BOTANY (BT) COURSES

BT 112 PRINCIPLES OF PLANT POPULATION GENETICS 3 UNITS[1]

Objectives:
By the end of the course the student should have:
Explain basic genetic principles that operate in natural plant populations
Explain the outcome of genetic principles with respect to temporal and spatial variations.

Content:
The gene. The origin of genetic variations in natural plant populations. Patterns of variations; developmental, phenotypic, genetic variation, (biotypes, and ecotypes). Genetic variation and the environment, Measuring genetic variations in populations; morphological and molecular markers. Gene and genotype frequencies (Genetic plasticity), Genetic variation and breeding systems and the concepts of gene flow. Selection forces; natural and artificial selections, genetic variation in wild and in domesticated plant species. Migration, Mutation, selection drift. The founder effect concept; population clash and distant dispersals.

Delivery: 30 lecture hours and 45 hours of practicals
Assessment: Coursework will constitute 40% and the final examination 60%.

Textbooks:
1. Daniel Hart and Andrew G. Clerk 1997. Principles of population genetics. 3rd Ed. Sinauer Associates, Inc. Publisher Sunderland. ISBN.0878933069
2. James F Crow and Motoo Kimura 1990. Introduction to population genetics. Harper and Row Publisher, New York.

References:
George, 2006. Principles of plant genetics and breeding. Lavoisier Library.
D. Briggs and S.M. Briggs 1997. Plant variation and Evolution 3rd Edition Cambridge University Press UK.

BT 113 INTRODUCTION TO PLANT PHYSIOLOGY 2 UNITS

Objectives:
By the end of the course students should be able to:
Explain plant cell functions in transporting nutrients
Describe processes that allow for transport of materials in plants
Predict possible mechanisms to facilitate transport
Predict defects from lack of various nutrients
Explain environmental impacts on plant physiological processes

Content:
Plant cell characteristics; diffusion, bio-energetics and water potential; osmosis; transpiration; the ascent of sap; mineral nutrition; absorption of mineral salts; transport in the phloem.

Delivery: 15 lecture hours, 45 hours of practical

[1] New course

Assessment: Coursework 40%, Final Examination 60%

Textbooks:
Salisbury, FB & Ross, CW 1991. Plant Physiology 4th Edition Wadsworth Publishing Company.
Ross, CW 1974. Plant Physiology Laboratory Manual. Wadsworth Publishing Company, California.

References
1. Lincoln Taiz and Eduardo Zeiger. (2006) Plant Physiology, 4th ed. Sinauer Associates, Inc. Sunderland
2. Horst Marschner (1986) Mineral Nutrition of Higher Plants, 2nd. ed. Academic Press, San Diego, CA
3. Peter H. Raven, Ray F. Evert, Susan E. Eichhorn (2005) Biology of Plants, 7th ed. W.H. Freeman and Co., New York.

BT 130 EVOLUTIONARY BOTANY 3 UNITS

Objectives:
By the end of the course students should be able to:
Differentiate plant groups from lower to higher taxa
Describe the evolutionary trend of different groups of plants and their evolutionary relationships.
Explain Structure and morphology of Angiosperm and their modifications for adaptation
Describe botanical techniques of collection and preservation of Herbarium specimens.

Content:
Survey of the plant kingdom from an evolutionary approach. Early earth environment, the prokaryotes, Fungi, Algae, Bryophytes, Ferns and their Allies, Gymnosperms and Angiosperms. Structure and life cycle of representative members of the groups with emphasis on alternation of generation. Angiosperm morphology adaptation and modification of roots, stems, leaves, fruits and seeds; aestivation and placentation. Botanical techniques of collection and preservation of Herbarium specimens.

Delivery: 30 lecture hours and 45 practical hours
Assessment: 40% Coursework; 60% final examination.

Textbooks:
Pandey, SN; Trivedi, PS & Misra, SP 1996. A textbook of Botany, Vol. I. Vikas; Publishing House PVT Ltd.
Pandey, SN; Trivedi, PS & Misra, SP 1998. A textbook of Botany. 11th Revised Edition, Vol. II. Vikas Publishing House PVT Ltd.

