

PRINCIPAL SUBJECT AREA

BOTANY

300 LEVEL COURSES

BT 301 Analytical Methods (2 credits)

Application of high precision mass spectrophotometer in stable isotopic research. Soil and foliar analytical techniques, Kjeldahl technique (theory, the equipment, sample preparation, measurements and calculations). Interferences and measures to improve the sensitivity and efficiency of the system and applications in research. Spectrophotometric methods: UV-VIS spectrophotometer (colorimeter), Atomic Absorption Spectrophotometer (AAS), Flame Emission Spectrophotometer (FES) and Mass Spectrophotometer. Use of radioactive isotopes in analytical Techniques: Geiger-Muller counters, Scintillation counters, Cerenkov counters and autoradiography. Molecular biological techniques, PCR, AFLP, RADP's, RFLP and DNA sequencing. Chromatographic techniques, TLC, Column chromatography, HPLC, GC. Laboratory exercises based on above topics.

Recommended Texts:

1. Coleman, D.C. & Fry, B.(1997). *Carbon Isotope Techniques*. Academic Press, New York.
2. Unkovich, M, Pate, J.S, McNeill, A. & Gibbs, D. (2001). *Stable isotope techniques in the study of biological processes and functioning of ecosystems*. Kluwer Academic Publishers.
3. Bergersen, F. J. (Ed.) (1980). *Methods for evaluating biological nitrogen fixation*. John Wiley and Sons, Chichester, UK.
4. Wilson, K. and Walker, J. M. (Eds.) (1994). *Principles and techniques of practical biochemistry* (4th edition). Cambridge University Press, UK.

BT 302 Advanced Microbiology (2 Credits)

Population counts, growth cycle of microorganisms. Applied microbiology. Microorganisms in their natural habitats and major activities, microbiology of air (types, diseases transmitted), soil (types, estimation, distribution, role in nutrient cycling), water (types, water pollution, coliform bacteria, sanitary water analysis, water borne diseases, water purification) and food (food microflora, food spoilage, food preservation and food borne diseases). Laboratory exercises based on above topics.

Recommended Texts:

1. Brock, T.D. , Madigan, M.T., Martinko, J.M. and Parker, J. *Biology of Microorganisms* (8th edition), Prentice Hall, USA, 986 pp.
2. Madigan, M.T. Martinko, J.M. Parker . J. Prentice Hall, USA, 986 pp.
3. Giller, K. E. and Wilson, K. F. (1991). *Nitrogen fixation in tropical cropping systems*. CAB. International, UK.
4. McLaren, R. G. and Cameron, K. C. (1996). *Soil Science: Sustainable production and environmental protection*. Oxford University Press, UK.
5. Brady, N. C. (1990). *The nature and properties of soils* (10th edition). Macmillan Publishing Company, UK.

BT 303 Soil Fertility and Management (2 credits)

Basic soil physical properties: structure and aggregation, formation and maintenance of soil structure and management of other soil physical conditions. Soil acidity and alkalinity and their amelioration. Nutrients and crop production: nutrient response relationships, concepts of nutrient availability, plant available nutrients and factors affecting availability and uptake by plants. Soil organic matter and its dynamics. Microbial population of the soil, interaction between plant roots and microorganisms. Nutrient availability, soil and plant nutrient analysis. Major nutrients, micro-nutrients and toxic elements in soil. Soil fertility and fertilizer management, fertilizer recommendations, soil erosion and its control. Flooded and poorly drained soils, sustainable management of soil and land resources. Soils requiring unusual management practices. Soils and the quality of the environment. Laboratory exercises based on above topics.

Recommended Texts:

1. McLaren, R. G. & Cameron, K. C. (1996). *Soil Science: Sustainable production and environmental protection* (New Edition), Oxford University Press, UK.
2. Brady, N. C. (1990). *The nature and properties of soils* (10th Edition). Macmillan Publishing Company, UK.
3. Miller, R. W. & Donahue, R. L. (1992). *Soils: An introduction to soils and plant growth* (6th edition). Prentice-Hall of India Pvt. Ltd. New Delhi.
4. Page, A. L., Miller, R. H. & Keeney, D. R. (Eds.) (1992). *Methods of soil analysis- Part 2 – Chemical and microbiological properties* (2nd Edition). American Society of Agronomy and Soil Science Society of America, Inc., USA.

BT 304 Plant Pathology (2 credits)

Introduction, history of Plant Pathology, terminology & definitions, cause of plant disease, infection process, mechanism of symptom development, fungal pathogenesis, plant defense responses – constitutive and inducible defenses, Systemic Acquired Resistance (SAR), principles of plant disease control, diagnosis of plant disease.

Practical exercises: Laboratory examination of diseased specimens covering major field and post-harvest diseases of food, ornamental and plantation crops, plant pathology techniques, study of plant-pathogen interactions.

