DEPARTMENT OF BOTANY
JAHANGIRNAGAR UNIVERSITY
SAVAR, DHAKA

Syllabus for M. Phil. & Ph. D. in Botany for the sessions: 2013-2014, 2014-2015, 2015-2016 and 2016-2017

A student admitted into M. Phil. or Ph. D. program shall have to complete respectively two or three years' full time study in the Department of Botany under the guidance of supervisor/supervisors. The Department will offer the degree of M. Phil. or Ph. D. in selected branches of Botany after the successful completion of (a) written examination on approved courses, (b) two seminars on the research work under approved research title, (c) submission of a thesis on the approved topic, and (d) an oral examination. The Department will offer a number of courses in the first year from which a student shall have to take two courses covering 200 marks which shall be determined by the respective supervisor/supervisors. Theoretical examinations on the approved courses shall be held at the end of the first year. The pass marks for the courses shall be 50%. The students shall have to carry out their research on the approved topic right from the first year and onward through the course of study and present two seminars according to Jahangirnagar University Ordinance on the findings of his/her research under the specific title approved by the supervisor/s. The student shall have to submit a thesis on the approved topic with written permission of his/her supervisor/supervisors and appear for an oral examination on his/her thesis that shall have to be accepted by the majority of examiners.

The following courses will be offered for the degree of Master of Philosophy (M. Phil.) and Doctor of Philosophy (Ph. D.) in Botany that will be effective from the session 2013-2014.

Course No.	**Course Title**	**Marks**
Bot. 601	Microbiology-I	100
Bot. 602	Microbiology-II	100
Bot. 603	Plant Pathology and Plant Protection-I	100
Bot. 604	Plant Pathology and Plant Protection-II	100
Bot. 605	Plant Systematics-I	100
Bot. 606	Plant Systematics-II	100
Bot. 607	Plant Physiology-I	100
Bot. 608	Plant Physiology-II	100
Bot. 609	Plant Tissue Culture-I	100
Bot. 610	Plant Tissue Culture-II	100
Bot. 611	Plant Ecology and Environment-I	100
Bot. 612	Plant Ecology and Environment-II	100
Bot. 613	Plant Breeding-I	100
Bot. 614	Plant Breeding-II	100

Detailed contents of the courses offered for M. Phil. & Ph. D in Botany are given below:

Bot. 601 Microbiology-I **100 Marks**

1. Bacterial Taxonomy: Modern approaches to bacterial taxonomy, numerical taxonomy, molecular and genetic taxonomy.
2. Microorganism and environment: Entry of nutrients into the bacterial cell; Utilization of substrates that cannot pass the cell membrane of bacteria. Effect of temperature, pH, oxygen and radiation.
3. Microbial metabolism: ATP generation in chemoautotrophs and anoxygenic photoautotrophs; anaerobic respiration and fermentation in microorganisms. Oxidation of methane and aliphatic hydrocarbons.
4. Bacterial genetics: Bacterial genome; Plasmids and their biological significance; Bacterial mutants and their isolation; Conjugation-properties of F-plasmid, formation and behaviour of Hfr strains, insertion elements, transposons.
5. Virus: Nucleic acids in viruses; Isolation and purification of plant viruses.
6. Water pollution and waste water treatment.
7. Brief description of selected representative groups: *Beggiatoa, Pseudomonas,* Nitrifying bacteria, *Thiobacillus* and *Bacillus.*

References
1. Flint S.J., Enquist L.W., Racaniello R.V.S. 2008. Principles of Virology (3rd edn.). ASM Press, Washington D.C.
2. Horikoshi K. and Grant W.D. 1998. Extremophiles. Wiley-Liss. New York, USA.
3. Larry S. and Wendy C. 1996. Molecular Genetics of Bacteria (2nd edn.) ASM press, Washington D.C.
4. Madigan M.T., Martinko J.M., Dunlap P.V. and Clark D.P. 2009. Brook Biology of Microorganisms. (12th edn.). Pearson Benjamin Cummings. San Francisco, USA.
5. Nelson D.L. and Cox M.M. 2008. Principles of Biochemistry (5th edn.). W. H. Freeman and Company, New York, USA.
6. Salyers A.A. and Whitt D.D. 2002. Bacterial Pathogenesis: A Molecular Approach (2^{nd} edn.) ASM Press, Washington DC, USA.
7. Tortora G.J., Funke B.R. and Case C.L. 2007. Microbiology: an Introduction. Pearson Education. Inc. USA.
8. Kathleen Park Talaro and Arthur Talaro, 1999. Foundations in Microbiology (3^{rd} edn.). McGraw Hill Company.