References:
Dutta, AC. 1999. Botany for Degree Students. Oxford University Press, Calcutta.
Stern KR. 1994. Introductory Plant biology. WC Brown Publishers, Iowa. Keeton, WT. and Gould, JL, 1986. *Biological Sciences*. 4th Edition, W.W. Norton & Company, New York.
Willis, KJ & McElwain, JC 2002. *The Evolution of Plants.* Oxford University Press, Oxford

BT 211 FUNDAMENTALS OF SOIL SCIENCE 2 UNITS

Objectives:
By the end of the course the student should be able to:

Explain the effects of soil texture, minerals and colloids on water movement, water retention as well as aeration.
Explain the concept of soil as a living component of the environment and soil utilization

Content:
Introduction to the physical properties, formation and classification of soils. The study of soil texture, minerals and colloids as they affect water movement, water retention, aeration, and chemistry of nutrient availability and soil reaction. The soil as a living component of the environment, organic matter characteristics and considerations of soil utilization. Plant residue decomposition and interactions in soil.

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%.
Textbooks:
Brady, NC & Weil, RR. 1996 The Nature and properties of Soil. 12th Edition. Prentice Hall, Upper Saddle River, NJ 07458, USA.
Urio, AP; Mong, HO; Chowdhury, MS & Singh BR & Semoka, JMR 1979. Introductory Soil Science. Tanzania Publishing House, Dar es Salaam.

BT 215 INTRODUCTION TO MYCOLOGY 2 UNITS
Objectives:
By the end of the course students should be able to:
Classify the members of the fungi kingdom
Describe structure and life cycle of fungi
Explain the economic importance of fungi
Contents:
Structure, live cycles and biology of fungi (Reproduction, spore dispersal and classification of Kingdom Fungi). Morphological variations in the Fungi, the mono- and polyphyletic relationship in the kingdom fungi Stremenopile and the Protists. The economic importance of Fungi, Stramenopile, Protists and Lichens. Role of fungi in genetics and biotechnology

Delivery: 15 lecture hours and 45 hours of practical.
Assessment: 40% Coursework; 60% final examination.

Textbooks:
1. Alexopoulos, CJ; Mims, CW & Blackwell, M 1996. Introductory Mycology. John Wiley & Sons Inc.,
New York.
2. Sarabhoy, A.K., 2005. A text book of mycology. Indian council of Agriculture Research. New Delhi.
India.

BT 217 PLANT GENETICS AND EVOLUTION 2 UNITS
Objectives:
By the end of the course students should be able to:
Explain basic concepts of plant genetics, genetic diversity and evolution
Describe different characteristics of chromosomes and their importance in evolutionary genetics
Explain natural forces determining evolutionary change in plants

Content:
Basic concepts of plant genetics and evolution. Chromosome morphology; chromosomal changes; Chromosome ecology; basic numbers, polyploidy, aneuploidy, euploidy; an interpretation of chromosome numbers. Plant genetic resources; genetic diversity (sources, measurements and levels); Theories explaining the origin of plants; Genetic basis of evolution: Mechanisms and evidences of evolution. Hardy-Weinberg rules. Forces changing gene frequencies; natural selection, drift, mutation and migration. Evolutionary trends within selected groups of plants. Evolution in small populations and effects of population size reduction; Variation and speciation modes. agricultural importance of ploidy levels

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%.

Textbooks:
1. Snustad D.P & Simmons M.J 2003 Principles of Genetics (3rd Ed) John Wiley & Sons New York.
2. James, RW 1981. Fundamentals of Plant Genetics and Breeding. Colorado State University.
3. Briggs, D and Walters SM 1997. Plant variation and Evolution. 3rd edition. Cambridge University
Press.

References
William, DS 1989. Genetics McGraw Hills & Company.
Max-King 1993. Species and Evolution. Role of Chromosome change. Cambridge University Press, Cambridge
Frankham R, Ballou J.D and Briscoe D.A 2002. Introduction to conservation genetics. Cambridge University Press.
Hartwell L; Hood L; Goldberg M.L; Raynolds A.E; Silver L.M and Veres R.C 2000. Genetics; From Genes to Genomes. McGraw-Hill Companies. USA

BT 218 PLANT PHYSIOLOGY AND GROWTH 2 UNITS
Objective:
By the end of the course students should be able to:
Describe plant metabolic and growth processes
Explain factors affecting plant growth.