Recommended Texts:

1. Agrios, G. N. (1997). *Plant Pathology*, 4th Edition, Academic Press, U.K.
2. Abeygunawardena, D.V.W. (1969). *Diseases of cultivated plants*, Their diagnosis and treatment in Ceylon, The Colombo Apothecaries Co. Ltd., Sri Lanka.
3. Mehrotra, R.S. (1994). *Plant Pathology*, 10th Print, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
4. Persley, Denis M. (1982). *Diseases of vegetable crops*. Department of Primary Industries, Queensland, Brisbane.
5. Beattie, B.B., W.B. McGlasson (1995). *Postharvest diseases of horticultural produce*, Volume 2: Tropical fruit. Department of Primary Industries, Queensland, Brisbane.

BT 305 Developmental Physiology and Postharvest Technology (2 credits)

Terminology of growth, development and differentiation, phytohormones and plant growth regulators, growth promoters, inhibitors and modifiers, their physiological effects, commercial applications, biosynthesis, interactions, theories on mechanism of photoperiodism and vernalization. Signal transduction. Basic techniques of detection of phytohormones: chromatography, immunoassays and bioassays.

Postharvest technology of fruits and vegetables, causes of fruit and vegetable deterioration, maturity indices, harvesting systems, packing house operations, transportation storage: temperature management, modified atmosphere, ethylene, cold chain maintenance, technology at village and industrial level, agrochemical usage and alternatives, quality parameters and methods of determination, minimal processing.

Laboratory exercises based on the above.

Recommended texts:

1. Raven, P.A. and Johnson, G.B. (1996). *Biology*, 4th edition, Wm.C. Brown Publishers.
2. Salisbury, F.B. and Ross, C.W. (1992). *Plant Physiology*. Wadasworth Inc. USA
3. Taiz, L and Zeiger, E. (1991). *Plant Physiology*. The Benjamin Cummings Publishing Company, New York, USA.
4. Kays, S.I. (1991). *Postharvest Physiology of Perishable plant products*. Van Nostrand Reinhold, USA.

BT 307 General and Molecular Genetics (2 credits)

Genetic mapping in eukaryotes and prokaryotes, variation in chromosome number and structure, replication of DNA and chromosomes, translation, transcription and genetic code, mutation and DNA repair, genetics of viruses & bacteria, organelles and transposable elements, regulation of gene expression, recombinant DNA technology, genomics, population and evolutionary genetics, speciation, conservation genetics.

Laboratory exercises based on the above.

Recommended Texts:

1. Griffiths, A.J.F., Miller, J.H., Suzuki, D.T., Lewontin, R.C. and Gelbert, W.M. (1996). *An introduction to genetic analysis*. W.H. Freeman and Company, New York.
2. Snusted, D.P. and Simmons, M.J. (1999). *Principles of Genetics*. John Wiley and Sons, Lewin, USA,
3. Benjamin (2003). *Gene VIII*. Prentice Hall, USA.

BT 308 Plant Systematics (2 credits)

General definitions, nomenclature, identification and classification. Taxonomic hierarchy, different classification systems. Different schools of thought as to the origin of the angiosperms. Phenetics, cladistics, different types of data. Plant collection and herbarium techniques.

Practical exercises on floral characteristics of representative species from useful plant families.

Recommended Texts:

1. Stace, C. A. (1993). *Plant taxonomy and biosystematics*. Cambridge University Press, U.K.
2. D.Bridson and L. Forman (Eds) (1998). *The herbarium hand book*. 3rd Edition. Scientific Publications of the Royal Botanical Gardens, Kew, England.
3. Thomas J. Elpel (2000). *Botany in a Day: Thomas J. Elpel's Herbal Field Guide to Plant Families*, HOPS Press.
4. Nordenstam, B. & El-Ghazaly, G. (Ed.) (2000). *Plant Systematics for the 21st Century*. Swedish Museum of Natural History, Sweden and M. Kassas, Cairo University, Egypt.

BT 309 Biodiversity Conservation & Management (2 credits)

Biodiversity – Introduction, Global biodiversity estimates, Measuring Biodiversity, Loss of biodiversity, Threats to Biodiversity, Biodiversity Conservation and Sustainable Development, Setting Conservation principles, Species management, Habitat management, Conservation Education & Ecotourism. Indigenous knowledge and Biodiversity, International conventions on Biodiversity.

Field visits.

Recommended Texts:

1. Groombridge, B. (1992). *Global Biodiversity: status of the Earth's living Resources*. Chapman and Hall. London.
2. Watson, R.T. & Heywood, V.H. (1995). *Global Biodiversity Assessment*. UNEP.