Bot. 602 Microbiology-II **100 Marks**

1. Useful methods of isolation and study of soil microorganisms.
2. Rhizosphere: Root exudate and microorganisms; Rhizosphere effect; Alteration of rhizosphere microflora; Microbial activities in rhizosphere.
3. Practical aspects of the microbial degradation of cellulose: Microorganisms and enzymes, Nature of cellulase complex and mechanism of lignocellulose breakdown, Production of cellulase.
4. Recent advances in mechanism and control of biological nitrogen fixation.
5. Ecological facts influencing the efficiency of biological nitrogen fixation in important microorganisms.
6. *Rhizobium* and its use in agriculture.
7. *Azospirillum* and its potential as biofertilizer.
8. Use of nitrogen fixing cyanobacteria in rice cultivation.
9. Microbial solubilization of phosphate.

References
1. Alexander M. 1977. Introduction to Soil Microbiology. John Wiley & Sons, New York.
2. Kannaiyan S. 2002. Biotechnology of Biofertilizers. Springer Publishing Co. New York.
3. Nelson D.L. and Cox M.M. 2008. Lehninger Principles of Biochemistry. W.H. Freeman and Company, New York, USA.
4. Rahman M., Podder A.K., Hove C.V., Begum Z.N.T., Heulin T. and Hartmann A. 1996. Biological Nitrogen Fixation Associated with Rice Producion. Kluwer Academic Publishers, London, U.K.
5. Somani L.L., Bhandari S.C., Vyas K.K. and Saxena S.N. 1990. Biofertilizers. Scientific Publishers, Jodhpur, India.
6. Subba Rao N.S. 1995. Soil Microorganisms and Plant Growth. Science Pub. Inc. New York.
7. Subba Rao N.S. 2009. Current Developments in Biological Nitrogen Fixation. Cambridge University Press, U.K.
8. Wang Y.P. 2006. Biological Nitrogen Fixation, Substantial agriculture and the environment. Springer, Netherlands.

Bot. 603 Plant Pathology and Plant Protection-I **100 marks**

1. Plant Pathogens: Origin, evolution, growth, physiology of plant pathogenic fungi, bacteria and viruses.
2. Alteration in plant physiological function due to plant-pathogen interaction: Permeability changes in diseased plants, Effect of plant pathogens on translocation of water, host plant respiration, photosynthesis and nutrients.
3. Root Pathology: General characteristics of pathogenic root-infecting fungi; Ecology of pathogenic root-infecting fungi; Benefits of mycorrhiza; Factor influencing mycorrhizal development.
4. Crop Pathology: Details studies on the diseases of cereals crops, vegetables, fruits, fiber and oil yielding crops with special reference to Bangladesh.

5. Forest pathology: Diseases of sal forest, mangrove forest and semi evergreen forest tree species with special reference to Bangladesh.
6. Timber decay: Types; fungi and bacteria involved; mechanism of timber decay; prevention and control measures.
7. Post-harvest Pathology: Loss estimates; Post-harvest diseases of durables-role of fungi, microecological factors affecting spoilage, control of storage fungi; Post-harvest diseases of perishables-factors affecting post-harvest diseases of perishables; Physiological changes brought about by post-harvest fungi in perishables; Prevention of post-harvest losses of perishables; Specific post-harvest fungicides and bactericides.
8. Seed Pathology: Seed transmission of plant pathogen; Process of seed transmission; Seed health testing methods; Proof of seed transmission; Role of seed pathology in quarantine; Role of seed pathology in seed certification; Factors affecting seed transmission; Significance of seed transmission in seed and crop production in the field- an approach of control seed borne pathogens.

References

1. Agrios G.N. 2000. Plant Pathology (4th edn.). Academic Press Inc. New York, U.S.A.
2. Bakshi B.K. 2000. Forest Pathology-principle and practice in forestry. Published by the controller of publication, New Delhi, India.
3. Bos L. 1983. Introduction to plant virology. Centre for Agricultural Publishing and Documentation. Netherlands.
4. Chakraverty A. 1988. Post Harvest Technology of Cereals, Pulses and Oilseeds. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi, India.
5. Dasgupta M.K. 1994. Principle of Plant Pathology. Allied Publishers Limited, New Delhi, India.
6. Fahy P.C. and Persley G.J. Plant Bacterial Disease- a diagnostic guide. Academic Press, London, U.K.
7. Mehrotra R.S. and Aggarwal A. 2003. Plant Pathology (2nd edn.). Tata McGraw-Hill Company, New Delhi, India.
8. Neergaard P. 1977. Seed Pathology. The MacMillan Press Ltd., London, U.K.