Content:
Enzymes, proteins and amino acids; Photosynthesis: chloroplasts and light; CO2 fixation and carbohydrate synthesis; factors affecting photosynthesis; respiration; nitrogen and sulphur assimilation; growth and development, hormones and growth regulators; movement in plants; photomorphogenesis; biological rhythms; growth response to temperature; photoperiodism

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Coursework will be 40% and final examination 60%.

Textbooks:
Salisbury, FB & Ross, CW 1991. Plant Physiology. Wadsworth Publishing Company.
Ross, CW 1974. Plant Physiology Laboratory Manual. Wadsworth Publishing Company, California.

References:

Goodwin, TW & Mercer, EI 1990. Introduction to Plant biochemistry. Pergamon Press, UK.
Hopkins, WG 1999. Introduction to plant Physiology. 2nd Edition. John Wiley & Sons, Inc. 512 pp.(ISBN 0-471-19281-3).
Conn, Stumpf, Bruening & Doi 1987. Outlines of Biochemistry. 5th edition. John Wiley & Sons, New York.

BT 219 PRACTICAL TRAINING 2 UNITS

Objectives:
By the end of the course students should able to:
Translate classroom botanical knowledge into practical working environments.

Content:
This is a field based course where students will be exposed to research, conservation activity and/or management for plant resources or ecosystems. Placement with an institution will allow for guided supervision.

Delivery: 6-8 weeks of institutional or field attachment.
Assessment: The practical training will be assessed basing on presentation on field stuation 10%, experimental approach 30%, comments from institution 10%, final report 50%.

BT 221 MANAGEMENT AND CONSERVATION OF SOILS 3 UNITS*

Objective:
By the end of the course the student should be able to:
Explain and characterize major types of soils in Tanzania
Explain problems of soil degradation and; restoration and conservation measures

Content:
Soil as living body and an important natural resource. Major soil types of Tanzania. Characteristics of degraded soils and causes of degradation (with examples from Tanzania). Practical indices for monitoring and evaluation of soil degradation. Problems of soil erosion, types and agents of soil erosion, nutrient depletion, acidification, toxicity and salinity. Restoration and management of degraded soils. Programmes (local and international) on soil conservation and restoration.

Delivery: 30 lecture hours and 45 hours of practicals
Assessment: Coursework will constitute 40% and the final examination 60%.
Textbooks
1. Donahue Troeh. 2003. Soil and Water Conservation for productivity and Environmental Protection. 4th edition Pearson Higher Education.
2. Gabriel Melchias. 2001. Biodiversity and Conservation. Science Publishers, INC. USA

Reference books
1. Hunter, M.L.2002. Fundamentals of Conservation Biology. Blackwell Science 2 nd edition. Abingdon
2. Donahue Troeh. 2003. Dictionary of Agricultural and Environmental Sciences. Iowa State University Press, AIMES, IOWA.

BT 223 BIOMETRY FOR PLANT SCIENCE 3 UNITS*

Objectives:
By the end of the course the student should be able to:
Explain and apply principles and skills in experimental designs and analyses of plant science related research.
Develop a research problem, objectives/ hypotheses, writing a proposal and designing experiment including data collection, analysis, report writing and presentation.

Content:
Basic descriptive statistics (graphical presentation, measures of location, (mode, mean median), numerical presentation, sampling methods, Chi square and Probability distribution, regressions correlation and setting and laying out simple experimental designs including One-way and two-way analysis of variance (ANOVA). Elements of plant experimentation: designed and non-designed experiments, (estimation of population size and sample size). Single Factor Experiments (Completely randomized design (CRD) and Randomized complete block design (RCBD), Lattice design, Balanced and Group balanced). Two Factor experiments and interactions Split-Plot design, Separation of Means; Comparison between treatment means; Factorial Experiments; Data Interpretation; Multi-factorial Experiments (Latin squares; Principles of Confounding; Regression and Correlation; Soil heterogeneity; Split-plot Designs; Incomplete Block Design (IBD). Multivariate analysis. Time series analysis. Ordination methods. Computer applications in statistical analysis. Field techniques and presentation of results. Compilation, analysis, report writing and presentation of results.