BT 310 Ecosystems of Sri Lanka: Their Ecology and Conservation (2 credits)

Geography, climate, geology, soils and floristic zones of Sri Lanka. Natural vegetation types of the island in relation to their distribution, extent, climate, vegetation structure, floristic richness, family and species dominance, population size distributions, endemic species, underutilized species. Factors responsible for degradation of natural ecosystems. Conservation and restoration of natural ecosystems. The ecosystems considered are i) marine, ii) maritime (mangroves, sea shore, and salt marshes) and inland aquatic ecosystems, forest types (rain forests -lowland & montane, dry zone forests and scrub vegetation), grasslands (wet and dry pathanas, thalawas, savannahs and damanas).

Recommended Texts:

1. Ashton, P. M. S. *et al.* (1997). *A field guide to the common trees and shrubs of Sri Lanka*. The Wildlife Heritage Trust, Sri Lanka, 432pp.
2. Whitmore, T. C. (1990). *An introduction to tropical rain forests*. Oxford University Press, Oxford, 226pp.
3. Mabberley, D. J. (1992). *Tropical Rain Forest Ecology*. Blackie and Son Ltd., 300pp.
4. Anon. (2000). *Natural Resources of Sri Lanka*. The National Science Foundation, Sri Lanka, 306pp.

BT 311 Plant Reproductive Biology and Plant Breeding (2 credits)

(Prerequisite: BT 307)

Genetic variation and its estimation, incompatibility and its inheritance. Pollination biology. Plant breeding perspectives, plant reproductive systems, principles of plant breeding, genetic basis of plant breeding, polygenic inheritance, methods of breeding and experimental designs, quantitative inheritance, polyploidy, methods of breeding of self- and cross pollinated crops. Application of molecular marker technologies for genome analysis. Germplasm resources preservation and utilization, hybrid crops, seed production and maintenance. Field visits to Plant Genetic Resource Centre (PGRC) and Rice Research and Development Institute, Batalagoda.

Recommended Texts:

1. Poehlman, J. M. and Sleper, D. A. (1995). *Breeding Field Crops* 4th Edition,. ISU Press.
2. Agarwal, R. L. *Fundamentals of Plant Breeding and Hybrid Seed Production*. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.
3. Sharma, J. R. (1994). *Principles and Practice of Plant Breeding*. Tata Mc Graw – Hill Publishing Company Ltd., New Delhi.

BT 312 Economic Botany (2 credits)

Crop plants and their wild relatives, centres of origin and diversification of crop plants. A brief botanical description of economically important plants selected from cereals, millets, pulses, oil seeds, essential oils, sugar crops, tuber crops, fibre crops, spices and condiments, medicinal plants, beverages, fruits and nuts, vegetables, gums and resins, dyes and tannins, forage crops, cover crops and shade trees, avenue trees, insecticidal plants, plant toxins, invasive plants and weeds. Food plants, plants and plant products of industrial value, medicinal plants and drugs, food adjuncts. Structure and properties of wood, factors affecting the strength of timber, timber processing technology, agencies of destruction of wood, wood preservation; manufactured products of wood and their applications.

Laboratory exercises based on the above.

Recommended Texts:

1. Samba Murthy, A.V.S.S. & Subrahmanayam, N.S. (1998). *A Text Book of Economic Botany*, Wiley Eastern Ltd.
2. Desch, H. E. & Dinwoodies, JM. (1998). *Timber- structure, properties, conversion and use*. Macmillan Press.
3. Tisseverasinghe, A.E.K. (1971). *A manual of timber utilization for Ceylon*. Forest Department, Sri Lanka.

BT 313 Independent study (1 Credit)

A structured programme to encourage active student learning and develop their communication and presentation skills. The students obtain an in-depth understanding of given topics of botanical interest by literature survey and reading research/scientific articles and a deliver seminar.

FS 302 Food Science II (2 credits)

Concepts in Food Engineering : Physical concepts in food engineering: Properties of liquids and solids, measuring sensory characteristics, Physical and chemical properties of food products. Heat transfer systems for heating and cooling food products, Evaporation and drying, grinding and size reduction, Psychrometrics and dehydration.

Nutrition and Quality of Food : Biochemistry and Nutrition: Digestion and absorption. Food nutrients, their role in human nutrition, sources and availability. Food safety, hygiene and quality control: Natural and artificial toxicants in foods, Importance of hygienic handling, Principles of quality control; HACCP and GMP, Use of sensory evaluations, Food laws and standards, Role of International Bodies, i.e. WHO/FAO, International Standards Organization, Biosafety Regulations, Food control infrastructure in Sri Lanka. Laboratory work Based on above topics.

Recommended Texts:

B.C.Hobbs (1978), *Food Poisoning and Food Hygiene*, Edward Arnold Publishers.

R.T.Toledo (1997), *Fundamentals of Food Process Engineering*, C.B.S. Publishers and Distributors.

N.W.Dessroshier(1963), *The Technology of Food Preservation*, The AVI Publishing Company.