Bot. 604 Plant Pathology and Plant Protection-II **100 marks**

1. Genetics of plant disease: Genes and diseases; Mechanisms of variability; stages of variation pathogens; Genetics of virulence in pathogens and of resistance in host plants-the gene for gene concept and nature of resistant to disease.
2. Plants defend against infection: Morphological or structural defense mechanisms; biochemical defense; through induced synthesis of protein and enzymes.
3. Chemical fungicides: Inorganic and organic sulphur, copper and mercurial fungicides; Heterocyclic N-compounds; Quinones; Therapeutic control measures.
4. Botanical antifungal compounds: Extraction procedure, industrial production, evaluation, application, physical and chemical properties of phytoalexins and terpenoids.
5. Recent approaches to plant disease control: Soil solarization for the control of soil-borne pathogen; *Trichoderma*- application, mode of action and potential as a biological control agent of soil-borne pathogenic fungi; Plant immunization and its application for disease control-an improved system for biological control; Review on the recent development of biological control of plant pathogens.
6. Integrated Disease Management: The concept of IPM; The philosophy of IPM- ecological basis of the approach; Methods; Phases; Appropriate IPM; Achievements.
7. Application of biotechnology in plant pathology: Tissue culture techniques of importance to plant pathology; Genetic engineering techniques of importance to plant pathology; Biotechnology and plant pathology.
8. Phytopathological techniques in plant pathology: Plant disease assessment methods; Requirement for isolation techniques of plant pathogenic fungi, bacteria, viruses, phytoplasma and nematodes; Application of PCR, RAPD, RFLP, RNAi technology in plant pathology.

References

1. Agrios G.N. 2000. Plant Pathology (4th edn.). Academic Press Inc. New York, U.S.A.
2. Chakraverty A. 1988. Post Harvest Technology of Cereals, Pulses and Oilseeds. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi, India.

3. Dasgupta M.K. 1994. Principle of Plant Pathology. Allied Publishers Limited, New Delhi, India.
4. Mehrotra R.S. and Aggarwal A. 2003. Plant Pathology (2nd edn.). Tata McGraw-Hill Company, New Delhi, India.
5. Nene Y.L. and Thaphlyal P.N. 1979. Fungicides in Plant Disease Control (2nd edn.) Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi, India.
6. Rangaswami G. 1988. Diseases of Crop Plants in India. Prentice-Hall of India, New Delhi, India.
7. Singh R.P. 2005. Plant Pathology. Kalyani Publishers, Kolkata, India.
8. Walker J.C. 1969. Plant Pathology (3rd edn.) Tata McGraw-Hill Company, New Delhi, India.

Bot. 605 Plant Systematics-I **100 Marks**

1. Taxonomic characters: Concept, types, selection, correlation and weighting of characters; character variations.
2. Concept of taxonomic categories: Family, genus and species concepts; concepts of infraspecific categories.
3. Taxonomic problems: Natural hybridization; polyploidy; phenotypic plasticity; parallelism and convergence.
4. Specimen preparation and taxonomic identification: Collecting and preparing plant specimens; pressing, drying and mounting herbarium specimens.
5. Process of taxonomic identification: Herbarium methods; experts; taxonomic keys.
6. Systems and methods of classification: Natural, phenetic and phylogenetic systems; phenetics and cladistics; molecular systematics.
7. Plant nomenclature: Major provisions; Sources of nomenclatural information; Process of naming of plant species and genus; concept on nomenclatural types; homonyms, basionyms, synonyms.
8. Taxonomic keys: Types, construction and application of keys;
9. Flora of Bangladesh: Floristic exploration; nature of Bangladesh flora; floristic analysis of Bangladesh; indigenous, exotic and threatened species; IUCN Threatened species categories.
10. Endemism and island biogeography: Definition and reasons of endemism; endemic flora; impacts on plant systematics.
11. Phylogeography: Definition, concepts and impacts on plant systematics.

References

1. Cox B.C. and Moore P.D. 2005. Biogeography-An Ecological and Evolutionary Approach (7th edn.). Blackwell Publishing, Malden, USA and Oxford, UK.
2. Graur D. and Li W.H. 2000. Fundamentals of Molecular Evolution.
3. Judd W.S., Campbell C.S., Kellogg E.A., Stevens P.F., Michael J. and Donoghue M.J. 2002. Plant Systematics: A Phylogenetic Approach, Second Edition.
4. Nei M. and Kumar S. 2000. Molecular Evolution and Phylogenetics. Oxford University Press, Oxford, UK.
5. Takhtajan A. 1997. Diversity and Classification of Flowering Plants. Columbia University Press, New York, USA.
6. Taylor D.W. 1996. Flowering Plant Origin, Evolution and Phylogeny. Chapman & Hall, New York,USA.
7. Walters D.R. and Keil D.J. 1996. Vascular Plant Taxonomy. Kendall Hunt Publication Co., Dubugue.
8. Whittaker R.J. 2007. Island Biogeography-Ecology, evolution and conservation (2nd edn.). Oxford University Press, U.K.

Bot. 606 Plant Systematics-II **100 Marks**

1. Relationship of Angiosperms: Relationships of Angiosperms to other groups; relationships within Angiosperms; pollination and dispersal of Angiosperms.
2. The evolution of plant diversity: Sources and patterns of variations; speciation; origins of reproductive isolating barriers.
3. Introduction and valuation of Biodiversity: Introduction; genetic-, species-, and ecosystem diversity; diversity indices: centres of diversity: valuation of biodiversity. Centres of diversity and distribution of plant family, genera and species. Valuation of biodiversity.

4. Conservation of biodiversity: *Ex situ* and *in situ* conservation; National Conservation Strategies and action plans. World Conservation strategies.
5. Plant genetic resources: Plant genetic resources of Bangladesh; resources for the future.
6. Population biology: regulation of plant population density, competition among plants; genetic control; inbreeding, outbreeding and apomictic populations and their diversity.
7. Concept on candidates taxon or Flora: Concepts on the taxon or Flora (on which the candidate works for thesis) from taxonomical reproductive biological, pollination and pollen morphological point of views; economic value and conservation practices.

References

1. Frankel O.H. 1995. The Conservation of plant Biodiversity. Cambridge University Press, U.K.
2. Heywood V.H. 2005. Global Biodiversity Assessment. IUCN.
3. Ingrouille M.1992. Diversity and Evolution of Land Plants. Chapman and Hall, London
4. Kapoor-Vijay P. and White J. 1992. Conservation Biology: A Training Manual for Biological Diversity and Genetic Resources. The Commonwealth Science Council, London, UK.
5. Raven P.H., Lvert R.F. and Eichhorn E.L. 1986. Biology of Plants (4th edn.). Worth, New York, USA.
6. Real L. 1983. Pollination Biology. Academic Press. New York, USA.
7. Richards A.J. 1977. The Pollination of Flowers by Insects. Academic Press. New York, USA.
8. Willemstein S.L. 1987. An Evolutionary Basis for Pollination Ecology. vol. 10, Reiden Botanical Series. Leiden University Press. Leiden.

Bot. 607 Plant Physiology-I **100 Marks**

1. Formation of primary and secondary cell wall, chemical composition, structure and physiological function of cell wall, extracellular excretion; cutin, waxes and suberin and their function, structure and physiological function of membrane.
2. Biosynthesis of growth regulators, analysis of plant growth substances, extraction procedures, quantification techniques, bioassay procedures, transport of growth substances.
3. Mechanism of action of plant growth substances, the role of plant growth substances in regulatory processes and protein synthesis.
4. Uses of plant growth substances in agriculture and horticulture.
5. Source and importance of minerals for plants, mineral uptake, circulation and loss, deficiency, sufficiency and excess of minerals.
6. Hydroponics and nutrient solutions in plant growth.
7. Stress and plant growth: Biotic and abiotic stress, types of damage caused by stress factors, interaction with stress, water, drought and saline stress; physiological and biochemical mechanism to overcome the stress on plants.
8. Detrimental effects of flooding on metabolic changes in plants.
9. Metal toxicity in plants; tolerance of metal phytotoxicity

References

1. Devlin M.R. and Witham H.F. 2001. Plant Physiology. CBS Publishers & Distributors.
2. Epstein E. 1972. Mineral Nutrition of Plants. John Wiley and Sons, Inc., New York.
3. Gupta U.S**.** 1997. Crop Improvement, Vol. 2, Stress Tolerance. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
4. Hopkins W.G. 1999. Introduction to Plant Physiology. John Wiley and Sons. Inc. New York.
5. