breeding. Tata McGraw-Hill Pub., New Delhi

Singh, B. D. 2000. Plant Breeding- Principles and Methods, Kalyani Publishers, India

Tamarin, R. H. 2002. Principles of Genetics. 7th edn. Tata McGraw-Hill Pub., India.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-1, Semester-1
Course No. HORT 111
Course Title: Fundamentals of Horticulture (Theory)
Credit: 2 hrs

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

2. 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.

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

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

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

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

Text and Reference Books

Adams, C.R., K.M. Bamford and M.P. Early. 1993. Principles of Horticulture (2nd ed.). Linacre House, Jordan Hill, Oxford.

Bose, T.K., S.K. Mitra and M.K. Sadhu. 1986. Propagation of Tropical and Sub-tropical Horticultural Crops. Naya Prokosh, Calcutta.

Chadha, K.L. 2001. Hand Book of Horticulture. ICAR, New Delhi.

Hartmann, H.T., D.E. Kester and F.T. Davies Jr. 1990. Plant Propagation: Principle and Practices. Prentice-Hall, International editions.

Mondal, M.F.2000. Nursery and Plant Propagation (in Bangla). Mrs. Afia Mondal, BAU Campus, Mymensingh.

Prasad, S. and U. Kumar, U. 1999. Principles of Horticulture. Agro Botanica, New Delhi.

Randhawa, G.S. and A. Mukhopadhyay. 1994. Floriculture in India. Allied Publishers Limited, New Delhi.

Rao, K.M. 1995. Text Book of Horticulture. Macmillan India Limited.

Sadhu, M.K. 1996. Plant Propagation. New Ag. Int. Ltd., Publishers, New Delhi.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-1, Semester-1
Course No. HORT 112
Course Title: Fundamentals of Horticulture (Practical)
Credit: 2 hrs

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 of manure and fertilizer.
9. Practices on different intercultural operations.
10. Harvesting methods of horticultural crops.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-2, Semester-1
Course No. HORT 211
Course Title: Ornamental Horticulture and Plantation Crops (Theory)
Credit: 2 hrs

1. **Importance and classification:** Scope, importance and classification of ornamental plants and plantation crops.

2. **Production and management of ornamental plants**

    a) Bedding flowers: Zinnia, cosmos, calendula, globe amaranth, phlox, antirrhinum, dianthus, balsam, corn-flower and lupin.
    b) Commercial flowers: Rose, dahlia, chrysanthemum, carnation, tuberose, gladiolus, marigold, aster, jasmine and lilies.
    c) Ornamental shrubs, trees, palms, orchids, ferns and cacti.

3. **Landscape horticulture:** Landscape horticulture and its classification, theory and principles of landscape gardening, development and maintenance of lawn, turf and hedge.

4. **Garden architecture and decoration:** Formal and informal garden; principles and geometry; establishment and maintenance of home and institutional gardens, water garden, rock-garden, park, bonsai, topiary, pergola and arches.

5. **Commercial floriculture:** Management of cut and dry flowers, production of perfumes and aromatics, business development.

6. **Production and management of plantation crops:** Production, management and processing of plantation crops: Rubber, oil palm, cocoa, betel leaf, betel nut and bamboo.

Text and Reference Books

Bose T.K. and B. Choudhury. 1991. Tropical Garden Plants in Colour. Horticulture and Allied Publishers. Calcutta.
Bose, T.K. and L.P. Yaday. 1989. Commercial Flowers. Naya Prakash, Calcutta.
Bose, T.K., R.S. Maiti, R.S. Dhua and P. Das. 1999. Floriculture and Landscaping. Naya Prokash Calcutta.
Chadha, K.L. 2001. Hand Book of Horticulture. ICAR, New Delhi.
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.
McMillan, H.E. 1962. Tropical Planting and Gardening. MacMillan, London.
Pal B.P. 1991. The Rose in India. ICAR, New Delhi.
Randhawa, G.S. and A. Mukhupadhyay. 1994. Floriculture in India. Allied Pub. Ltd., New Delhi.
Rashid, M.M. 1990. Phuler Chas. Bangla Academy, Dhaka.
Srivastava H.C., B. Vatsu and K.K.G. Menon. 1986. Plantation Crops: Opportunities and Constraints. Oxford & IBH Pub., New Delhi, India.
Swarup, V. 1979. Garden Flowers. National Book Trust, New Delhi.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-2, Semester-1
Course No. HORT 212
Course Title: Ornamental Horticulture and Plantation Crops (Practical)
Credit: 2 hrs

1. Identification of different flowers, ornamental plants, cacti, fern, orchid and plantation crops and their propagating materials.
2. Preparation of seed album for ornamental plants.
3. Preparation of herbarium.
4. Preparation and packaging of cut flowers for marketing.
5. Preparation of bouquet and flower arrangements for different purpose.
6. Making bonsai and topiary.
7. Techniques of growing orchids and cacti.
8. Graphic design of different types of ornamental gardens and their components.
9. Graphic design of park.
10. Cost of production of rose and tuberose.
11. Raising of saplings of plantation crops.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-3, Semester-1
Course No. HORT 311
Course Title: Vegetable and Spice Crops (Theory)
Credit: 3 hrs

1. **Vegetables and spices in Bangladesh:** Background, status of production and export, importance in human nutrition and economy.
2. **Classification and morphology of vegetable and spice crops :** Origin, distribution, classification, morphology and growth habit.
3. **Soil and climatic factors in vegetable production:** Influence of soil, temperature, light, air and water on physiology, vegetative growth, flowering, yield and quality of vegetables.
4. **Vegetable seeds:** Present situation of production, import and supply, classes, quality, techniques of production, factors influencing quality during production and storage.
5. **Vegetable farming:** Kitchen and commercial garden; organic farming, polytunnel production; inter-multiple-relay cropping, crop rotation.
6. **Production technology of vegetables:** Technology of production and storage of fresh vegetables: cabbage, cauliflower, potato, tomato, brinjal, sweet potato, carrot, sweet gourd, pointed gourd, cucumber, watermelon, aroids, leafy vegetables and mushroom.
7. **Production and processing of spices:** Production, processing and storage of onion, garlic, chilli, ginger, turmeric, coriander and black pepper.

Text and Reference Books

Anonymous. 1995. Winter Vegetables and Spices Production. Hort. Res. & Dev. Project, FAO/UNDP, DAE/BADC, Dhaka.
Bose, T.K. and M.G. Som. 1990. Vegetable Crops in India. Naya Prokash, Calcutta.
D.K. Salunkhe, B.B. Desai and N.R. Bhat. 1987. Vegetable and Flower Seed Production. Agricole Pub. Academy, New Delhi.
Hussain, M.M. 1995. Seed Production and Storage Technology. Meer Imtiaz Hossain, Dhaka.
Pruthi, J.S. 1986. Spices and Condiments. National Book Trust, New Delhi.
Purseglove, J.W., E.G. Brown, C.L. Green and S.R.J. Robbins. 1981. Spices, Vol I & II. Longman Group UK Ltd., London.
Rashid, M.A. and D.P. Singh. 2000. A Manual on Vegetable Seed Production in Bangladesh. AVRDC-USAID-Bangladesh Project, BARI, Joydebpur.
Rashid, M.M. 1999. Shabji Biggyan. 2nd ed., Rashid Pub. House, Dhaka.
S.L. Katyal and K.L. Chadha. 1996. Vegetable Growing in India. Oxford & IBH Pub. Co. Pvt. Ltd. New Delhi.
Sanmugavelu, K.G. 1989. Production Technology of Vegetable Crops. Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi.
Sharfuddin, A.F.M. and M.A. Siddique. 1985. Shabji Biggan. Hasina Akter Beauty, Mymensingh.
Hoque, M.M. 1995. Training Manual: Summer and All-season Vegetable and Spice Production. Hort. Res. & Dev. Project, DAE/BADC, Dhaka. 130 p
Hoque, MM. 1995. Training Manual: Winter Vegetables and Spices Production. Hort. Res. & Dev. Project, DAE/BADC, Dhaka. 284p.

Hossain, M.I. 1996. Seed and Seed Technology. School of Agri. & Rural Dev., Bangladesh Open Univ. , Gazipur. 63p.
Rashid and Singh. 2000. A Manual on Vegetable Seed Production in Bangladesh. AVRDC-USAID-Bangladesh Project, Hort. Res. Centre, BARI, Gazipur. 119p.
Pruthi, J.S. 1986. Spices and Condiments. National Book Trust, New Delhi.
Rashid, M.M. 1999. Shabji Biggyan. 2nd. ed., Rashid Pub. House, Dhaka.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-3, Semester-1
Course No. HORT 312
Course Title: Vegetable and Spice Crops (Practical)
Credit: 2 hrs

1. Identification of important vegetable and spice plants, plant parts and their planting materials.
2. Methods of planting vegetable and spice crops.
3. Studies on morphological features of important vegetable and spice crops.
4. Identification of important cultivated varieties of tomato, potato, brinjal and sweet potato.
5. Estimation of cost of production and economic returns of tomato, cabbage, onion and potato.
6. Studies on quality of vegetable seeds.
7. Demonstration and report writing on homestead and commercial production of vegetables in a neighboring village.
8. Extraction of bottlegourd, tomato and brinjal seeds.
9. Studies on techniques of staking, trellising, artificial pollination and poly-tunnel making for vegetable production.
10. Estimation of seed rate and fertilizer dose for vegetable production.
11. Making of a crop calendar for vegetable and spice crops
12. Rising of vegetable and spice crops in plots and report writing.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-4, Semester-2
Course No. HORT 421
Course Title: Pomology (Theory)
Credit: 3 hrs

General aspects of fruit production in Bangladesh: Scope, importance, classification, area, production and factors affecting distribution of fruits in Bangladesh. Major fruit growing regions of the world.

1. **Propagation of fruit plants:** Physiological and anatomical aspects of vegetative propagation. Stionic relationship and incompatibility. Micropropagation and its principles, stages and techniques.

3. Establishment and management of fruit orchards and homestead gardens : Concept, site selection, land development and planting plans and orchard management practices. Bearing habit and its implications. Unfruitfulness–causes and remedies; use of growth regulators in fruit industry.

2. **Physiology of flowering, fruit set and fruit development :** Factors influencing flower bud initiation, differentiation, pollination, fertilization, fruit set, growth, development, parthenocarpy and seedlessness.

3. **Production technology of fruits** : Origin, morphology, production statistics, soil, climate, varieties, propagation, cultural practices, pest management, harvesting, yield and improvement: Banana, pineapple, papaya, mango, jackfruit, litchi, guava, jujube, coconut, citrus fruits. Important minor and exotic fruits of Bangladesh.

5. Post-harvest management of fruits: Post harvest physiology, factors affecting post harvest quality and shelf life, causes of spoilage and remedies.

Text and Reference Books

Bose T.K. and S.K. Mitra. 1995. Fruits: Tropical and Subtropical. Naya Prokash, 106, Bidhan Sarani, Calcutta-6, India.
Bose, T.K., S.K. Mitra and M.K. Sadhu. 1990. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prokash, 206, Bidhan Sarani, Calcutta-6, India.
De. K.K. 1992. An Introduction to Plant Tissue Culture. New Central Book Agency, Calcutta.
Gardner, V.E.F.C. Bradford and M.D. Hooker. 1952. Fundamentals of Fruit Production. McGraw Hill Book Company, New York.
Hartmann, H.T., D.E. Kester and F.T. Davies Jr. 1990. Plant Propagation: Principle and Practices. Prentice-Hall, Iner Editions.
Mondal, M.F. 2000. Production and Storage of Fruits (in Bangla). Published by Mrs. Afia Mondal, BAU Campus, Mymensingh.
Mukhopadhya, S. 1995. Commercialization of Micropropagated Plants in India. New Delhi
Ryogo, K. 1988. Fruit Culture. Its Science and Art. John Wiley and Sons. New York.
Samson, J.A.1980. Tropical Fruits. Longman, London & New York.
Singh, A. 1986. Fruit, Physiology and Production. Kalyani Publishers, New Delhi.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-4, Semester-2
Course No. HORT 422
Course Title: Pomology (Practical)
Credit: 2 hrs

1. Identification of common fruit plants of Bangladesh.
2. Identification of cultivated varieties of important fruits.
3. Morphological features of important fruit plants.
4. Preparation of different planting plans for orchards.
5. Practices on layout, planting, manuring, fertilizing, training, pruning and other cultural operations of orchards.
6. Acceleration of fruit seed germination.
7. Preparation and application of starter and hormone solutions.
8. Practicing vegetative propagation methods of common fruit plants of Bangladesh.
9. Costing of cultivation of mango, banana, papaya and pineapple.
10. Determination of brix of fruits.
11. Determination of fruit volume and texture.
12. Determination of ripeness of fruits.

