

Subject: Botany (BOTA)			
Special			
	Course Units	Status	Pre-requisite
Year 3 Sem 1	<a href="#">BOTA 41016 Plant Systematics and Bioinformatics</a>	C	All BOTA compulsory course units
Year 3 Sem 2	<a href="#">BOTA 42026 Plant Physiology and Biochemistry</a>		
Year 4 Sem 1	<a href="#">BOTA 41034 Plant Pathology</a>		All BOTA compulsory course units and BOTA 32034
	<a href="#">BOTA 41043 Applied Microbiology</a>		
	<a href="#">BOTA 41066 Economic Botany and Plant Breeding</a>		
	<a href="#">BOTA 43098 Research Project-Dissertation</a>		
	<a href="#">BOTA 43112 Term Paper</a>		
Year 4 Sem 2	<a href="#">BOTA 42056 Ecology of Sustainability</a>		
	<a href="#">BOTA 42074 Molecular &amp; Microbial Genetics</a>		
	<a href="#">BOTA 42083 Fungal Eco-physiology and Applied Mycology</a>		

## Botany

### LEVEL - 4

**Course Code** : BOTA 41016  
**Course Title** : Plant Systematics and Bioinformatics  
**Prerequisite** : All compulsory course units in Botany

#### Learning outcomes:

At the completion of this course unit, the student should be able to (i) recognize different taxonomic sources (ii) analyze taxonomic information using computer aided methods (iii) develop a collection of herbarium specimens.

#### Course contents:

Classification of Angiosperms, Angiosperm Phylogeny Group (APG). Numerical taxonomy: cluster analysis, phenetics and cladistics, definitions and concepts, character selection, sympleisomorphies and synapomorphies, parsimony method. Introduction to bioinformatics, definitions, application of computer methods in bioinformation, Sources of taxonomic information: structural, chemical, chromosomal, geographical and ecological information. Evolution, variation and biosystematics. Plant nomenclature: type specimens, author citations, rule of priority. Presentation of data: monographs, Floras and revisions. Taxonomic databases. Herbarium techniques, Use and construction of identification keys.

**Method of teaching and learning:** Lectures, tutorials, presentations, field exercises and practical assignments.

**Assessment:** Presentations, assignment reports, assessment of herbarium specimens and end of course written examination.

#### Recommended reading:

1. Judd, W S; Campbell, C S; Kellog, E A; Stevens, P F and Donoghue, M J (2002). Plant Systematics: A Phylogenetic Approach. Sinauer Associates, Inc.,
2. Stace, C A (1989). Plant Taxonomy and Biosystematics. Cambridge.
3. Forman, L and Bridson, D (eds) (1989). The Herbarium Handbook. Royal Botanic Gardens, Kew.
4. Podani, J (2000). Introduction to the Exploration of Multivariate Biological Data. Backhuys Publishers.
5. Manly, B F J (2004). Multivariate Statistical Methods. A Primer London.

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**Course Code** : BOTA 42026  
**Course Title** : Plant Physiology and Biochemistry  
**Prerequisite** : All compulsory course units in Botany

#### Learning Outcomes:

At the completion of this course unit, the student should be able to (i) explain certain physiological/biochemical concepts and phenomena (ii) discuss the physiological changes that take place in extreme environments, (iii) discuss the molecular biology of plant-nutrient relations, and (iv) explain how the various metabolic processes are regulated and provide energy and material for life.

#### Course contents:

Water relations: soil-plant-atmosphere continuum. Stress physiology: stress concepts, water, salt, and temperature stress, nutrient acquisition from toxic or extreme soils. Physiological genetics and molecular biology. Photosynthesis: photochemistry, mechanisms of light absorption and emission, photophosphorylation and chemiosmotic coupling hypothesis, prokaryotic photosynthesis, carbon isotope fractionation and water use efficiency. Photomorphogenesis. Metabolism: metabolic fuels and regulation. Respiration and lipid metabolism:  $\beta$ -oxidation, glyoxylate cycle and gluconeogenesis, pentose phosphate pathway, cyanide-resistant respiration. Secondary metabolites and plant defense. Isozymes, isoforms of enzymes and allosteric enzymes.