Delivery:30 lecture hours and 45 hours of practicals
Assessment: Coursework will constitute 40% and the final examination 60%.

Textbooks:
Mead, R R.N Curnow and A.M.Hasted.1998. Statistical methods in Agriculture and Experimental Biology. Chapman and Hall, London, NewYork.
Bailey, N.T. 1981 Statistical Methods in Biology (2nd Ed). Edward Arnold.

References
Gomez A and A.Gomez 1984. Statistical Procedures for Agricultural Research.2nd Edition. IRRI Book. John Wiley and Sons. NewYork
Kothari, C.R. 1990 Research Methodology: Methods and Techniques (2nd Edition).
Siegel, S. and N.J. Castellan 1988 Non-parametric Statistics for the Behavioral Sciences (2nd Ed). McGraw-Hill, Tokyo.
Sokal, R.R. and F.J. Rohlf 1995. Biometry (3rd Ed). W.H. Freeman and Co., San Francisco. York.

BT 224 INTRODUCTION TO PLANT MOLECULAR BIOLOGY 3 UNITS*
Objectives:
By the end of the course the students should be able:
Describe different plant cell genomes and their origins.
Independenly develop a cDNA library
Design an experiment to map genomic traits in plants.

Content:
Plant genome constituents and organisation; The nuclear genome; the chloroplast genome; The cytoplasmic genome; The mitochondrial genome; endo-symbiont theory.

Types and use of genomic libraries (cDNA, lambda, BAC and YACs); Heterology/Homology, Differential; Expression and Functional Complementation; Mapping genomic traits in plants (classical mutagenesis, chromosome walking, T-DNA mutagenesis and Transpon mediated mutagenesis), Techniques used in cloning; PCR and cDNA genomic subtraction.

Delivery:30 lecture hours and 45 hours of practicals
Assessment: Coursework will carry 40% and the final examination 60%

Textbooks:
P. Jones, P. G. Jones and J. M. Sutton (eds.) (1997) Plant Molecular Biology: Essential Techniques. John Wiley & Sons; 232 pp (ISBN: 0471972681)

Reference books
Alberts, et al., Molecular Biology of the Cell, 1989 2nd ed., Garland Publishing, Inc. New York, pp. 195-196.
Foster, G.D and Twell, D (eds.) (1996): Plant Gene Isolation: Principles and Practice. John Wiley and Sons. 426pp. (ISBN 0-471-95539-6)

BT 225 TAXONOMY OF HIGHER PLANTS 3 UNITS
Objectives:
By the end of the course the student should be ale to:
Explain Basic concepts of taxonomy
Describe Principles of Taxonomy and source of data for taxonomic classification
Explain Species concept
Describe different classification systems

Content:
Basic definitions and concepts; History of plant classification; taxonomy of angiosperms emphasising on the phylogenetic relationships and evolutionary features in classification; Species and species concepts; Nomenclature: Taxonomic Hierarchies; the botanical code (ICBN); handling of taxonomic data; collection, evaluation, presentation; detail studies of selected families among seed plants; classification systems:Takhtajan, Cronquist, Angiosperm Phylogenetic group (APG); sources of taxonomic information; character and character state.

Delivery: 30 lectures hours and 45 practical hours
Assessment: 40% Coursework; 60% final examination.

Textbooks
Stuessy TF (1990) Plant Taxonomy. The Systematic Evaluation of Comparative Data. Tod F. Stuessy. Columbia University Press, New York.
2. Heywood, V. H. R. K. Brummit, and A. Culham and O. Seberg (2007). Flowering Plant Families of the World. Kew Botanical gardens

References:
1. Douglas E. Soltis , Pamela S. Soltis, Peter K. Endress. Mark W. Chase 2005. Phylogeny and Evolution of Angiosperm. Sinauer Associates Inc. Publishers Sunderland, Massachusetts USA
Walter S. Judd, Christopher S. Campebll, Elizabeth A. Kellong, Peter F. Stewvens, Michael J.
2. Donoughue 2002. Plant Systematics A phylogenetic approach 2nd ed. Sinauer Associates Inc. Publishers Sunderland, Massachusetts USA.

3. Woodland DW 1991. Contemorary Plant systematics. Prentice Hall, Englewood Cliff, New Jessy,
Cronquist A. 1981. An intergrarted system of Classification of Flowering Plants. Columbia University Press, New York.

BT 321 APPLIED PLANT PHYSIOLOGY 2 UNITS

Objectives:
By the end of the course students should be able to:
Explain the applications of plant physiology
Explain how plants function in normal and stressful environment

Content:
Aspects of Plant physiology: light interception, photosynthesis and respiration models, water relations, mineral nutrition and yield prediction; Topics in environmental physiology: principle of plant response to the environment, ecotypes and genetic adaptation; stress physiology; stressful environments, water stress and response, temperature stress, soil stress factors, pollutants.

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%.

Textbooks:
Salisbury, FB & Ross, CW 1991. Plant Physiology. 4th Edition. Wadsworth Publishing Company.
Ross, CW 1974. Plant Physiology Laboratory manual. Wadsworth Publishing Company, California.

References:
Milthorpe, FL & Moorby, J 1979. An Introduction to Crop Physiology. 2nd |Edition. Cambridge University Press, London
Hay, RKM & Walker, AJ 1989. An Introduction to the Physiology of Crop Yield. Longman Scientific and Technical.
Larcher, W. 1995, Physiological Plant ecology. 3rd Edition. Springer-Verlag, Berlin.

BT 323 ALGAL ECOLOGY AND SYSTEMATICS 3 UNITS

Objectives:
By the end of the course students should be able to:
Differentiate algae from other organisms classified under the plant kingdom.
Describe criteria used in algal classification and classify algae according to their respective taxa.
Describe the ecology and distribution of different algal taxa.
Explain the effects of human activities on the growth and distribution of algae.
Explain different techniques used in algal farming.
Explain ecological and economic importance of algae.

Content:
Introduction to the algae; their role in aquatic ecosystem (primary productivity and trophic levels); Survey of classification: characteristics features, vegetative morphology, life histories; ecological and economic importance of major taxa; Phytoplankton; Benthic Marine Algal ecology: ecological factors controlling benthic Algal growth and distribution: Physical, chemical

and biotic factors. Human utilization of algae; effects of pollution and harvesting on Algal populations. Cultivation of algae.

Delivery: 30 lecture hours and 45 hours of practical
Assessment: 40% Coursework; 60% final examination.

Textbooks:
Hoeh, CV; Mann, DG & Jahns, HM 1995. Algae. An Introduction to Phycology. Cambridge University Press (ISBN 0-521-30419-9).
Lobban, CS & Harrison, PJ 1994. Seaweed ecology and Physiology. Cambridge University Press. (ISBN 0-521-40334-0).

References:
1. Graham, L.E & Wilcox, L.W.2000. Algae. Prentice Hall. (ISBN 0-13-660 333-5).
2. Philip, S 1998. Biology of Algae. 3rd Edition. McGraw-Hill (ISBN 0-697-21910-0).

BT 327 ANATOMY OF ANGIOSPERMS 2 UNITS
Objective:
By the end of the course students should be able to:
Described the structures and functions of various plant tissues

Content:
Organization of meristems; development of lateral organs; phyllotaxy. Ecological anatomy; evolution of vascular tissues; secondary thickening in plants; preparation of permanent slide; flower, seed, and root anatomy; cambial activity in monocotyledons; leaf ontogeny.

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%.

Textbook:
Esau, K 1991. Plant Anatomy Wiley Eastern Limited

Reference books
2. Weier T. E; Barbour M.G; Rost T.L and Stocking R 1982, Botany: an introduction to plant Biology. 6th
Edition. University of Califpnia Davis Califonia
3. Dutta A.C 1979, Botany for Degree Students 5th Edition. Calcutta Oxford University Press. Delhi

BT 329 PLANT ECOLOGY AND PHYTOGEOGRAPHY 3 UNITS
Objectives:
By the end of the course students should be able to;
Describe different techniques of vegetation sampling
Explain different systems of plant community classification and ordination
Expain different environmental factors affecting plant growth
Explain the criteria used in vegetation description and analysis.