Department of Horticulture
B. Sc. Ag.(Hons.), Level-4, Semester-2
Course No. HORT 423
Course Title: Postharvest Management of Horticultural Crops (Theory-Elective)
Credit: 2 hrs

1. **Postharvest management of horticultural crops :** Concept, importance, scope and present situation of postharvest activities on horticultural crops in Bangladesh.

2. **Preharvest factors affecting postharvest quality :** Agroclimate, cultural management, and maturity.

3. **Postharvest physiology:** Respiration, transpiration, ethylene production, ripening, sprouting, physical and chemical changes.

4. **Harvesting and postharvest handling :** Harvesting, cooling, cleaning, curing, sorting, grading, packaging, transportation and marketing.

5. **Technology of storage:** Principles and methods of different types of storage including CA, MA, refrigerated and traditional storage.

Processing and preservation : Objective, principles and methods, preparation of value added products.

Books Recommended:

Champa, B.R., E, Highley, and G.I. Johnson. 1994. Postharvest Handling Technology for Tropical Fruits. ACIAR Australia.

FAO. 1998. Fruits and Vegetable Processing. Intl. Book Distribution Co. UP, India.

Johnson. G.I. and E. Highley. 1994. Development of Postharvest Handling Technology for Tropical Fruits. ACIAR Australia.

Johnson. G.I. and E. Highley. 1994. Development of Technology for Extension of Shelf life of Tropical Fruits. ACIAR Australia.

Kader, A. 1992. Postharvest Technology. Pub. No. 3311. Univ. of California, Div. of Agriculture and Naturul Resources.

Lal G., Siddappa GS & Tandon GL. 1998. Preservation of Fruits and Vegetables. ICAR, India.

Pabtastucim E.B. 1975. Postharvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables. AVI, Westport, USA

Salunkhe, D. K. and B. D. Desai. 1984. Postharvest Biotechnology of Fruits. Vol. I & II CRC Press. Inc., Boca Raton, Florida.

Singh, A. 1986. Fruit Physiology and Production. New Delhi.

Srivastava RP & Kumar S. 1998. Fruit and Vegetable preservation-Principles & Practices. Intl. Book Distribution Co. UP, India.

Tai, E.A. 1977. Ecophysiology of Tropical Fruits. London.

Wills, R.B.H, T.H. Lee, D. Graham, W.B. McGlasson and E.G. Hall. 1989. Postharvest: An introduction to the Physiology and Handling of Fruits and Vegetables. N.S.W. Australia 2033.

Department of Plant Pathology and Seed Science
B. Sc. Ag. (Hons.) Level-2, Semester-2
Course No. PPATH 221
Course title: Fundamentals & Principles of Plant Pathology (Theory)
Credits: 3 hrs

Concept and Causes of Plant Diseases
Introduction to fungi:

a) General characteristics of fungi including morphology, reproduction and nutrition, nomenclature and classification of fungi.
b) Study of the following genera including their families and orders: Synchytrium, Phthium, Phytophthora, peronospora, Rhizopus, Saccharomyces, Penicillium, Aspergillus, Erysiphe, Claviceps, Puccinia, Ustilago and Agaricus.
c) Detailed study of the orders, families and genera of Deuteromycotina

Introduction to Plant Viruses and Mycoplasmas: Nature of viruses, physical and chemical structures, transmission, identification and classification of viruses; viroids and mycoplasmas.

Introduction to Bacteriology: General morphology, reproduction and nutrition, classification of plant pathogenic bacteria, symptoms of bacterial diseases with examples. General control of bacterial diseases

Introduction to Plant Parasitic Nematodes: Morphology, anatomy, physiology with special emphasis to feeding and reproduction; classification of plant parasitic nematodes, symptoms of nemic diseases with examples.

Plant diseases caused by parasitic phanerogams
Principles and methods of plant disease control: Cultural, Legislative, Chemicals, Host resistance, Biological, Integrated Plant Diseases Management

Text and Reference Books

Alexopoulos, C. J. 1962. Introductory Mycology, John Wiley & Sons. Inc. NY.
Bawden F. C. 1964. Plant Viruses and virus diseases. The Ronald Press
Been, T. H. and Schonaker, C. H. 2004. Quantitative studies on the management of potato cyst nematodes (Globodera spp.) in the Motherlands.
Butler, E. J. 1973. Fungi and Disease in Plants. M/S. Bishen Singh Mahendra Pal Singh, New Connaught Place, Dehra Dun. and M/S Periodical Experts, Vivek Vihar, Delhi-32.
Bradbury, F. F. 1986. A Guide to Plant Pathogenic Bacteria. Published by CAB International, Farnham House, Farnham Royal , Slough LS2 3BN, UK
Brunt, A. A., Carbtree, K., Dallwitz, M. J., Gibbs, A. J. and Watson, L. 1996. Viruses of Plants. CBA International Wallingford Oxon Ox108DE UK.
Christensen, Cm. 1961. The Molds and Man: An Introduction of FUngi, University of Mennesota Press.
Christie, J. R. 1950. Plant Nematodes: Their Dynamies and Control. Florida Agricultural Experimental Station, USA
Corbett, J. K. and H. D. Sister (ed). 1987. CRC Press. Inc., Bora Raton, Florida, USA
D. J. Hunt., 1993. Aphelenchida, Longidoridae and Trichodoridae: Their systematies and Bionomies CAB International Institute of Parasitology, London, UK
Dimmock, J. N. and Primose, S. B. 1987. Introduction to Modern Virology, 3rd ed. Blackwell Sci. Publishing
Emerson, F. 1946. Microbes Militant: A challenge to Man: The Ronald Press Company.
Goto, M. 1996. Fundamental of Bacterial Plant Pathology. Academic Press Inc. Tokyo

Jenkins, W. R. and D. P. Taylor, 1967. Plant Nematology. Reinhold Pub. Crop. N. Y. Amsterdam and London

Lucas, J. A. 1988. Plant Pathology and Plant Pathogens. 3rd edition. Blackwell Publishing.
Luc, M., Sikora, R. A> and Bridge, J. 2002. Plant Parasitic Nematodes in Subtropical and Tropical Agriculture. CAB International, Institute of Parasitilogy, London, UK
Lelliott, R. A. and Stead, D. E. 1987. Methods for the Diagnosis of Bacterial Diseases of Plants. Black well Seicntific Publications Oxford, 8 John Street, London
Mathews, R. E. F. 1991. Plant Virology. Third Edition. Academic Press, INC. 1250 Sixth Avenue, San Diego, California, USA
Mehtrotra, Brahm Swarlep. 1967. The Fungi. 2nd Ed. Oxford & IBH Publishing Co., New Delhi.
Mundkur, B. B. 1964. Fungi and Plant Diseases: MacMillan & Company, London
Pelezar, M. J. J. Jr. and R. D. Reid. 1950. Microbiology. McGraw-Hill Book Company, New York.
Rangaswami, G. 1972. Diseases of crop plants in india. Prentiee Hall of India Private Ltd.
Singh, R. S. 1973. Plant Diseases 3rd ed. Oxford & IBH Publishing Co., New Delhi
Singh, R. S. 1994. Plant Pathogens: The fungi. 3rd Oxford & IBH Publishing Co., New Delhi
Stakman, E. C. and J. C. Harrar, 1957. Principles of Plant Pathology. The Ronald press Company, New York
Stevens. F. L. 1913. The Fungi which causes plant disease. The Macmillan Company, New York
Strange, R. N. 2003. Introduction to plant pathology, John Wiley and Sons Ltd., England.
Thimann, K. V. 1966. The life of Bactreria. The MacMillan Co.
Southey, J. F. 1964. Plant nematology, Published by S. Chand & Company (Pvt.) Ltd. Ram Nagar, New Delhi-110055
Throne, G. 1961. Principles of Nematology, MacGraw-Hill Book Co., N. Y.
Webster, J. 1990. Introduction of Fungi. Third Edition. Cambridge University Press, Cambridge.
Weidel, W. 1959. Virus. The University of Michigan Press.

Department of Plant Pathology and Seed Science
B. Sc. Ag. (Hons.) Level-2, Semester-2
Course No. PPATH 222
Course title: Fundamentals & Principles of Plant Pathology (Practical)
Credits: 2 hrs

Calibration of microscope and measurements of plant pathogens and spore count
Techniques involved in preparation of slides for microscopic study
Preparation of culture media

Sterilization: Methods and techniques
Isolation and detection of fungi, bacteria and nematodes from diseased plant materials and soil
Isolation and detection of viruses from diseased plant materials

Study of the following genera of fungi:

Synchtrium, Phjthium, Mucor, Rhizopus, Aspergillus, Penicillium, Agaricus, Alternaria, Curvularia, Pyricularia, Fusarium, Rhizoctonia, Sclerotium and Colletotrichum.
Demonstration of different types of symptoms of plant diseases. An assignment of phanerogamic parasites.

Department of Plant Pathology and Seed Science
B. Sc. Ag. (Hons.) Level-3, Semester-2
Course No. PPATH 321
Course title: Diseases of Field Crops (Theory)
Credits- 3 hrs

Pathogenesis: Parasitism and pathogenicity, chain of events in disease developments. Enzymes and toxins in disease development, pathogenic effects on physiological functions of plants.

Dissemination of plant pathogens: Importance, factors and mechanisms. Disease Development, Predisposition.

Epidemiology of Plant Diseases

Diseases of Crops
Cereals: Rice, Wheat, Maize, Barley and Millets.
Fibres: Jute and Cotton
Pulses: Pea, Gram, Lentil, Blackgram, Mungbean, Grasspea and Pigeonpea
Oilseeds: Mustrad, Groundnut, Sesame, Soybean and Sunflower
Sugar Crop: Sugarcane

Text and Reference Books
Agrios, G. N. 1969. Plant Pathology, Academic Press, New York.
Alexopoulos, C. J. and E. S. Beneke. 1962. Laboratory Manual for Introductory Mycology. Bargees Publishing Co.
Ashrafuzzaman, M. H. 1976. 1st ed. Laboratory Manual of Plant Pathology. Department of Plant Pathology, BAU
Ashrafuzzaman, M. H. 1976. A Lecture Guide to Crop Diseases. 1st ed. Department of Plant Pathology, BAU
Barnett, R. I. 1960. Illustrated Genera of Imperfect Fungi. Burgess Publishing Co.
Butler, E. J. 1973. Fungi and Disease in Plants. M/S Bishen Singh Mahendra Pal Singh, New Connaught Place, Dehra Dun, and M/S Periodical Experts, Vivek Vihar, Delhi-32.
Bos, L. 1987. Symptoms of Virus Diseases in Plants Oxford & IBH Publishing Co., New Delhi
Carter, W. 1962. Insects in Relation to Plant Diseases. McGraw-Hill Book Company
Frobisher, M. 1953. Fundamentals of Microbiology, Fifth edition, London, Saunders.
Funder. S. 1968. Practical myc9ology. Hafner Publishing Co.
Leech, J. G. 1940. Insects Transmission of Plant Diseases. McGraw-Hill Book Co.
Mehrotra, R. S. 1980. Plant Pathology. Tata McGaw-Hill Publishing Co.
Pathak, V. N. 1987. Laboratory Manual of Plant Pathology. Published by Mophan Primlani for Oxford & IBH Pub. co. Pvt. Ltd., 66 Janpath, New Delhi 110001
Rangaswami, G. 1962. Bacterial Plant Diseases in India Bombay. Asia Publishing House
Rangaswami, G. 1972. Diseases of crop plants in India. Prentice Hall of India Private Ltd.
Schaad, N. W. 1980. Laboratory Guide for Identification of plant pathogenic bacteria, Bacteriological committee of American Phytopathological Society St. paul. Minnesota.
Singh, R. S. 1973. Plant Diseases, 3rd ed. Oxford & IBH Publishing Co.
Singh, R. S. 1978. Introduction to Principles of Plant Pathology. 2nd edition. Oxford & IBH Publishing Co. New Delhi, India
Ven der Plank, J. E. 1963. Plant Diseases. Epidemics and control. Academic Press, New York, London
Ven der Plank, J. E. 1968. Diseases REsistance in Plants. Academic Press, New York, London
Ven der Plank, J. E. 1978. An Introduction to Plant Diseases, John Wiley and Sons Ltd.