**Method of teaching and learning:** Lectures, tutorials, seminars, CAL and practical assignments

**Assessment:** Practical assignments and end of course written examination

**Recommended reading:**

1. Salisbury, F B and Ross, C W (1992). Plant Physiology. Wadsworth.
  2. Taiz, L and Zeiger, E (2005). Plant Physiology. Sinauer Associates, Inc.,
  3. Lambers, B H; Chapin, F S and Pons, T L (1998). Plant Physiological Ecology. Springer Publishers.
  4. Moran, L A; Scrimgeour, K G; Horton, H R; Ochs, R S and Rawn, J D (1994). Biochemistry. Neil Patterson.
  5. Stryer, L (1995). Biochemistry. W H Freeman.
  6. Lehninger, L, Nelson, D L, & Cox, M M (2000). Principles of Biochemistry. Worth.
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**Course Code** : BOTA 41034  
**Course Title** : Plant Pathology  
**Prerequisite** : All compulsory course units in Botany and BOTA 32034

**Learning outcomes:**

At the completion of this course unit, the student should be able to explain (i) the principles involved in the modern plant disease diagnostics (ii) the intricacies of the compatible and incompatible interactions between plants and pathogenic microorganisms.

**Course contents:**

Diagnostic techniques in plant disease: use of symptoms, biochemical, physiological, ultra-structural, immunological and nucleic acid based methods in disease diagnosis. Infection and pathogenesis: adhesion and penetration by bacterial and fungal pathogens. Pathogenicity determinants, mechanisms of defense in plants including elicitation of defense mechanisms. Viral diseases. Post harvest diseases. Soil-borne pathogens in the tropics and their control. Disease management using bio-control agents.

**Method of teaching and learning:** Lectures, presentations, CAL and visits to research institutes.

**Assessment:** Reports and end of course written examination.

**Recommended reading:**

1. Fox, R T V (1993). Principles of Diagnostic Techniques in Plant Pathology. CAB International.
  2. Callow, J A (ed). (1983). Biochemical Plant Pathology. John Wiley and Sons.
  3. Hillocks, R J and Waller, J M (1997). Soil-borne Diseases of Tropical Crops. CAB International.
  4. Jeger, M J (2007). Biotic Interactions in Plant Pathogen Associations. Blackwell
  5. Relevant articles in Annual Review of Phytopathology.
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**Course Code** : BOTA 41043  
**Course Title** : Applied Microbiology  
**Prerequisite** : All compulsory course units in Botany and BOTA 32034

**Learning outcomes:**

By the end of this course unit, the student should be able to (i) distinguish between the food-borne intoxications and food infections (ii) describe principles of food preservation and aseptic procedures adopted in industrial food production (iii) compare the effectiveness of various groups of antibiotics in the management of diseases.

**Course contents:**

Microbial spoilage of food, food-borne intoxications and food infections. Principles and processes of food preservation. Microbial standards and quality control of foods. Industrial microbiology: use of microbial processes and technology in the production of beverages, perishable foods and pharmaceuticals. Water treatment: industrial and domestic systems, sewage disposal. Antibiotics: clinical use of antibiotics, mechanism of action of antibiotics and drug resistance.

**Method of teaching and learning:** Lectures, seminars and industry visits.

**Assessment:** Continuous assessment, presentations and end of course written examination.

**Recommended reading:**

1. Andrian, R E (ed.) (1994). Microbial Food Poisoning. Chapman & Hall.
2. James M J; Loessner, M J and Golden, D A (2005). Modern Food Microbiology. 7<sup>th</sup> Edition. Springer Science, Business Media Inc.
3. Marriot, N G and Gravani, R B (2006). Principles of Food Sanitation. 5<sup>th</sup> Edition. Springer Science, Business Media, Inc.
4. Rahman, M S (Ed) (1999). Handbook of Food Preservation. Marcel Dekker, Inc, New York.
5. Waites, M J; Morgan, N L; Rockey, J S and Higton, G (2001). Industrial Microbiology - An Introduction. Blackwell Science Ltd, London.

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**Course Code** : BOTA 42056  
**Course Title** : Ecology of Sustainability  
**Prerequisite** : All compulsory course units in Botany and BOTA 32034

**Learning outcomes:**

At the end of this course unit, the student should be able to demonstrate skills in analysis of ecological patterns and proposing sustainable solutions.

**Course contents:**

Life-supporting ecological interactions in soil, role of fungi and bacteria in the processes and methods for studying nutrient cycling in soil. Physical and functional structure of ecosystems, their measurement, factors affecting food web structure and community/ ecosystem stability, plant diversity within areas, alpha, beta and gamma diversity, keystone species, functional diversity, magnitude and assessment of plant diversity. Minimizing energy usage and impact of climate change, optimizing material usage and minimizing ecological impact of human activities to levels that natural systems can sustain, use of GIS in EIA, industrial designs as living systems interdependent with nature, “ecological farming”, fundamentals of ‘Ecological Foot Printing’, conservation and ecosystem restoration.

**Method of teaching and learning:** Lectures, field visits, practical assignments and CAL.

**Assessment:** Assignment reports and end of course written examination.

**Recommended reading:**

1. Bormann, F H and Kellert, S R (1991). Ecology, Economics and Ethics. Yale University.
2. Heywood, V H (Ed) (1995). Global Biodiversity Assessment. UNEP.
3. Begon, M; Herper, J L and Townsend, C R (1990). Ecology, 3<sup>rd</sup> Edition, Blackwell Science.
4. Chambers, N; Simmons, C and Wackernagel, M (2000). Sharing Nature's Interest. Earthscan Publishers Ltd.
5. Cushing, J M (2004). Chaos in Ecology. Elsevier Science, USA.
6. Farina, A (2006). Principles and Methods in Landscape Ecology. Springer, The Netherlands.
7. Gaston, K J (2006). Biodiversity: An Introduction. 2<sup>nd</sup> Edition. Blackwell Science.
8. Krebs, Charles J (1999). Ecological methodology. Addison-Wesley Publishers, USA.
9. Snedaker, S C and Snedaker, J G (1984). Mangrove Ecosystem: Research Methods. UNESCO, Paris.
10. National Science Foundation (2000). Natural resources of Sri Lanka 2000, National Science Foundation, Sri Lanka.
11. Osborne, P L (2000). Tropical Ecosystems and Ecological Concepts. Press Syndicate of the University of Cambridge, UK.
12. Westman, W E (1985). Ecology, Impact Assessment and Environmental Planning. John Wiley & Sons.

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**Course Code** : BOTA 41066  
**Course Title** : Economic Botany and Plant Breeding  
**Prerequisite** : All compulsory course units in Botany and BOTA 32034

**Learning outcomes:**

At the end of this course unit, the student should be able to describe botanical aspects of economically important plants, post harvest practices of grains, fruits and vegetables and potential of plant-based industries, and explain the underlying principles and methods in plant breeding.

**Course contents:**

**Economic Botany:** Botany of economically important plants, domestication of crops, bio geography of selected crop plants. Post harvest practices; storage, post harvest losses, effect of preharvest and postharvest factors to the quality and shelf life of commodity. Bioprospecting: Plant based industries: Pharmaceuticals, food and beverages, cosmetics, insecticides and pesticides.

**Plant Breeding:** Cytogenetics. Mating systems of plants, male sterility, and self incompatibility. Genetic aspects of plant breeding. Plant breeding methods and their objectives. Breeding methods for cross pollinating and self pollinating crop plants. Special techniques in plant breeding.

**Method of teaching and learning:** Lectures, tutorials, practical assignments, presentations and visits to research institutes.

**Assessment:** Assignment reports, presentations and end of course written examination.

**Recommended reading:**

1. Simpson, B B and Ogorzaly, M C (1995). Economic Botany. McGraw-Hill.
2. Hill, A F (1972). Economic Botany. A Text Book of Useful Plants and Plant Products. McGraw Hill.
3. Kaufman, P B; Cseke, L J; Warber, S; Duke, J A and Brielmann, H L (1999). Natural Products from Plants. CRC Press, London.
4. Wills, R B H; Lee, T H; Graham, D; McGlasson, W B and Hall, E G (1998). Post Harvest: An Introduction to the Physiology and Handling of Fruits, Vegetables & Ornamentals. CAB International.
5. Allard, R W (1966). Principles of Plant Breeding. John Wiley & Sons. New York.
6. Richards, A J (1997). Plant breeding systems. Chapman & Hall, London.
7. Acquah, G (2007). Principles of Plant Genetics and Breeding. Blackwell Publishing.

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**Course Code** : BOTA 42074  
**Course Title** : Molecular and Microbial Genetics  
**Prerequisite** : All compulsory course units in Botany and BOTA 32034

**Learning outcomes:**

At the completion of this course unit, the student should be able to explain the concepts of advanced molecular and microbial genetics with a view to applying in genetic engineering.