Content:

Description and classification of vegetation; techniques of vegetation measurement; vegetation gradients, zonation and succession; patterns in vegetation. Classification and ordination of plant communities; environmental factors affecting plant growth. Vegetation of the earth; major vegetation zones of Africa; floras of major tropical and land masses; affinities of the Flora of tropical Africa. Vegetation history in relation to climatic changes

Delivery: 30 lecture hours and 45 hours of practical.
Assessment: Course work will constitute 40% and final examination 60%

Textbooks:
Mueller-Dombois, D & Ellenberg, H. 1974. Aims and Methods of Vegetation Ecology. John Willey & Sons, New York.
Good, RD 1970. The Geography of Flowering Plants. Longmans, London.

BT 333 PLANT PATHOLOGY 2 UNITS
Objectives:
By the end of the course students should be able to:
Explain causal organisms of plant diseases and the methods of prevention

Content:
Concept of plant pathology; History of plant diseases: Plant diseases: their causes, symptoms and development. Fungal, bacterial and viral diseases of economic importance to Tanzania. Principles of plant disease control

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%.

Textbooks:
Agrios, GN 1997. Plant Pathology. 4th Edition. University of Florida, Gainesville
Hiorsefall. J.G and Cowling E.B (Ed). 1979. Plant Diseases ; an Advanced Treatise Vol 4

BT 335 PLANT BREEDING AND GENETIC MANIPULATION 2 UNITS
Objective:
By the end of the course students should be able to:
Describe breeding systems in plants
Differentiate genetic nature of wild and cultivated plant populations
Apply plant breeding techniques for productivity improvement.

Content:
Natural breeding systems in plants. Genetic variability in plants. Genetic nature of wild and cultivated plants populations. Origins of important crop plants. Breeding techniques in cross – pollinated and self – pollinated crops. Breeding for disease resistance and drought tolerance. Plant improvement by genetic manipulation. Traditional and biotechnological means of creating and disseminating recombinant genotypes or cultivars. Plant breeders' rights. Moral, social, ethical, legal and biosafety consideration of genetically modified organisms (GMOs)

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%.

Textbooks:
1. Walter, RF 1997. Principles of cultivar development. Vols. I & II. McGraw Hill Inc.
2. Old, RW & Primrose, SB 1996, Principles of gene manipulation. Blackwell scientific Publishers.

Reference
1. Watson, JD et al. 1983. Recombinant DNA. W.H. Freeman & Company.

BT 337 PLANT TISSUE CULTURE **2 UNITS**

Objectives:
By the end of the course students should be able to:
Explain basic concepts and application of tissue culture
Apply industrial and agricultural techniques of tissue culture in solving specific problems e.g. drugs mass propagation.
Propagate callus from leaf tissue under minimal assistance

Content:
Cultural consideration. Totipotency and the culturing of meristems, somatic cells, embryos, anthers and protoplasts. Shoot culture (Micropropagation). Callus Somaclonal variation and cybrids. Somatic cell selection. Haploid production. Genetic transformation. Application of Tissue culture. Techniques in agriculture. Industrial applications.

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%.

Textbooks
Gamborg, OL & Phillips, GC (eds.) 1995. Plant cell, Tissue and organ Culture. Fundamental Methods. Springer-Verlag, Berlin (ISBN 3-540-58068-9).

References:
Torres, KC 1989. Tissue culture Techniques for Horticultural Crops. Van Nostrand Reinhold, New York (ISBN 0-442-28465-9).
Kyte, L 1987. Plants from Test Tubes. An Introduction to Micropropagation. Timber Press inc.
Pierik, RLM 1998. In Vitro Culture of Higher Plants. Kluwer Academic Publisher, the Netherlands

BT 341 ECONOMIC BOTANY 3 UNITS

Objectives:
By the end of the course students should be able to:
Identify Useful and toxic plants.
Explain Plant products and derivatives used in nutrition, medicine, industry and clothing
Explain roles of plants in historical and modern civilization

Content:
Useful and toxic plants: their origin and history. Plant products and derivatives used in nutrition, medicine, industry and clothing: their chemical and structural nature potential for new crop species. Roles of plant in historical and modern civilization. Importance of conservation of plant species. Utilization of indigenous plants Agroforestry systems.