Department of Plant Pathology and Seed Science
B. Sc. Ag. (Hons.) Level-3, Semester-2
Course No. PPATH 322
Course title: Diseases of Field Crops (Practical)
Credits- 2 hrs

Field and laboratory studies of plant disease

a) Detailed study (symptoms, preparation of slides and identification of pathogens) of the followings

i. Brown spot, blast & BLB of Rice
ii. Stem rot, black band & anthracnose of Jute
iii. Leaf blight, Leaf rust, Foot rot and Loose smut of Wheat and covered smut of Barley
iv. Tikka, Leaf rust and Collar rot of Groundnut
v. Root-knot diseases
vi. Cercospora leaf spot of Blackgram and Mungbean
vii. Alternaria blight of Mustrad

b) Brief study (symptoms aided by permanent slides of the pathogen) of the following

i. BLB, stem rot, bakanae, false smut, NBS, sheath blight, sheath rot, leaf scald, ufra, BLS, grassy stunt, yellow dwarf and tungro of Rice
ii. Leaf spot, soft rot and mosaic of Jute
iii. Angular leaf spot and boll rot of Cotton
iv. Foot and root rot, mosaic, rust, wilts and blights of Pulses and Oilseed crops
v. Smut, wilt, White leaf, Pineapple disease and red rot of Sugarcane

c) Demonstration of Koch's postulates by using Fungi, Bacteria, Nematodes and Viruses

Department of Plant Pathology and Seed Science
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. PPATH 411
Course title: Diseases of Horticultural Crops and Seed Pathology (Theory)
Credits- 3 hrs

Diseases of Fruits: Mango, banana, papaya, coconut, pineapple, jackfruit, citrus and guava
Diseases of vegetables: Potato, tomato, sweet potato, cabbage, cauliflower, lettuce, chili, brinjal, okra, amaranth, cucrubits and beans
Diseases of cash crops: Tobacco, tea, betelnut, betelvine, turmeric, ginger, onion, garlic, ornamental plants and flowers
Nursery disease: Diseases of agro forest trees, root rots, die-back, wilts and cankers of important forest trees.
Introduction of seed pathology: Importance of seed borne diseases in Bangladesh, significance & mechanism of seed transmission of pathogens, seed health testing methods, control of seed borne diseases
Disease forecasting: Forecasting of plant diseases
Assessment of crop loss owing to plant diseases

Text and Reference Books

Anderson, H. N. 1979. Diseases of fruit crop. MeGraw Hill Book Co.
Ashrafuzzaman, M. H. 1976. 1st ed. laboratory manual of Plant Pathology. Dept.of Plant Pathology, BAU
Barnett. H. L. 1960. Illustrated Genera of Imperfect Fungi, Burgess Publishing Company
Boyce, J. S> 1961. Forest Pathology 3rd ed. McGraw-Hill Book Co.
Bos, L. 1987. Symptoms of Virus Diseases in Plants Oxford & IBH Publishing Co., New Delhi
Bilgrami, K. S. and Dube, H. C. 1990. A Text book of modern plant pathology. Vikas Publishing Co. Pvt. Ltd. 576 Masjid Road, Jangpura, New Delhi-110014New Delhi.
Chester, K. S. 1941. Nature and prevention of plant diseases. Blakiston
Dasgupta, M. K. and Mandal. 1989. Post harvest pathology of perishables. Oxford & IBH Publishing Co. Pvt. Ltd. New. Delhi.
Fergus, C. I. 1966. Illustrated Genera of Wood Decay fungi, Burgess Publishing Company
Fulton, J. P., D. A. Slack, N. D., Fulton, J. L. Dale, M. J. Eoodeand and G. E. Templeton. 1965. Plant pathology laboratory manual, Burgess Publishing company.
Matthews, G. A. 1988. Pesticide application methods, Longmans Scientific & Technical, England
Meah, M. B. and A. A. Khan. 1985. CHeck list of fruit and vegetable diseases in Bangladesh. Department of Plant Pathology, BAU, Mymensingh
Meah, M. B. and A. A. Khan. Mango diseases. Department of Plant Pathology, BAU, Mymensingh
Naqvi, S. A. M. H. 2004. Diseases of fruits and vegetables. Kluwer Academic Publishers. Dordeecht/Boston/London
Nene, Y. L. and Thaplial, P. N. 1982. Fungicides in plant disease control. Published by Oxford & IBH Publishing Co. 66, Janpath, New Delhi
Nagarajan, S. 1983. Plant Disease Epidemiology. Published by Oxford & IBH Publishing Co. 66, Janpath, New Delhi
Neergaard, P. 1987. Seed pathology. S. Chand & Company Ltd. Publishing Co. Ram Nagar, New Delhi-110055
Pathnk, V. N. 1986. Diseases of fruit crops. Published by Mohan Primlani, Oxford & IBH Publishing Co. 66, Janpath, New Delhi
Ranaswami, G. 1972. Disease of crop plant in India. Prentice hall of India Private Ltd.
Singh, R. S. 1973. Plant Disease. 3rd ed. Oxford & IBH Publishing Co.
Singh, R. S. 1987. Disease of vegetable crop. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, Bombay
Stakman, F. C. and J. G. Harrar. 1975. principals of plant pathology. The Ronald press Company.
Walker, J. C. 1952. Diseases of vegetable crops. McGraw-Hill Book Co.
Walker, J. C. 1957. Plant pathology, McGraw-Hill Book Company
Walker, J. C. 1969. An Introduction of Plant Diseases, John Wiley and Sons, Ltd.

Department of Plant Pathology and Seed Science
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. PPATH 412
Course title: Diseases of Horticultural Crops and Seed Pathology (Practical)
Credits- 2 hrs

Methods of collection and preservation of diseased plant materials
Preparation of herbarium of diseased specimen of important crops
Field and laboratory studies of plant diseases

a) Detailed study of the following diseases

i. Late blight and early blight of potato and tomato
ii. Anthraconose of chili, okra, guava and data
iii. Fruit rot of chili
iv. Alternaria leaf spot of cabbage
v. Alternaria leaf spot and stemphylium blight of onion
vi. Powdery and downy mildew of cucurbits
vii. Rhizopus fruit rot of Jackfruit and kul
viii. Brown spot and Frogeye leaf spot of tobacco
ix. Anthraconose and Taphrina leaf spot of turmeric
x. Anthracnose and leaf spot of betelvine.

b) Brief study of the following diseases

i. Dry rot, hollow heart, black heart and scab of potato
ii. Yellow vein mosaic of okra, little leaf and fruit rot of brinjal
iii. Anthracnose, stem end rot and malformation of mango
iv. Bud rot and leaf spot of coconut
v. Leaf spot, wilt, bunchytop, anthracnose and fruit rot of banana
vi. Foot and root rot and mosaic of papaya
vii. Wilt of guava
viii. Scab, canker, die back and greening of lemon
ix. Tobacco mosaic
x. Blister blight and gery blight of tea
xi. Foot rot and leaf rot of betelvine
xii. Damping-off and seedling blight

Seed health testing: Dry inspection, incubation methods (Blotter and agar plate methods) and growing on test, chemical control.

Handling of plant protection equipment

Preparation and application of foliar fungicides, Calculation of its concentration, percentage of active ingredients, and rates of application

Field excursion for plant disease study: Each student is required to submit a comprehensive report on the prepared herbarium, spray experiment and field excursion.

Department of Plant Pathology and Seed Science
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. PPATH 423
Course title: Clinical Plant Pathology (Theory-Elective)
Credits- 2 hrs

Field visits and plant disease diagnosis

Soil treatment

Seed treatment

Seed bed preparation and raising of healthy seedlings

Field plot experiment for raising healthy crop

Post harvest practices for crops and seeds for disease management

Cost benefit analysis

Photography

Recommended Books & Journals:

Dixon, D.R. Vegetable Crop Diseases. McMillan Press, London.

Fox. R. T. V. 1994. Principles of Diagnostic Techniques in Plant Pathology*. CAB International, U.K.

Hawkswoth, D.L. 1983. Plant Pathologists Handbook*. (2nd Ed.). CMIKew, Surrey, England. Lucas, G.B., C.L. Campbell and L. T. Lueas. 1985. Introduction to plant diseases identification and management. The AVI pub. Inc. USA.

Nyal, R.F. 1989. Field crops disease Handbook. AVI Publishing Co. Inc. Westport, Connecticut, USA.

Pathak, V.N. 1981. Diseases of fruit crops. Oxford & OBH Pub. Co. New Delhi.

Sherif, A.F. and A.A. Macnab. 1986. Vegetable diseases and their control. Wiley Interscience, New York.

Department of Entomology
B. Sc. Ag. (Hons.) Level-2, Semester-2
Course No. ENT 221
Course title: Fundamentals of Entomology (Theory)
Credits- 3 hrs

Insecta and arachnida: General characters and classifications

Insect morphology: External anatomy of insect, antennae, legs, mouthparts, wings, stridulatory organs and integument in insects.

Insect taxonomy: Diagnostic characters and economic importance of orders and families of insects, mites and spiders of agricultural importance

Insect physiology: Insect nutrition, endocrine glands- neurosecretory cells, corpora cardiaca, corpora allata and thoracic glands, Moulting- Process of moulting, Metamorphosis- types of metamorphosis, Insect reproduction- types of reproduction.

Insect sense organ: Neuron-Sensory neuron, Motor neuron and associated neuron, reflex are, Sense organs- Mechanoreceptor, Chemoreceptor, photoreceptor, auditory receptor, temperature and humidity receptor

Text and Reference Books

Blum, M. S. 1985. Fundamentals of insect physiology. John Wiley and Sons, New York.
Fiennes, R. N. 1972. Biology of nutrition. Pregamon Press, Oxford and New York.
Frederik, H. and Jhout, N. I. 1994. Insect hormones. Intercept Ltd., London.
Hossain, M. and Rahman, R. 1985. Opakhkhal O Bahipakhkhal Kitpatanga Parichiti (in Bengali), Bangla Academy, Dhaka.
Mani, M. S. 1990. General Entomology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
Pathak, S. C. and Sahai. Y. N. 1986. Recent advances in insect physiology, morphology and ecology. Todays and Tomorrow's Printers and Publishers, New Delhi
Romoser, W. S. 1973. The Science of Entomology. MacMillan Publ. Co., New York.
Ross, H. H. 1965. A text book of Entomology. John Wiley, New York.

Department of Entomology
B. Sc. Ag. (Hons.) Level-2, Semester-2
Course No. ENT 222
Course title: Fundamentals of Entomology (Practical)
Credits- 2 hrs

1. External anatomy of grasshopper
2. Study of various types of antennae, legs, mouth parts and wings of insects
3. Internal anatomy of grasshopper
4. Methods of colleting, killing, preparing and preserving of insects
5. Identification up to family of insects, mites and spiders of economic importance in Bangladesh
6. Techniques of preparation of temporary and permanent slides of insect appendages
7. An assignment on collection of economic important insects of different families

Department of Entomology
B. Sc. Ag. (Hons.) Level-3, Semester-2
Course No. ENT 321
Course title: Insect Ecology and Pest Management (Theory)
Credits: 3 hrs

A. Insect Ecology

Insect population: Ecological niche and habitats, agroecosystem, population dynamics, influence of environmental factors on insect population, growth forms on insect populations, insect demography

Insect polymorphism: clonal, phase and social polymorphism, adaptation of polymorphic insects in agroecosystem

Monitoring and forecasting: Survey, field based and fixed position monitoring, pest migration, forecasting system of pest attack.

Population estimation and crop loss assessment: Aggregation pattern, types of pest damage, sampling, methods of population estimation, methods of crop yield loss assessment.

B. Pest management

Pest management strategy: Concept of pest and pest management, economic threshold, economic injury level and general equilibrium position, principles of insect pest management.

Methods of pest management

Conventional methods- Cultural, mechanical, physical, legal and chemical methods, Biotechnological methods- Biocontrol, botanical control, host plant resistance, insect sterility technique, insect growth regulators, Behavioural control- Attractants, repellants, antifeedants and pheromones.

Integrated pest management (IPM): Prospects and limitations of IPM, Development and implementation of IPM.

Text and Reference Books

Andrewartha, H. G. and Birch, L. C. 1970. The distribution and abundance of animals. The University of Chicago Press Ltd., London.

Atwal, A. S. 1976. Agricultural Pests of India and Southeast Asia. Kalyani Publ., New Delhi.

Dent, D. 1991. Insect pest management. CAB International.

Evans, J. W. 1987. Insect pest and their control. Soni Reprints Agency, Delhi

Hossain, M. 2001. Smannita Kitpatanga Babasthtapana (in Bengali). Bangla Academy, Dhaka

Price, P. W. 1984. Insect ecology. John Wiley and Sons, New York, Chichester, Brishane, Toronto, Singapore.

Saxena, A. B. 2000. Bioological control of insects. Anmol Publ., India.

Speight, M. R. Hunter, M. D. and Watt, A. D. 1999. Ecology of insects, Concepts and Applications, Blackwell Science.

Department of Entomology
B. Sc. Ag. (Hons.) Level-3, Semester-2
Course No. ENT 322
Course title: Insect Ecology and Pest Management (Practical)
Credits: 2 hrs

1. Study of commonly used pesticides for controlling insects, mites and rodents
2. Formulation of pesticides and computation of doses
3. Precautionary measures to be taken during handling and using pesticides
4. Plant protection equipment- their operation and maintenance
5. Uses of commonly used traps and poison baits
6. Measurement of insect population density with absolute and relative methods
7. Techniques of crop yield loss assessment in pest infested fields
8. Identification of potential predators, parasitoids and pathogens of insect pests in Bangladesh
9. An assignment on mass culture of a pest insect and biocontrol agent

Department of Entomology
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. ENT 411
Course title: Economic Entomology (Theory)
Credits: 3 hrs

Field crop pests: Bioecology, nature of damage and control measures of major insect and mite pest of rice, wheat, jute, cotton sugarcane, pulses, oilseeds, tobacco and tea

Horticultural crop pests: Bioecology, nature of damage and control measures of major insect and mite pests of vegetables, fruits, ornamental plants and spices, nursery pests

Forest pests: bioecology, nature of damage and control measures of major insect and mite pests of forest plants.

Storage pests: Important insect and mite pests in storage; their life cycle and nature of damage, general control measures of storage pests

Vertebrate pests: Important vertebrate pests of field crops and stored products, Population dynamics, rodent damage assessment, control measures of rodents pests.

Insect borne plant diseases: Insects in relation to plant diseases, Role of insects in plant disease development, methods of transmission of pathogens by insects. Toxicoses and aecidium.

Industrial insects: Silkworm, honey bee and lac insect

Department of Entomology
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. ENT 412
Course title: Economic Entomology (Practical)
Credits- 2 hrs

1. Survey of major pest of field crops, horticultural crops, forest plants and stored products
2. Identification of important nursery pests
3. Identification of insects carrying disease organisms of major crops in Bangladesh
4. Development of IPM programme for a cereal, fibre, vegetable and fruit crop
5. An assignment on collection of important pests of major crops.

Department of Entomology
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. ENT 423
Course title: Insect Physiology (Theory-Elective)
Credits- 2 hrs

1. Essential physiological processes of insects
2. Digestive system: structure and function of digestive organs, digestion and absorption: types of digestive tract
3. Nervous system: central, peripheral and sympathetic nervous system
4. Circulatory system: insect blood, dorsal aorta, mechanism of blood circulation
5. Reproductive system: male and female reproductive system, spermatogenesis and oogenesis, embryology
6. Respiration system: respiration, tracheal system
7. Excretory system: excretory organs and excretory products
8. Insect hormone: types of hormone and their functions.

Reference Books

Ashfaq, A. and Sohail, A. 2002. Manual of Insect Physiology. Pakistan Science Foundation.

Blum, M.S. 1985. Fundamentals of Insect Physiology. John Wiley and Sons, N.Y.

Chapman, R.F. 1998. The Insects: Structure and Function. 4th Ed. Cambridge University Press, New York.

Evans 1994. Advances in Insect Physiology. Vol. 25, Intercept Ltd. London.

Frederik, H.and Jhout, N.I. 1994. Insect Hormones. Intercept Ltd., London.

Howse, P. Stevens, I. and Jones, O. 1998. Insect Pheromones and their Use in Pest Management. Chapman and Hall, London.

James L. Nation. 2008. Insect physiology and biochemistry. CRC Press/Taylor & Francis

Klowden, M.J. 2002. Physiological Systems in Insects. Academic Press.

Litwack, G. 2005. Insect Hormones (Vitamins and Hormones). Elsevier Academic Press, California.

Liu, N. 2008. Recent Advances in Insect Physiology, Toxicology and Molecular Biology. Research Signpost Publishers.

Patanaik, B.D. 2002. Physiology of Insects. Dominant Publishers and Distributors, Dehli, India.

Wigglesworth, V.B. 1972. Principles of Insect Physiology. 7th Ed. Meltron & Co. Ltd. U.K.

Wigglesworth, V.B. 1984. Insect Physiology, Springer.

Yadave, M. 2003. Physiology of Insects. Discovery Publishing House, New Delhi

Department of Agricultural Extension Education
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No. AGEXT 121
Course Title: Fundamental of Extension, Leadership and Motivation (Theory)
Credit: 3 hrs

1. **Extension Education** : Basic concepts of extension, education, and extension education; evolution of extension; and comparative history of agricultural extension in South-east Asia; philosophies, principles, scope and phases of extension work

2. **Learning process** : Elements in the learning process; theories of learning; laws of learning and their implication in extension work; special features of adult learning

3. **Extension teaching process**: Meaning and steps; guides to effective extension teaching; classification of extension teaching methods; procedures, advantages and limitations of extension teaching methods; criteria/factors for selection and use of extension teaching methods.

4. **Teaching aids**: Purpose and classification; selection of appropriate teaching aid

5. **Leadership**: Importance in extension work, types, and qualities of a good leader; different methods for identification; ways of recognizing; methods of organizing and developing local leaders; duties and responsibilities of local and professional leaders; importance of opinion leadership in extension work; opinion leaders and their characteristics.

6. **Fundamentals of motivation in extension: C**oncept of need and motivation; importance of motivation in extension work; ways of motivating extension workers and farmers.

7. **Need theories**: Concept of need; need theories of Maslow, Hertzberg and McGregor; implication of need theories in extension work.

Text and Reference Books

Beal, G.M., J.M. Bholen and. J.N. Roudabaugh 1972. Leadership and Dynamic Group Action. Ames: The Iowa State University Press.

Bhuiya, M.H. 1988. Krishi Samprasaran Parichiti, Dhaka Jamuna Printers.

Bhuiya, M.H. and M. A. M. Miah. 1998. Extension Psychology, Krishi Lekhak Forum, Dhaka: Colourline Printers.

Dahama, O.P. and, O.P. Bhatnagar 1980. Education and Communication for Development.2nd. edn. New Delhi : Oxford and IBH Publishing Co. Pvt. Ltd.

Kashem, M.A. 1992. Samprasaran Bijnan (Extension Science). Dhaka : The Bangladesh Packing Press.

Kelsey, L.D, C.C. Hearne 1963. Cooperative Extension Work. 3rd edition, Comstock Publishing Associates, New York: Ithaca.

Ray, G.L., 1991. Extension Communication and Management. 2nd edition, Naya Prokash Publication, Calcutta, India.

Wilson, M.C. and G. Gallup. 1955. Extension Teaching Methods. Federal Extension Service, U.S. Department of Agriculture.

Department of Agricultural Extension Education
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No. AGEXT 122
Course Title: Fundamental of Extension, Leadership and Motivation (Practical)
Credit: 2 hrs

1. **Demonstration**: Conducting method and result demonstrations.

2. **Teaching Aids**: Preparation and use of poster, flash cards, leaflets and flip chart.

3. **Overhead projector (OHP) and slide projector**: Working principles and components of OHP and slide projectors; preparation of OHP transparencies and slides; handling of OHP and slide projectors (practice session).

4. **Small group discussion techniques:** Brainstorming, Role Playing, and Philips 66 — procedure and practice.

5. **Delivering a Talk (Lecturing)**: Practice of delivering a talk on an assigned topic.

Sylhet Agricultural University, Sylhet

Department of Agricultural Extension Education
B. Sc. Ag.(Hons.), Level-2, Semester-1
Course No. AGEXT 211
Course Title: Extension Communication & Group Approaches (Theory)
Credit: 2 hrs

1. **Communication process: C**oncept of communication and communication process; importance of communication in extension work; functions of communication.

2. **Models of communication process**: Different models of communication and their elements; feedback in communication process.

3. **Communication noise and fidelity**: Concept of noise in communication process; reasons for noise in communication; ways of overcoming noise; concept of communication fidelity.

4. **Diffusion process**: Concepts of innovation and diffusion; elements of diffusion process; characteristics of innovation; consequences of innovations.

5. **Innovation-decision process**: Description of innovation-decision process; different types of innovation-decision; decision-making process of farmers relating to use of an innovation; barriers of diffusion of innovations.

6. **Adopter categories**: Concept of innovativeness; adopter categories; and characteristics of adopter categories

7. **System approach**: Concept and components of a system; difference between system and management; needs of a system in extension work.

8. **Knowledge system**: Concept of knowledge system; difference sources of knowledge system in extension work; selection of the best alternative system in existing situation

9. **Approaches to extension work**: Meaning of extension approaches; different approaches of extension work and their critical analysis.

10. **Partnership programme in extension**: Concept of partnership; salient features of partnership programmes; ways of sharing strengths and resources; different types of partnership programmes; justification of different collaboration programmes among GOs, NGOs & private sectors.

11. **People's participation in agricultural extension programmes** : Concept of 'people's participation' in extension programme; positive and negative factors of people's participation; major criteria of securing people's participation in extension programmes; examples showing evidences of people's participation in the programmes of GOs and NGOs.

12. **Group dynamics: C**oncept of group and importance of group dynamics; internal and external forces acting in a group; principles of working with groups and their mobilization; roles of member in a group.

13. **Working with group**: Principles of working with a group; advantages and limitations in working with groups; skills of working with a group; skills necessary for forming a new group.

14. **Target group:** Concept of target group; characteristic features of extension target groups; criteria for selecting a target group; basis for segmentation of adult target groups.

Text and Reference Books

DAE. 1985. Agricultural Extension Manual (The Training and Visit System). Department of Agricultural Extension. Ministry of Agriculture. Govt. of the People's Republic of Bangladesh.

Kamath, M.C. (editor) 1961. Extension Education in Community Development. Directorate of Extension. New Delhi:Ministry of Food and Agriculture, Govt. of India.

Kashem, M.A. 1992. Samprasaran Bigyan . Dhaka : The Bangladesh Packing Press.

Ray, G.L., 1996. Extension Communication and Management. 3rd edn. Calcutta: Naya Prokash .

Samanta R.K. (ed). 1990. Development Communication for Agriculture. New Delhi:B.R. Publishing Corporation.

Wentling, T. 1993. Planning for Effective Training. Rome: FAO of the UN.

Department of Agricultural Extension Education
B. Sc. Ag.(Hons.), Level-2, Semester-1
Course No. AGEXT 212
Course Title: Data Collection, Processing and Report Writing (Practical)
Credit: 2 hrs

1. **Instruments of data collection**: Preparation of different types of interview schedule/questionnaire – structured, semi-structured and non-structured.

2. **Methods of data collection:** Practicing case study, survey and selected PRA technique. Transect walk, time line, Venn diagram and seasonal maps.

3. **Data processing and analysis**: Transferring data from interview schedule/questionnaire; categorization and tabulation of data. Types of data analysis; carrying out appropriate descriptive and inferential statistical analyses.

4. **Preparation and presentation of report**: Organizing data for presentation; presentation and evaluation of a survey report.

Department of Agricultural Extension Education
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. AGEXT 411
Course Title: Extension Organization Management (Theory)
Credit: 3 hrs

Extension organization : Concept of organization and extension organization; objectives and features of an extension organization, classification of extension organizations in Bangladesh; qualifications and duties of an extension administrators, specialists, supervisors and field workers.

Management functions in organization: Concept of management function; elements of management; management problems of an organisation.

Human Resources Development: Different techniques of human resources development; training and its importance and types; methods of identification of training needs.

Decision-making process in extension organization: Concept of decision-making; steps in decision-making; factors affecting decision-making; constraints in decision making in organisations.

Extension programme planning: Concept of programme and extension programme planning; importance, principles and steps of extension programme planning

Monitoring and evaluation of extension programme: Meaning and types of monitoring; importance of monitoring in extension programmes; meaning, types, principles and steps in evaluation of extension programmes.

Rural youth: Yoth, youthhood and rural youth; roles of youths; youth programmes in Bangladesh; rural youths in agricultural extension programmes and activities.

Rural women in agriculture: Role of rural women in agricultural activities; involvement of women in decision-making process in family; agricultural extension work for income generation and empowerment of women in Bangladesh.

Landless farmers: Concepts of landlessness; socio-economic situation of landless rural families; suitable agricultural activities and interest of landless families.

Text and Reference Books

Bhuiya, M.H. and M.A.M. Miah. 1998. Extension Psychology. Dhaka: Krishi Lekhak Forum, Colourline Printers,

Bhuiya, M.H. 1999. Extension Organization and Management. Dhaka:Gulshan Publications.

Hassanullah, M. 1995. Managing Extension Services. Dhaka: University Press Ltd

Kashem, M.A. 1992. Samprasaran Bigyan Dhaka : The Bangladesh Packing Press.

Samanta R.K. (ed). 1993. Extension Strategy for Agricultural Development. New Delhi: MD Publications.

Samanta, R.K. (ed.) 1995. Women in Homestead The South Asian Perspective. New Delhi: . MD Publications Ltd.

Swanson, B. E., R.P. Bentz and A.J. Sofranko (eds) 1997. Improving Agricultural Extension. a reference Manual. 3rd edn. Rome: Food and Agriculture Organization of the United Nations.

Van den Ban, A.W. and H.S. Hawkins.1996. Agricultural Extension. 2nd ed. London: Blackwell Science Ltd.

Department of Agricultural Extension Education
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. AGEXT 412
Course Title: Extension Program Planning and Outreach Program (Practical)
Credit: 2 hrs

1. **Problem identification:** Identification of farmers' problems through using participatory methods; conduction of problem census for problem identification.

2. **Problem and objective analysis**: Different categories of problems and objectives; preparation of appropriate problem chart/tree and objective chart/tree and stakeholder analysis.

3. **Alternative analysis:** Procedure for alternative analysis; preparation of alternative analysis/chart.

4. **Logical framework of an extension programme**: Preparation of a logical framework.

5. **Plan of work and calendar of work**: Preparation of a plan of work and a calendar of work.

6. **Training :** Preparation of a training schedule; management of training activities

7. **Visit to agricultural farms/organization**: Visit to an agricultural organization/farm visit and preparation of report.

8. **Extension field trip**: Conduction of an extension field trip and submission of report.

Department of Agricultural Extension Education
B. Sc. Ag.(Hons.), Level-4, Semester-2
Course No. AGEXT 423
Course Title: Community Participation (Theory-Elective)
Credit: 2 hrs

1. Community Participation — The on-going community based leading organizations in Bangladesh and their role and functions: BAUEC, BRDB, LGED, Gucha gram, BARD, BRAC, CARE, PROSHIKHA etc. The class teacher will select any two/three suitable agencies in each semester for study/observation.

2. The present community development approaches of above selected GOs and NGOs in Bangladesh and their comparative advantages and disadvantages.

3. The role and functions of the field level workers of the above selected community based organizations.

4. The history of comparative community development programme in Bangladesh and other Southeast Asian Countries: India, Thailand, Malaysia, Vietnam and Japan.

References

Allen F.R., H. Hart, D.C. Miller, W.F. Ogbur and F.N. Meyer. 1957. *Technology and Social Change*. New York: Appleton- Century-Crofts, Inc.

Ahmed, A.F.S. 1976. *Social Ideas and Social Change in Bengal 1818-1835*. 2nd edn. Kolkata: The Technical & General Press.

Ahmed, A.F.S. 1987. *Bangladesh: Tradition and Transformation*. Dhaka: The University Press Limited.

Beals R. L and H. Hoijer. 1971. An *Introduction to Anthropology*. New York: The Macmillan Company.

Berlo, D.K.1965. *The Process of Communication: An Introduction to Theory and Practice*, New York: Hall Rinehart & Winston.

Bigge, M.L 1976. *Learning Theories for Teacher*. New York: Harper and Row, Pub.

Chitamber, J.B. 1973. *Introduction Rural Sociology*. New Delhi: Wiley Eastern private Ltd.

Doshi, J.K. 1961. *Social Structure and Culture Change in A Bhil Village.* New Delhi: Raj Kamal Electric Press.

Foster, G. M. 1962. *Traditional Cultures and The impact of Technological Change*. New York: Harper and Row Pub.

Foster, G.M. 1973. *Traditional Societies and Technological Change.* New York: Harper & Row Publishers Inc.

Gisbert. P. 1972. *Fundamentals of Sociology*. Calcutta: Orient Longmans.

Halpern, J.M. 1969. *The Changing Village Community.* New York: Prentice-Hall, Inc.

Krishnaswamy, K.S. A. Mitra, I.G. Patel, K.M. Raj and N.N. Srinivas. 1977. *Society and Change*. Mumbay: Oxford University Press.

Steward, J.H. 1955. *Theory of Culture Change*. Urbana: University of I11 inois Press.

Department of Agroforestry and Environmental Science
B. Sc. Ag.(Hons.), Level-3, Semester-1
Course No. AGROF 311
Course Title: Principles of Agroforestry (Theory)
Credit: 3 hrs

Introduction: Concept, scope and benefits of agroforestry, present status of forest resources in Bangladesh; possible improvement of present land use system through sustainable agroforestry practices.

Classification of agroforestry systems: Components and structures of agroforestry and social forestry systems, their classification and interlinkages with other farming systems.

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

Agroforestry management techniques: Various regeneration systems and nursery management, plantation and replanting systems, development of wastelands and establishment of trees through agroforestry systems, management of trees and other components.

Tree-crop interaction, soil fertility and productivity in agroforestry: Concepts and types of tree-crop interaction, resource sharing and minimizing competition for maximum production and economic return; soil and water conservation, land reclamation and byproduct processing, utilization and nutrient recycling in agroforestry.

Agroforestry production Techniques: Introduction to agrisilvicultural, silvopastoral, agrosilvopastoral and multistoried tree production techniques, hill cultivation-SALT practice and its different models.

Agroforest products-their uses and economics of agroforestry systems: Harvesting of fuel, fodder, timber and crops; processing and preservation of agroforest products; marketing systems, economic analysis of agroforestry systems using PRA techniques.

Text and Reference Books

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

Department of Agroforestry and Environmental Science
B. Sc. Ag. Hons.), Level-3, Semester-1
Course No. AGROF 312
Course Title: Principles of Agroforestry (Practical)
Credit: 2 hrs

Identification of MPTS and their plant parts.

Demonstration on tree crop interactions and their combined productivity.

Preparation of nursery for raising saplings of different trees.

Plantation under different systems, shoot and root management of trees and shrubs under agroforestry systems.

Study of roots spread and root mass of trees in crop fields.

Determination of growth and biomass yield of trees and other components.

D & D planning, data collection and economic analysis of agroforestry systems.

Field visit to Madhupur sal forest area to observe agroforestry, social forestry and forestry activities and preparation of reports individually.

Department of Agroforestry and Environmental Science
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. ENVSC 411
Course Title: Management of Environment (Theory)
Credit: 2 hrs

Natural resources: Introduction to Soil, water, vegetation, animals (including fishes, livestock and wildlife), food, minerals and energy as natural resources and their use and management for environmental sustainability.

Biodiversity: Classification and conservation for environmental sustainability, Concept and components of Eco-park, Convention of biodiversity.

Wetlands of Bangladesh: Introduction, classification, socio-economic values, management and strategies for sustainable development.

Rural and urban environment: Components and management of rural and Urban environment, population and environment.

Waste management: Importance of waste management. Types, sources and disposal of wastes. Collection, storage and transport of farm waste: livestock and poultry. Waste water treatment. Wasting resources, reuse, recycling, detoxifying, burning, burying, exporting wastes; hazardous-waste regulation.

Environmental degradation: Concepts of' degradation and pollution, degradation of atmosphere, hydrosphere and lithosphere, causes and impacts on Bangladesh environment and their management. Environmental pollution models

Disaster Management: Concept, classification, management of untimely rainfall, drought, river erosion, flood, cyclone and earthquake

Environmental economics: Concept, utilization of resources, economies 01' natural resources, risk-benefit analysis.

Text Books/References

Botkin, D. B. and Keller, E. A. 2000. Environmental Science - Earth as a Living Planet. Third Edition. John & Wiley Sons, Inc. New York.

Chiras, D. D. 1985. Environmental Science - A Framework for Decision Making. The Benjamin/Cummings Pub. Co. Inc.

Kaufinan, P. B. and LaCroix, J. D.1979. Plants, People & Environment. Macmillan Publishing Co., Inc.

Khan, M. S. 1994. Wetlands of Bangladesh (Edited). Holiday Printers Limited, Dhaka.

Khuda, Z. R. M. M.2001. Environmental Degradation - Challenges of the 21st Century. Environmental ,Survey and Research Unit, Dhaka, Bangladesh.

Miller, Jr., G. T. 2001. Living in the Environment - An Introduction to Environmental Science. Eighth Edition. Wadsworth Pub. Co. Inc.

Odum, E. P. 1971. Fundamentals of Ecology. Saunders, Philadel.

Owen, O. S. 1980. Natural Resource Conservation- An Ecological Approach. Macmillan Publishing Co. Inc.

ReVelle, P, and Revelle, C. 1981. The Environment- Issues and Choices for Society. Willard Grant Press. New York (Edited).

Taiganides, E.P. 1977. Animal Waste. Applied Sci. Pub. Ltd, England.

Turk, A.; Turk, J.; Wittes, J. T. and Wittes, R. E.1978. Environmental Science. Second Edition. W. B. Saunders Co

Department of Agroforestry and Environmental Science
B. Sc. Ag. (Hons.) Level-4, Semester-1
Course No. ENVSC 412
Course Title: Management of Environment (Practical)
Credit: 2 hrs

01. Analysis of water for pollution studies
02. Analysis of heavy metals of soils.
03. Analysis of residual effect of pesticides of soil, water and crop.
04. PRA exercise and reporting on environmental related issues.
05. Waste management activities in crop, livestock and poultry farms.
06. Survey of lifestyle of slum people.
07. Survey of a city traffic system.
08. Studies on biodiversity of a particular village.
09. Studies on biodiversity preservation and conservation for environmental sustainability.
10. Study of design of EIA.

Text Books/References

Greenwood, N. J. and Edwards, J. M. B. 1979. Human Environments and Natural Systems. Duxbury Press (Wadsworth Pub. Co. Inc.)
Gaston, K. J. and Spicer J. 1. 1998. Biodiversity - An Introduction. Blackwell Science.
Odum, E.P. 1971. Fundamentals of Ecology. Saunders, Philadel.
Sutherland, W.J. 2001. The Conservation Handbook- Research, Management and Policy. Blackwell Science Ltd.
Taiganides, E.P. 1977. Animal Waste. Applied Sci. Pub. Ltd, England.
Saha, S.K.2004. Handbook of Environmental Auditing-A road map of Registration. ASOSED. Khulna.

Department of Agroforestry and Environmental Science
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. AGROF 423
Course Title: Plant Biodiversity and Conservation (Theory-Elective)
Credit: 2 hrs

The nature and value of plant biodiversity: Nature, importance and types of biological diversity, direct and indirect values of biological resources.

Biodiversity loss and causes: Dimension of the loss of agricultural and forest biodiversity, principal causes of biodiversity losses, threats from the loss of plant species. IUCN Red list of plant species.

Conservation strategy: National strategy for in situ and ex situ conservation of agricultural and forest biodiversity. Conservation of rare and important wild plant genetic resources in protected areas and in different farming systems.

Biodiversity indicators: Indicators for measuring diversity, indicators of wild species and genetic diversity, community diversity and domesticated species diversity.

Plant products and uses: Resource assessment, uses, domestication and commercialization of timber and non-timber forest products.

Plant exploration and germplasm collection: Germplasm exploration, collection, conservation, evaluation and utilization.

References:

Arora, R. K. and Rao, V. R. (edited). 1995. Proceedings of the South Asia National Coordinators Meeting on Plant Genetics Resources. 10-12 January, 1995. BARC, Dhaka.

Baily R. 1995. The True State of The Planet. The Free Press. New York.

Botkin, D. B. and Keller, E. A. 2000. Environmental Science – Earth as a Living Planet. Third Edition. John & Wiley Sons, Inc. New York.

Chowdhury, Q. I. 2001. Bangladesh State of Biodiversity (*Edited*). Forum of Environmental Journalists of Bangladesh (FEJB), Dhaka.

Glowka, L. and others. 1994. A Guide to the Convention on Biological Diversity. IUCN, Switzerland.

Owen, O. S., Chiras, D. D. and Reganold, J. P. 1998. Natural Resource Conservation – Management for a Sustainable Future. Seventh Edition. Prentice Hall, New Jersey 07458.

Shukla, R. S. and Chandel, P. S. 1985. Plant Ecology. S.Chand & Company Ltd. Ram Nagar, New Delhi.

Department of Agricultural Chemistry
B. Sc. Ag. (Hons.) Level 2, Semester 2
Course No.: AGCHM 221
Course Title: Nuclear, Agro-industrial & Water Chemistry (Theory)
Credits: 3 hrs

Nuclear Chemistry

Nuclear reactions and stability; properties and absorption of radionuclide radiations; radioactive decay and half-life, radiocarbon dating; radiation detection radiation safety, selection of isotopes for radiotracer assay; radiotracer methodology- isotopic dilution and plant injection techniques; application of radioisotopes in soil, crop, plant protection, irrigated agriculture and irradiation studies.

Chemistry and Technology of Fertilizer

Choice and purification of feedstock's; manufacturing technology of urea, SSP, TSP, DAP and MOP; secondary and micronutrient fertilizers; mixed, compound, liquid and controlled release fertilizers; properties of fertilizers; quality control, specifications, compatibility and comparison of commonly used fertilizers.

Chemistry and Technology of Agro industrial Crops

Rubber: Tapping system; composition and processing of natural rubber, properties and synthesis of synthetic rubber.

Sugar: Condition and quality of sugarcane, manufacture of plantation white sugar, industrial utilization of sugar mill by produces.

Tea: Manufacturing processes and change of chemical composition in tea leaves, aroma, tea infusion and liquoring quality of tea

Tobacco: processing of tobacco leaves; chemical composition of leaf in relation to type and quality; chemical changes during fermentation and processes.

Water Chemistry

Sources of water, quality assessment and criteria for drinking, irrigation, poultry, livestock, aquaculture and agro industrial usage of water, ionic toxicity and plant tolerance, water pollution and treatment.

Basic techniques of radiotracer assay in agriculture

APHA (American Public Health Association). 2005. Standard Methods for the Examination of Water Wastewater, 21st edn., AWWA and WEF, Washington, USA

Ayers, R. S. and Westcot, D. W. 1985. Water Quality for Agriculture. FAO Irrigation and Drainage Paper 29 Rev. Rome, Italy.