**Course contents:**

Structure and organization of eukaryotic chromosomes. Eukaryotic gene expression (transcription and RNA processing). Molecular basis of transformation and conjugation. Specialized transduction. Transcriptional regulation in bacteria. Genetic regulation in bacteriophage Lambda. DNA damage and repair mechanisms in bacteria. Transposable elements. Plasmids, vectors and restriction enzymes as tools in recombinant DNA technology. Transformation of foreign genes into plant cells and construction of transgenic plants. Other techniques and applications in genetic engineering.

**Method of teaching and learning:** Practical assignments, lectures and tutorials

**Assessment:** Assignment reports and end of course written examination.

**Recommended reading:**

1. Lewin, B (2000). Genes VII. Oxford University Press.
  2. Griffiths, A J F; Miller, J H; Suzuki, D T and Gelbart W M (1996). An Introduction to Genetic Analysis. 6<sup>th</sup> Edition. W H Freeman.
  3. Sambrook, J; Fritsch, E F and Maniatis, T (1989). Molecular Cloning. Cold Spring Harbor Laboratory.
  4. Podila, G K and Douds, D D (Eds) (2000). Current Advances in Mycorrhizae Research. APS Press. The American Phytopathological Society. St. Paul, Minnesota.
  5. Kendrick, B (1992). The Fifth Kingdom. 2<sup>nd</sup> Edition. Mycologue Publications, Focus Information Group.
  6. Lodish, H; Berk, A and Matsudaria, P (2004). Molecular Cell Biology. 5<sup>th</sup> Edition. W.H. Freeman and Co., New York.
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**Course Code** : BOTA 42083  
**Course Title** : Fungal Eco-physiology and Applied Mycology  
**Prerequisite** : All compulsory course units in Botany and BOTA 32034

**Learning outcomes:**

By the completion of this course, the student should be able to explain the principles of fungal growth, metabolism and their eco-physiological interactions in relation to their economic use.

**Course contents:**

Fungal growth. Nutrient requirement and modes of nutrition. Metabolism. Tolerance of fungi to extreme environments. Environmental factors affecting fungal diversity. Fungal conservation. Fungal interactions and their application in pest and weed management, improvement of forest plantations and crop cultivations. Industrial use of fungi. Fungicides

**Method of teaching and learning:** Lectures, assignments and presentations.

**Assessment:** Assignment reports and end of course written examination.

**Recommended reading:**

1. Esser, K and Lemke, P A (1994). *The Mycota*. Springer-Verlag, New York.
2. Hawksworth, D L (1990). *Frontiers in Mycology*. C A B International, UK.
3. Kendrick, B (1992). *The Fifth Kingdom*. 2<sup>nd</sup> edition, Mycologue Publications; Focus Information Group.
4. Landecker, E M (1996). *Fundamentals of the Fungi*. Prentice Hall, New Jersey.
5. Deacon, J (2004). *Fungal Biology*. 4<sup>th</sup> Edition. Blackwell Science.

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**Course Code** : BOTA 43098  
**Course Title** : Research Project - Dissertation  
**Prerequisite** : All compulsory course units in Botany and BOTA 32034

**Learning outcomes:**

By the end of this course unit, the student should be able to demonstrate competence in (i) planning and carrying out a research project scientifically, (ii) presenting the research in the form of a dissertation, and (iii) defending the work carried out and outcomes.

**Course contents:** Research related to sub disciplines of the Botany curriculum.

**Method of teaching and learning:** A one year research project is assigned to each student under the supervision of a senior academic staff member at the beginning of level four. Before commencement of the research, research plan and methodology of the project should be presented at a seminar. A dissertation should be submitted before the end of the academic year. Presentation of the research findings at a seminar will be evaluated by a board examiners.

**Assessment:** Dissertation and oral presentation.

**Recommended reading:**

1. Day, R A (1994). *How to Write and Publish a Scientific Paper*. Orix.
2. Alley, M (1998). *The Craft of Scientific Writing*. Springer Verlag.
3. Reference material relevant to each research topic provided by the Department of Botany.

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**Course Code** : BOTA 43112  
**Course Title** : Term Paper  
**Prerequisite** : All compulsory course units in Botany and BOTA 32034

**Learning outcomes:**

By the end of this course unit, the student should be able to demonstrate the ability for critical, self-directed learning, and skills in oral and written communication.

**Course contents:** Two written papers on topics related to sub disciplines of the Botany curriculum.

**Method of teaching and learning:**

Survey of literature related to a prescribed topic and subsequent presentation in written and oral form.

**Assessment:** Written paper and oral presentations.

**Recommended reading:**

Prescribed by the lecturer in-charge of each term paper.

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