Delivery: 15 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%.

References:
Watt, JM & Breyer-Brandwijk, MG 1962. The Medicinal and Poisonous Plants of Southern and Eastern Africa. E. & S. Livingstone Ltd., Edinburgh and London.
Evans, Z. 1993. Crop Evolution, adaptations and Yield. Cambridge University Press, Cambridge. 500pp.
Janick, J. (Ed.) Plant science Introduction to world crops. W.H. Freeman and company, San Francisco.
Mshigeni K.E 1982. Mwani: Ukulima wake Baharini na Manufaa yake kwetu. Tanzania Publishing House. Dar es salaam

BT 349 MANAGEMENT AND MONITORING OF FRAGILE ECOSYSTEMS 3 UNITS*
Objectives:
By the end of the course the student should be able to:
Characterize fragile ecosystems namely wetlands and arid and semi arid (ASAL) ecosystems.
Explain the hydrology and dynamics in wetlands
Classify and describe major types of African wetlands
Explain land use, management and utilization of wetland ecosystems including RAMSAR sites

Content:
Characteristics of arid and semi-arid lands, hydrology, agrometeorology and water resource utilization. Water harvesting for agricultural development. Land use practices. Desertification and land degradation in marginal lands. Traditional land use practices and prevention of land degradation. Biodiversity conservation in arid and semi-arid lands, reclamation and sustainable economic exploitation of arid and semi-arid lands.
Introduction to wetlands and water-plant biology; wetland classification and description of major types of African wetlands; wetland biodiversity, hydrology and dynamics; natural functions and values of wetlands and benefits and uses for people; constructed wetlands for pollution control and waste-water treatment; threats and degradation of wetlands; frameworks for wetland conservation and management (including RAMSAR) and the wise use principle; public awareness and participation; wetland restoration.

Delivery: 30 lecture hours and 45 hours of practicals
Assessment: Course work 40%, and final examination 60%

Textbook:
Hunter,M.L.Jr. (2002). Fundamentals of Conservation Biology. Blackwell Science,

References:
Enger, EM (2000). Environmental science. McGraw Hill Publishers. Boston.
Donahue Troeh (2003). Soil and Water Conservation for Productivity and Environmental Protection, 4th edition. Pearson Higher Education

BT 350 PLANT SYSTEMATICS 3 UNITS*
Prerequisite: BT 225

* New course

Objective:
By the end of the course the student should be able to:
Explain the application of Phylogenetic and phenetic approaches in Plant Systematics
Explain the use of macro-molecules (especially DNA markers) in the study of plant Systematics.
Construct phylogenetic trees and describe evolution
Explain Diversity and endemism of plant species

Content:
The practice of Plant Systematics**,** comparison between Phylogenetic and phenetic approaches, Methods of determining evolutionary history; character coding, constructing evolutionary trees and rooting, choosing trees, summarizing trees, the probability of evolutionary changes in character. Measuring support for trees. Describing evolution; mapping of characters. Constructing a classification. Molecular taxonomy and molecular markers, Phylogenetic relationships between angiosperms and other seed plants, origin of angiosperms, an overview of phylogeny of extant plants. Treatment of selected families in different clades of flowering plants; Floral diversification Floristic regions of TEA. Diversity and endemism of plant species. Phylogeography

Delivery: 30 lecture hours and 45 hours of practical
Assessment: Course work will constitute 40% and final examination 60%

Textbooks:
Walter S. Judd, Christopher S. Campebll, Elizabeth A. Kellong, Peter F. Stewvens, Michael J. Donoughue 2002. Plant Systematics A phylogenetic approach 2nd ed. Sinauer Associates Inc. Publishers Sunderland, Massachusetts USA.
Heywood, V. H. Brummit, R. K., Culham A.and O. Seberg (2007). Flowering Plant Families of the World. Kew Botanical gardens.