Barnes, A. S. 1974. The Sugarcane Intersciences Publishers Inc., New York, USA.

Chase, G. D. and Rabinowitz, J. R. 1984. Principles of Radioisotopes Methodology. Burgess Publishing Company, USA.

Das, R. K. 1987. Industrial Chemistry, Par-2, Kalani Publishers, New Delhi, India

Dhingra, K. C. 1984. Hand Book on Rubber and Rubber Goods Industries. Small Industry Research Institute, New Delhi.

Freeze, R. A. and Cherry, J. A. 1979. Groundwater. Prentice-hall Inc., Englewood Cliffs, New Jersey.

Garner, W. W> 1981. The Production of Tobacco McGraw Hill Book, London

Jain, N. K. (ed). 1999. Global Advances in Tea Science. Aravali Books International Pvt. Ltd., New Delhi, India.

Jones, U. S. 1979. Fertilizers and Soil Fertility, Reston Publishing Com, Reston, Virginia, USA

Mathur, R. B. L. 1987. Hand Book of Cane Sugar Technology. Oxford and IBH Publishing co., Calcutta, India.

Ramulu, U. S. S. 1982. Isotopes in Agriculture. Oxford & IBH Publishing Co. New Delhi, India

Tandon, H. L. S. (ed). 1995. Methods of Analysis of Soils, Plants, Waters and Fertilizers, Fertilizer Development and consultation Organization, New Delhi, India.

UNIDO and IFDC (eds). 1998. Fertilizer Manual. Kluwer Academic Publishers. Dordrecht, The Netherlands.

Vose, P. B. 1980. Introduction to Nuclear Techniques in Agronomy and Plant Biology. Pergamon Press Ltd., Oxford, England.

Department of Agricultural Chemistry
B. Sc. Ag. (Hons.) Level 2, Semester 2
Course No.: AGCHM 222
Course Title: Nuclear, Agro-industrial and Water Chemistry (Practical)
Credits: 2 hr

Instructions for the use of laboratory chemicals and glassware are with their safety measures.

Operation and calibration of laboratory equipments-

a) pH meter; b) Electrical conductivity meter; c) Spectrophotometer; d) Flame emission spectrophotometer and e) Atomic absorption spectrophotometer.

Principles and procedures for obtaining soil, water, plant and fertilizer samples.

Manure and fertilizer analysis: Moisture and nutrient contents in cow dung, FYM, poultry borax.

Water analysis: Surface and ground water samples for dissolved ionic constituents including toxic metals like As, Zn, Mn, Cr, Cd, Pb & Hg.

Department of Agricultural Chemistry
B. Sc. Ag. (Hons.) Level 3, Semester 1
Course No.: AGCHM 311
Course Title: Plant Nutrition, Pesticide and Environmental Chemistry (Theory)
Credits: 3 hrs

Colloids and Plant Nutrition
Classification, properties and role of colloids in plant nutrition; classification, role and principal form of essential and beneficial nutrient elements; translocation of nutrients from soils to plant roots; nutrient uptake mechanisms; interactions of nutrient ions in soil-plant system and adsorption isotherms.

Pesticide Chemistry
Preparation, properties, mode of action and uses of commonly used pesticides: Natural organic compounds, organochlorinated hydrocarbons, organophosphorus, organocarbamate and synthetic pyrethroid insecticides, synthetic fungicides, herbicides and acaricides; compatibility of pesticides with agrochemicals, environmental fate of pesticides in soil, plant and aquatic systems; adverse effects of pesticides and their remediation, pesticide ordinance and rules.

Pesticide formulation
Chemistry and utilization of auxiliary materials for insecticide, fungicide and herbicide formulations; Dust, wettable powder, granule, emulsifiable concentrates, fumigant, aerosol and microencapsulation.

Instrumental Methods of Analysis
Principle, instrumentation and application of colorimetry and spectrophotometry, flame emission and atomic absorption spectrohpotometry, mass spectrometry, fluorimetry, differential thermal analysis (DTA) and Chromatography.

Environmental Chemistry
Concept of environmental compartments; toxicological chemistry of chemical substances; biochemical effects of contaminants; environmental fate of inorganic and organic contaminants; adverse effects of contaminants on soil, plant and aquatic ecosystems; remediation of the polluted environments.

Bioenergy
Concept, scope and importance of bioenergy; energy from different agroindustrial wastes and sewage sludge, generation of biogas and utilization of effuents; b iodegradation of hazardous waste.

Books Recommended

Brady, N. C. and Weil, R. R. 2002. The Nature and Properties of Soils. 13th edn. Pearson Education, Inc., USA

Chopra, L. S. and Kanwar, J. S. 1980. Analytical Agricultural Chemistry. Kalyani Publishers, Ludhiana, New Delhi, India

Fageria, N. K.; Baligar, V. C. adn Jones. C. A. 1991. Growth and Mineral Nutrition of Field Crops, Marcel Dekker, Inc., New York.

Lewis, C. 1983. Biological Fuels, Studies in Biology No. 153. Edward Arnold Publishers Ltd., London.

Manahan, S. E. 2005. Environmental Chemistry. 8th edn. CRC Press LLC, Boca Raton, Florida, USA

Mendham, J.; Denney, R. C.; Barnes, J. D. adn Thomas, M. 2000. Vogel's Textbook of Quantitative Chemical Analysis. 6th edn. Pearson Education Pte. Ltd., New Delhi, India.

Ramulu, U. S. S. 1985. Chemistry of Insecticides and Fungicides. Oxford and IBH Pub. New Delhi, India.

Sarkar, B. (ed). 2002. Heavy Metals in the Environment. Marcel Dekker Inc., New York, USA

Skoog, D. A.; West, D. M. and Holler, F. J. 2001. Fundamentals of Analytical Chemistry. 7th edn. Harcourt Asia Pte. Ltd., Singapore.

Sparks, D. L. (ed). 1996. Methods of Soil Analysis. Par 3. Chemical Methods- SSSA Book Series No. 5., Soil Science Society of America and American Society of Agronomy, Inc., Madison, USA

Tandon, H. L. S. (ed.). 1995. Methods of Analysis of Soils, Plants, Waters and Fertilizers. Fertilizers Development and Consolation Organization, New Delhi, India

Tomlin, C. D. S. (ed.). 2003. The Pesticide manual. 13th edn., British Crop Protection Council, Hampshire, UK

Valkenburg, W. V. (ed). 1972. Pesticide Formulatins. Marcel Dekker Inc., New York, USA

Westerman, R. L. (ed). 1990. Soil Testing and Plant Analysis, 3rd edn. Soil Science Society of America, Inc., Madison, Wisconsin, USA

Wheeler, W. B. (ed). 2002. Pesticides in Agriculture and the Environment. Marcel Dekker Inc., New York, USA

Willard, H. H.; Merritt, L. L. Jr. and Dean, J. A. 1988. Instrumental Methods of Analysis. 7th edn., Wadsworth Publishing Company, Belmont, CA

Department of Agricultural Chemistry
B. Sc. Ag. (Hons.) Level 3, Semester 1
Course No.: AGCHM 312
Course Title: Plant Nutrition, Pesticide and Environmental Chemistry (Practical)
Credits: 2 hrs

Preparation of Plant extracts for the analysis of different nutrients.

Analytical techniques of titrimetry, colorimetry, flame emission spectrophotometry, atomic absorption spectropotometry and chromatography.

Plant analysis for different nutrient elements like N, P, K, S, Ca, Mg, B, Zn, Cu, Fe and Mo.

Techniques of pesticide formulation and residue analysis.

Generation of bioenergy from different agrowases.

Department of Agricultural Chemistry
B. Sc. Ag. (Hons.) Level 4, Semester 2
Course No.: AGCHM 423
Course Title: Bioenergy-Principles and Practices (Theory-Elective)
Credits: 2 hrs

Concept, scope and importance of bioenergy; energy from biomass- past and present perspectives of bioenergy.

Biomass resources: Biomass wastes, energy crops and aquatic sources.

Energy profiles: Producer gas, biogas, hydrogen, ethanol, methanol, vegetable oil and solid fuels.

Bioconversion processes: Microbial conversion; thermal conversion; fuels and co-products.

Biogas: Anaerobic digestion process, digester design, primary products and by-products of biogas; utilization of biogas and biogas effluents.

Role of wood in energy production: Prospect and retrospect; description of the process and requirements for agricultural applications.

Energy, economics and environment: Energy analysis and economics of biomass; environmental and sociological issues.

Renewable resources of energy: Concept, scope and importance; comparative feasibility of renewable energy against bioenergy.

Bioremediation Technology: Scope and importance of bioremediation; bioremediation treatment technologies; bioremediation organisms, bioavailability of compounds and biological process requirements.

Text and Reference Books for ‘’Bioenergy- Principles and Practices’’

Manahan, S.E. 1984. Environmental Chemistry. 4th edn. Brooks/Cole Publishing Company,Monterey, California.

Misra, S.G. and Mani, D. 1991. Soil Pollution. Ashish Publishing House, Punjabi Bagh, New Delhi,India.

Cheris Lewis. 1983. Biological Fuels. Studies in Biology No. 153. Energy Studies Unit, Universityof Strathclyde, UK.

Goteberg.1984. World Conference on Bioenergy, held on June 18-21, 1984, Sweden.

Mason, C.F. 1976. Decomposition. Studies in Biology No. 74. University of Essex, UK.

USDA Agricultural Research. 2002. Bioenergy Today. USA.

Loeppert, R. 2000. Arsenic chemistry and biology, and the management of arsenic contaminatedsoil and water.

Treatment/Remediation. Biological/Phytoremediation Symposium, Nov. 6-7.pp. 1-10.

Department of Basic Science and Language
B. Sc. Ag. (Hons.) Level-1, Semester-1
Course No. LAN 111
Course Title: English Language (Theory)
Credit: 2 hrs

1. Textual study and comprehension of a few selective BBC talks.
2. Socio-linguistic rules to perform language function in English.
3. Basic grammatical structures:
   i) Types and constructional forms of sentences; Sequence of tense; Voice; Verbs, verb patterns and verb modifiers; Syntax including transformation and combination of sentence and framing of WH-questions.
   ii) Nouns, determiners and adjectives; Adverbials; Prepositional phrases; Headword, Infinitive phrases; Participle phrases; Appositives.
   iii) Mechanics -- Punctuation, Quotation marks, Capitalization, Numbers, Abbreviation, Italics, Spelling (including most common mistakes).

4. Principles and methods of composition:
   Precis, Abstract or Summary, Paragraphs, Letters, Short Essays and Reports.

Text and Reference Books

Close, R.A. 1988. The English We Use (24th Indian Edition). Longman, Calcutta.
Leech, G. and Svartvik, J. 1996. A communicative grammar in English (2nd Edition.). Longman, London and NY.
Hornby, A.S. 1998. Guide to Patterns and Usage in English (2nd Editio.). Oxford University Press, Delhi.
Pyle, K.A. and Munoz, M.A. 1992. Chiffs TOEFL Preparation Guide (62 Revised Edition) BPB Publications,
Chowdhury, M.Y.A. and Hossain, M.M. 2002. Advanced Learner's Degree General English. Advanced Publications, Banglabazar, Dhaka.
Hornby, A.S. 1996. Oxford Advanced Learner's Dictionary of Current English (Ed. J. Crowler, 5th Edition) Oxford University Press, London.
Begum, J. 1988. A Text Book of Modern Functional English. Globe Library (Pvt.) Ltd. Dhaka.
Berkoff, N.A. 1975. Agriculture (English Studies Series: 10. Oxford University Press, London.
McArthur, T. 1978. A Rapid Course in English for Students of Economics (Ed. R. Mackin). Oxford University Press, London.

Department of Basic Science & Language
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No.: LAN 422 (P)
Course Title: English Language (Practical)
Credits: 1 hrs

Speaking: Phonetics & Phonology, IPA Symbols, Intonation and Stress.

Conversational Skills: Short Conversation, Long Conversation, Class Discussion, Agreement and Disagreement etc.

Listening: Studies in distributive Practice.

Short Conversation through longer conversation to mini talks, gaining experience in listening. Extensive practice consisting of watching English dramas on television, listening to a local radio program.

Reading Comprehension: In this section several passage are given. Each one is followed by a number of question about it. The students are to choose it out of some alternative questions.

Writing: Composition and Report Writing.

Books Recommended:

A communicative Grammar in English by Leach G and Spastic, J. 1995, Second Edition, Longman, London and New York.

Guide to pattern and uses in English, by Hornsby. A.S (1998) Oxford University press, Delhi.

High School English Grammar and Compositions Wren and Martin.

TOEFL & IELTS Guide.

Department of Agricultural Economics & Policy
B. Sc. Ag. (Hons.) Level-1, Semester-1
Course No. AGECO 111
Course Title: Agricultural Economics (Theory)
Credit: 3 hrs

Introduction: Concepts of economics and agricultural economics, scope of agricultural economics, relation of agricultural economics with other social sciences.
Theory of consumer behaviour: Marshallian utility analysis, indifference curve analysis, derivation of demand and elasticity of demand.
Theory of Production: Factors of production, law of diminishing returns, stages of production and optimum input use.
Theory of firm: Cost and revenue concepts, equilibrium of firm, markets and their characteristics, price determination under different market conditions.
Population Theory: Malthusian theory, Optimum theory of population and comparison and acceptance of the two theories.
National Income: Concepts and measurement of national income, difficulties of measuring national income in Bangladesh.
International trade: Concept of international trade**,** classical theory of international trade and gains from international trade.
Money and Banking: Definition and functions of money, value of money, inflation, functions of central, commercial and specialized banks.
Economy of Bangladesh Agriculture: Role of agriculture in the economic development of Bangladesh, problems of agricultural development in Bangladesh, characteristics and marketing of agricultural products, farm power issues, farmer's role as a decision maker, agricultural credit and its sources, role of cooperative and non-government organizations in the agricultural development of Bangladesh, Farm size, tenure and productivity in Bangladesh and land reforms in Bangladesh.

Text and Reference Books

Ahuja, H.L. 2001: Advanced Economic Theory, S. Chand & Company LTD, Pub. Ram Nagar, New Delhi.
Bishop, C.E. and Toussaint W.D. 1958: An Introduction to Agricultural Economc Analysis., John wiley and Sons, New York.
Chokrobarti, Monotos. 1984: Micro Economics, Padma Pub. Dhaka.
Dewett, K.K. 2001: Modern Economic Theory, S. Chand & Company LTD. Pub. Ram Nagar, New Delhi.
Dey, Monoranjan. 1982: Krishi Aarthonity, Bisho Paricoy Pub. Dhaka.
Dutta, S.C. 1987: Krishi Arthonity Swarup, Puthighar pub., Dhaka.
Hill, B. 1990: An Introduction to Economics for Students of Agriculture, Pergamon Press, London.
Mandal, M.A.S. 2000: Changing Rural Economy of Bangladesh, BEA Pub. Dhaka.
Mian, M.S. 2001: Economics and Agricultural Development-Bangladesh Perspective, Universal Pub. Dhaka.
Mukharji, Smpath. 1988: Samokalin Arthobiddha, New Central Book Agency, Calautta.
Rahman, A. 1988: Adhunik Arthonity. Puthighar Pub. Dhaka.
Ritson, C. 1977: Agricultural Economics: Principles and Policy, Granada Pub. London.
Samuelson. P.A. 1995: Economics. 15th Edition, McGraw Hill New York.
Sikder, J.I. 1995: Krishi Arthonity, Confidence Pub. Dhaka.
Uddin Taj. and Masuduzzaman, M. 1997: Krishi Arthonity, Bangladesh Technical Education Board Pub., Dhaka.
Vaish, M.C. 1977: Macroeconomic Theory, Vikas Pub. New Delhi.

Department of Agricultural and Rural Development
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No. ARD 121
Course Title: Rural Sociology (Theory)
Credit: 2 hrs

1. **Introduction:** Definition of Sociology and Rural Sociology. Origin and Development of Rural Sociology, Importance of Rural Sociology and Scope of Rural Sociology.
2. **Method and Techniques of Social Research:** Scientific Research Method, Importance, Value Judgment and Ethical Issues, Types, Research Process, Sampling Mode of Data Collection and Analysis of Social Data.
3. **Culture:** Meaning, Importance and Functions, Elements of Culture, Characteristics of culture, Theory of Cultural Lag, Ethnocentrism, Sub-culture, Cultural unity and difference, Acculturation, Counter culture, Culture and Civilization.
4. **Social Differentiation, Stratification and Rural Power Structure**: Nature and Sources of Social Differentiation, Importance and Consequences, Forms of Stratification, Class and Caste, Class system of Rural Bangladesh. Nature of Rural Power Structure, Kinship and Rural Elites, Power Structure and Development Activities.
5. **Social Institutions:** Family and Marriage, Rural Politics, Leadership, Rural recreation, religious aspects of rural life, Rural Economy.
6. **Society, Technology and Rural Social Change:** Technology and Change in human Society, Change in Traditional Technologies, Green Revolution, Industrialization, Urbanization, Modernization, Unemployment.
7. **Socialization and Social Control:** Status-role, Norms and values, Importance of socialization, Failure of socialization process and the problems of faulty Socialization. Definition of nature of Social control, Types of Social control, Agencies of Social Control.
8. **Poverty and Rural Development:** Meaning and nature of rural poverty, rural development model, GO and NGO activities.
9. **Rural Livelihood and Sustainability:** Definition of Livelihood and Changing Socio-economic Activities, Institutional Arrangement, Integrated Farming System: Agriculture, Rich fish Culture, Poultry and Livestock.
10. Land Tenure System: Human Settlement pattern, Land Reform, Society and caste practice, Land ownership and power, economic power and social status, politics and Government efforts
11. Rural Women and Gender Issues: Women and Development, Gender Discrimination, Aspect of Gender Inequality, Important Issues and Techniques of Development of Women in Bangladesh.
12. Rural Social Policy and Planning: Meaning and Contribution of Rural Sociology in Social Policy, Objectives of Rural Planning, Pre-requisites, limitations and Obstacles of Effective Social Planning, Application of Social Planning.

Books Recommended:

Chittambar, J.B. 1997. Introductory Rural Sociology (2nd edition) New Age Int: New Delhi. Doshi.S.I.and Jain P.C. 2001 Rural Sociology, Rawar Publication: New Delhi.

Raj, Hans 2000. Rural Sociology (3rd edition) Surjeet Publication: New Delhi.

Rogers EM. et al 1988. Social Change in Rural Societies: An Introduction to Rural Sociology Prentice-Hall:NJ

Devi, Laxmi 1998 Rural Sociology. Anmol: New Delhi

Chowdhary, Anwarullah 1982 Agrarian Social Relation and Development in Bangladesh Oxford & IBH Publishing CO: New Delhi

Jahangir, B, K, 1982 Rural Society, Power structure and class Practice. CSS, University of Dhaka: Dhaka.

Hye, H.A. 1996. Below the line: Rural Poverty in Bangladesh UPL, Dhaka, Jansen, Erick G. Rural Bangladesh: Competition for Scarce Resources (2''' Impression) UPL: Dhaka.

Alamgir, M.K. 1981 Land Reforms in Bangladesh, CSS, and University of Dhaka: Dhaka.

Department of Agricultural Statistics
B. Sc. Ag. (Hons.) Level-3, Semester-1
Course No. AST 311
Course Title: Agricultural Statistics (Theory)
Credit: 3 hrs

Definition, scope and limitations of Agricultural Statistics. Different types of variables. Frequency distribution: construction and graphical representation. Measures of location and variation and shape characteristics of curves.

Random experiment, outcome, sample space events, mutually exclusive, equally likely, independent and dependent events. Mathematical and statistical definitions of probability, compound and conditional probability. Additive and multiplicative laws of probability. Random variable, probability distribution. Probability function, Binomial, Poisson and Normal distributions.

Simple correlation and regression: Scatter diagram, the Pearson's correlation coefficient with its properties, least squares method for fitting regression line. Properties of regression coefficient.

Population and sample. Hypothesis, null and alternative hypotheses, type I error, type II level of significance. Basic steps for testing hypothesis. Statistical tests: a population mean is equal to a specified value, equality of two population means (independent and correlated), significance of correlation and regression coefficients, independence of attributes.

Experimental design: Basic concepts and principles. Completely randomized, randomized blocked Latin square design.

Text and Reference Books

Ahmed, A.R. et.at (2001). Parsankhyan: Tattwa-o-proyog, Second Edition, Shamsunnahar and associates, North Seota, Manikgonj, Dhaka.
Ali, M.A. (1969). Theory of Statistics, Vol. 1 & 2, Dhaka Book Mart, 38 Bangladesh, Dhaka
Goulden, G.H. (1952). Methods of Statistical Analysis, John Wiley, New York.
Gupta, S.C. & V.K. Kapoor (1982). Fundamentals of Mathematical Statistics, S. Chand and Company Ltd.
Kapur, J.N. & H. Sexena (1976). Mathematical Statistics, S. Chand & Company Ltd., Ramnagar, New Delhi.
Khan, M.Z.A. and S.C. Debnath (1987). Prathamic Parisankyan, Printed by City Press, Mymensingh.
Shil, R.N. and S.C. Debnath (1992). An Introduction to the Theory of Statistics, Minati Shil and Amita Debnath,
Snedecor, G.W. Statistical Methods, Iowa State University Press.
Steel, R.G.D. adn J.H. Torrie (1960). Principles and Procedures of Statistics, McGraw-Hill Inc., New York.
Yule, G.U. & M.G. Kendall (1965). An Introduction to the Theory of Statistics, Charles Griffin, London.

Department of Agricultural Statistics
B. Sc. Ag. (Hons.) Level-3, Semester-1
Course No. AST 312
Course Title: Agricultural Statistics (Practical)
Credit: 2 hrs

Frequency tables and their graphical representation. Measures of location and variation. Measures of skewness and kurtosis. Pearson's correlation coefficient. Fitting linear regression to observed data by the method of least squares.

Statistical tests: A population mean is equal to a specified value, equality of two population means (for both independent & correlated samples), a population is equal to a specified value, equality of two population proportions, independence of attributes, significance of correlation and regression coefficients.

Anylysis of variance for completely randomized, randomized block and Latin square designs. Multiple comparison (using 't' and 2sd).

Department of Farm Power & Machinery
B. Sc .Ag. (Hons.), Level-1, Semester-1
Course No. FPM 111
Course Title: Farm Mechanics (Theory)
Credit: 2 hrs

Farm mechanization, Sources of farm power and their status.

Definition of engine and their classification, major component of engine, engine terminelogy, engine systems, maintenance of engine.

Introduction to farm machinery: Tillage, crop planting and plant protection machinery, repair and maintenance of farm machinery.

Importance of drying and classification of dryers.

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

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

Text and Reference Book

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

Department of Farm Power & Machinery
B. Sc. Ag. (Hons.) Level-1, Semester-1
Course No. FPM 112
Course Title: Farm Mechanics (Practical)
Credit: 2 hr

Inspection and study of engine parts and systems, agricultural machines, centrifugal pumps. Other need-based Farm mechanical practical/sessional/operational works complementary to the theoretical topics.

Department of Computer Science & Engineering
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No. COMPS 121
Course Title: Computer Science (Theory)
Credit: 2 hrs

Computer fundamentals: computer systems, number systems, number conversion techniques; introduction of computer architecture: internal representations of numbers, binary arithmetic, information coding; computer application in professional environment: text processing, spreadsheet analysis, development of presentation materials, database development and information retrieval, and the internet; Introduction to object oriented programming.

Reference Book

01. Peter Norton's Introduction to Computers, Fourth Edition, Published by: Glencoe/McGraw-Hill
02. Introduction to Computer Science by Pauline Cushman, Ramon Mata- Toledo, Published by: Schaum's Outline
03. Computer Systems: A Programmer's Perspective by Randal E. Bryant & David R. O'Hallaron: Published by: Prentice Hall, 2003, ISBN 0-13-034074-X
04. Computer Science: An Overview (7^{th} edn) Brooksher, J. G., Published by: Addison- Wesley, 2003
05. Beginning Visual Basic 6 by Peter Wright, Published by: Wrox Publication

Sylhet Agricultural University, Sylhet

Department of Computer Science & Engineering
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No. COMPS 122
Course Title: Computer Science (Practical)
Credit: 1 hrs

Problem solution and terminal use based on CSM 127 course

Department of Plant and Environmental Biotechnology
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. BTECH 421
Course Title: Plant Biotechnology (Theory)
Credit: 3 hrs

1. Introduction: Concept, scope and importance of Genetic Engineering.
2. Gene Manipulation: Recombinant DNA technology, vectors, methods for gene delivery, selection of recombinants, site specific recombination/mutagenesis.
3. Molecular Techniques: Nucleic acid and protein purification, Electrophoresis, PCR, Southern, Northern and Western blotting; DNA sequencing, cDNA library.
4. Gene Expression: Regulation of transcription in prokaryotes and eukaryotes, promoter, terminator, splicing and processing of RNAs, translation, Operon concept.
5. Application of Genetic Engineering:
Plants: Pest resistance, herbicide tolerance, resistance to fungi, bacteria and virus. Oxidative, salt, drought and submergence tolerance. Nutritional quality improvement: Provitamin A, iron, protein etc. Genetic manipulation for flower pigmentation, nitrogen fixation, photosynthesis, male sterility, fruit ripening, senescence tolerance. Edible vaccines in food products.
Medicine and Industry: Commercial synthesis of hormones, vaccines, gene therapy, disease diagnosis, monoclonal antibodies, biomining, biogas, bioengineering. genome mapping, DNA fingerprinting, forensic medicine; enzymology, immunotechnology.
6. Biosafety and GMO: Biosafety and environmental issues. Biosafety guidelines & regulations. Ethics and issues regarding genetically modified organisms. Religious and social acceptance of GMOs.
7. Bioinformatics: Model for Sequence related information, usage of IT in biotechnology, internet browsing for retrieval and dissemination of biological information.

Text Books/References

Baxevanis, A. D. and B. F. F. Ouellette. 2002. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. 2nd Edition. Gopsons Papers Ltd., India.
Cunningham, C. and A. J. R. Porter. 2000. Recombinant Proteins form Plants. Humana Press, New Jersey.
Gupta, P. K. 1997. Cell and Molecular Biology. Rastogi Pub., India.
Lewin, B. 2004. Genes VIII. Pearson Prentice Hall Pub., NJ 07458.
Mehga, P., D. F. Klessig, A. R. Oshmore, W. Cruissem, and J. E. Varner. 1995. Methods in Plants Molecular Bioloty, Cold Spring Harbour Lab. Press, New York.
Michael, W. F., S. W. Graham and M. M. Young. 1992. Plant Biotechnology. Pergamon Press, New York.
Primrose, S.B. 1987. Modern Biotechnology. Blackwell Scientific Pub., London.
Primrose, S. B., R. M. Twyman and R. W. Old. 2003. Principles of Gene Manipulation. 6th Edition. Blackwell Pub. Com., Germany.
Traynor, P. L., R. J. Frederick and M. Koch. 2002. Biosafety and Risk Assessment in Agricultural Biotechnology.
Watson, J. D., T. A. Baker, S. P. Bell, A. Gann, M. Levine, R. Losick. 2004. Molecular Biology of the Gene. 5th Edition. Pearson Education Pte. Ltd., New Dilhi, India.
Westhead, D. R., J. H. Parish and R. M. Twyman. 2003. Instant Notes: Bioinformatics. 1st Edition. Bios. Scientific Pub. Ltd., Oxford, UK.
Winnacker, E. L. 2003. From Genes to Clones: Introduciton to Gene Technology. Panima Publishing Corporation, New Delhi.

Department of Plant and Environmental Biotechnology
B. Sc. Ag. (Hons.) Level-4, Semester-2
Course No. BTECH 422
Course Title: Plant Biotechnology (Practical)
Credit: 2 hrs

1. Agrobacterium-mediated transformation techniques; co-cultivation of explants.

2. Polymerase Chain Reaction (PCR), Restriction Fragment Length Polymorphism (RFLP), Amplified Fragment Length Polymorphism (AFLP), Randomly Amplified Polymorphic DNA (RAPD); Southern, Northern and Western blotting; bioassay tests.

3. Radioisotopes, their uses and monitoring concept, counting efficiency; autoradiography.

4. Applications and types of chromatography.

5. Applications of UV and visible spectrophotometry, fluorimetry.

6. Cryopreservation and conservation of seed, plant sample, semen, embryo, revival of frozen germplasm.

Text Books/References

Ansubel, F. M., R. Brent, R. E. Kingston, D. D. Moore, J. A. Sidman, J. A. Smith and K. Struhl. 1993. Current Protocols in Molecular Biology. Wiley Pub., UK.

Baxevanis, A. D. and B. F. F. Ouellette. 2002. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. 2nd Edition. Gopsons Papers Ltd., India.

Brown, T. A. 2002. Gene Cloning and DNA Analysis. 4th Edition. Blackwell Pub., London.

Glover, D. M. and B. D. Hames. 1995. DNA Cloning-1 Core Techniques: A Practical Approach. Oxford University Press, UK.

Jane, K. S. and H. Alexander. 1982. Genetics engineering. Principles and methods Plenum Press, New York.

Kjellssion, G., V. Simonsen, and K. Ammann. 1997. Methods for Risk Assessment of Transgenic Plants. Birkhauser Verlag, Germany.

Raymond, L. R. and C. T. Robert. 1983. Recombinant DNA Techniques. An introduction. The Benjamin Cumming Publishing Co., London.

Robert, J. 1987. Tissue Culture of Selected Tropical Fruit Plants; a handbook on the application of tissue culture of plant propagation. FAO, Rome.

Sambrook, J., E.F. Fritsch and T. Manniatis. 1999. Molecular Cloning. Cold Spring Harbor Press, USA.

Singh, B. P., U. Srivastava. 2004. Plant Genetic Resources in Indian Perspective: Theory and Practices. Directorate of Information and Publications of Agriculture. Indian Council of Agricultural Research, New Delhi.

Slater, R.J. 1990. Radioisotopes in Biology- A Practical Approach. Oxford University Press, UK.

Department of Biochemistry & Chemistry
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No. BCHEM 121
Course Title: Chemistry of Biomolecules (Theory)
Credit: 2 hrs

Important organic constituents of plants and animals

Carbohydrates: Occurrence, definition, classification, physical and chemical properties. Chemistry of monosaccharide 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 pecificity and inhibition with special reference to plant proteolytic enzymes, Concept of active entire, Principle of enzyme assay.

Vitamins: Classification and biochemical functions.

Plant Hormones: Classification and biochemical functions.

Secondary Plant Compounds: Occurrence and Physiological Action.

a) Glycosides, b) Alkaloids and c) Isoprenoids

Books Recommended

Biochemistry, Albert L. Lehninger and Edition, Kalyani Publishers, Ludhiana, New Delhi, 1982.

Biochemistry, Lubert Stryer, Published by S. K. Jain for CBS Publishers and Distributors, 485 Jain Bhawan, Bhola Nath Nagar, Delhi, India, 1986.

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, Allos, California, USA, 1983.

Outlines of Biochemistry, Eric E Conn, Paul K. Stumpf, George Brueming and Roy, H. DOi, John Wiley and Sons, New York, 1987.

Text Book of Biochemistry Edwards S. West, Wilber R. Todd, Haward S. Mason and John T. Van Bruggan, 4th Edition, 1966. The MaCmillan Company, Collier-MaCmillan Ltd. London, 1966.

Department of Biochemistry & Chemistry
B. Sc. Ag. (Hons.) Level-1, Semester-2
Course No. BCHEM 122
Course Title: Chemistry of Biomolecules (Practical)
Credit: 2 hrs

Preparation of buffer solutions and determination of pH.
Determination of pKa value.
Colour tests of carbohydrates.
Colour tests of proteins.
Preparation of esters and solubility tests for fats.
Preparation of starch and detection of amylase activity,
Determination of vitamin C
Proximate analysis: Moisture, fat, protein, crude fibre and ash.

Text and Reference Books

0utlines of Biochemistry, Eric E. Conn, Paul K. Stumpf, George Brueming and Roy, H. Doi. John Wiley and Sons, New York, 1995 (5th edition).

An introduction to practical Biochemistry.Davit T. Plummer. Tata McGraw-Hill Publishing Company Limited, New Delhi, 1995.

Biochemical Calculations. How to Solve Mathematical Problem in General Biochemistry. Irwin H. Segel. John Wiley and Sons, Inc. New York, 1968.

Biochemistry Laboratory Manual. F. M. Strong. WM.C. Brown Company Publishers, USA, 1965.

Biochemistry Laboratory Technioques. Sterling Chaykin. Wiley Eastern Private Limited, New Delhi, 1970.

Biochemistry, Lubert Stryer, Publshed by S.K. Jain for CBS Publishers and Distributors, 485 Jain Bhawan, Bhola Nath Nagar, Delhi, India, 1986.

Experimental Biochemistry. A Laboratory Manual. Gerald Litwack. John Liley and Sons. Inc, New York, 1960.

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.

Official Methods of Analysis. Association of Official Analytical Chemists (AOAC), Washington D.C., 1990.

Principle of Biochemistry, Albert L. Lehminger 2nd Edition. Kalyani Publishers. Ludhiana, New Delhi, 1994.

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.

Department of Biochemistry & Chemistry
B. Sc. Ag. (Hons.) Level-2, Semester-1
Course No. BCHEM 211
Course Title: Metabolism and Human Nutrition (Theory)
Credit: 3 hrs

Bioenergetics: Free energy, entropy and enthalpy, Exergonic and endergonic reaction, ADP-ATP cycle ATP as universal currency of energy in biological systems, Anabolism and catabolism.
Digestion and absorption: Food in human
Carbohydrate Metabolism: Glycolysis and alcoholic fermentation, Kerbs cycle, Electron transport chain, Shuttle systems, Pentose phosphate pathway, Gluconeogenesis, Biosynthesis of sucrose and starch.
Nucleic acid: Replication and transcription of genetic code.
Protein Metabolism: Transmination, deamination, decarboxylation, deamidation, Assimilation of ammonia in plants. Nitrogen cycle, Urea cycle, Protein synthesis- translation of genetic message.
Xenobiotic Metabolism and Aresenocosis
Fat metabolism: Beta, alpha and omega oxidation of fatty acids, glyoxalate Pathway, Fatty acid biosynthesis.
Vitamins and minerals: Occurrence, biochemical functions and deficiency symptoms, RDA
Nutrient contents and availability: Basic food groups, Cereals, legumes, oil seeds, fruits, vegetables etc., Antinutritional factors, Dietary fibre, Effect of cooking and heat processing on nutrients.
Energy: Requirement according to age, sex and weight, Basal metabolic rate, respiratory quotient balanced diet.
Obesity: Assessment, complication, prevention, therapeutic diet.
Nutrition and agriculture: National nutritional policy, Crop diversification in relation to human nutrition.

Books Recommended

Applied Human Nutrition F.Ann Walker, Ellis Horwool Limited, West Sussex, England, 1990.
Biochemistry, Albert L. Lehninger 2nd Edition, Kalyani Publishers. Ludhiana, New Delhi, 1982.
Biochemistry, Lubert Stryer, Published by S. K. Jain for CBS Publishers and Distributors, 485 Jain Bhawan, Bhola Nath Nagar, Delhi, India, 1986.
Granner, 20th Edition, 1983, Lange Medical Publication Drawer L. Los, Altos, California, USA
Hand Book of Food and Nutrition, M. Swasminathan Ganesh and Company, Madras, India, 1977.
Harper's Review of Biochemistry, David W. AMartin Jr. Peter A. Mayes, Victor W. Rodwell and Davy K.
Nutrition in Health and Disease, S. Helen Mitchell, J. B. Lippincott Company, Philadelphia, 1976.
Outlines of Biochemistry, Eric E Conn, Paul K. Stumpf, George Brueming and Roy, H. DOi, John Wiley and Sons, New York, 1987.
Text Book of Biochemistry Edwards S. West, Wilber R. Todd, Haward S. Mason and John T. Van Bruggan, 4th Edition, 1966. The MaCmillan Company, Collier-MaCmillan Ltd. London.

Department of Biochemistry & Chemistry
B. Sc. Ag. (Hons.) Level-2, Semester-1
Course No. BCHEM 212
Course Title: Metabolism and Human Nutrition (Practical)
Credit: 2 hrs

Determination of isoelectric pH
Biuret method of protein estimation.
Fehlings and Folin-Wu methods of glucose estimation.
Determination of saponification value, iodine value and acid value of fats.
Separation of amino acids by paper chromatography.
Separation of sugar by TLC
Extraction and estimation of DNA
Extration of albumin and globulin from plant sample
Extraction and estimation of plant pigments.
Assay of glucose oxidase.

Text and Reference Books

An introduction to practical Biochemistry.Davit T. Plummer. Tata McGraw-Hill Publishing
Applied Human Nutrition.F. Ann Walker. Ellis Horwood Limited, West Sussex, England, 1990.
Biochemical Calculations. How to Solve Mathematical Problem in General Biochemistry. Irwin H. Segel. John Wiley and Sons, Inc. New York, 1968.
Biochemistry Laboratory Manual. F. M. Strong. WM.C. Brown Company Publishers, USA, 1965.
Biochemistry Laboratory Technioques. Sterling Chaykin. Wiley Eastern Private Limited, New
Biochemistry, Lubert Stryer, Publshed by S.K. Jain for CBS Publishers and Distributors, 485 Jain Bhawan, Bhola Nath Nagar, Delhi, India, 1986.
Company Limited, New Delhi, 1995.
Delhi, 1970.
Experimental Biochemistry. A Laboratory Manual. Gerald Litwack. John Liley and Sons. Inc, New York, 1960.
Hand Book of Food and Nutrition. M. Swasminathan Ganesh and Company, Madras, India, 1977.
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,
Nutrition in Health and Disease. S. Helen Mitchell. J.B. Lippincott Company, Philadelphia, 1976.
Official Methods of Analysis. Association of Official Analytical Chemists (AOAC), Washington D.C., 1990.
Outlines of Biochemistry, Eric E. Conn, Paul K. Stumpf, George Brueming and Roy, H. Doi. John Wiley and Sons, New York, 1995 (5th edition).
Principles of Biochemistry, Albert L. Lehminger 2nd Edition. Kalyani Publishers. Ludhiana, New Delhi, 1994.
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.