References:
Douglas E. Soltis , Pamela S. Soltis, Peter K. Endress. Mark W. Chase 2005. Phylogeny and Evolution of Angiosperm. Sinauer Associates Inc. Publishers Sunderland, Massachusetts USA.

BT 351 WATERSHED MANAGEMENT 3 UNITS*
Objective:
By the end of the course the student should be able to:
Describe watershed.
Explain Principles and objectives of watershed management.
Relate water resource and environmental management and conservation
Explain Underground water sources and their management in Tanzania.

Content:
The watershed as a unit of resource-oriented planning and development. Principles and objectives of watershed management. Physical description of watersheds. Relationships between land use conditions and water delivery characteristics of watersheds Perennial rivers. Watershed analysis including techniques, collection of field data and sources of information. Underground water sources and their management in Tanzania.
Delivery: 30 lecture hours and 45 hours of practical)

* New course

Assessment: Course work will constitute 40% and final examination 60%

Textbook:
David Stephenson (1996). Water resources management. A.A. Balkema

References:
Donald J. Baird, Malkom Beveridge, Liam Kelly, James Muir (eds.) (?). Aquaculture and Water Resources Management. Blackwell Science (UK).
James R. Kahn (1997). The Economic Approach to Environmental and Natural Resources. South-Western College Pub.

BT 352 HORTICULTURE 2 UNITS*

Objective:
By the end of the course students should be able to:
Explain the principles of horticulture
Consolidate theoretical and practical skills acquired during the course, thus, be abel to grow short term intensive horticultural crops.

Content:
Principles of horticulture (olericulture, floriculture, pomology, Urban horticulture, landscaping, Organic farming). Agronomy of specific horticultural crops. Commercialization of horticultural crops.

Delivery: 15 lecture hours and 45 hours of practical)
Assessment: Course work will constitute 40% and final examination 60%.

Textbooks:
Nakasone,H.Y. and R.E.Paul (1998). Tropical Fruits. Crop Production Science in Horticulture. CAB INTERNATIONAL
Reader's Digest Association (1995). Practical guide to Home Landscaping. Pleasantville, NewYork, USA. ISBN 0-89577-005-9

BT 356 PLANT DIVERSITY AND CONSERVATION 3 UNITS*

Objective:
By the end of this course the student should be able to:
Define biological diversity including agro-biodiversity
Explain cause and consequences of biodiversity loss (global, regional and local examples)
Explain the rationale for sustainable utilization and conservation of biological diversity
Explain conservation activities undertaken by different Institutions in the Country.
Apply theoretical knowledge to practice in applied botany and conservation issues.

Content:
Definition of biological diversity including agro-biodiversity. Global biodiversity distribution pattern, Genetic resources. Threat to biological diversity and the concept of extinction. Cause and consequences of biodiversity loss both (global, regional and local examples). Diversity and conservation of wild plants; major determinant of variation, level and pattern of variation, use of wild genetic resources. Diversity and conservation of cultivated plants; conservation in

* New course

perspective, *in situ* and *ex situ* conservation strategies, germplasm collection. Conservation of plant species; plant species and population biology, *in situ* and *ex situ* conservation of useful or endangered species, Conservation of plant communities; community structure and species interaction, choosing plant community reserves and managing plant community reserves. Biodiversity and biotechnology. Economics of biodiversity conservation. Global initiatives on conservation of biodiversity; the convention on biological diversity, IUCN and Red list of threatened species etc.

Delivery: 30 hours of lectures and 45 hours of practicals
Assessment: Course work will constitute 40% and final examination 60%.

Textbooks

Frankel O.H., Brown A.H.D and Burdon J.J (1998) The Conservation of Plant biodiversity. Cambridge University Press.
Lindenmayer D., Franklin J.F. (2002) Conserving Forest Biodiversity. A comprehensive multiscaled approach.

References:

K.V. Krishnamurthy: (2003). Text Book on Biodiversity. Science Publishers, USA.
Markussen M., Buse R., Garrelts H. and M.A.M, Menzel S. and Marggraf R. (Eds.) 2005. Valuation And Conservation of Biodiversity: Interdisciplinary Perspectives on the Convention on Biological diversity.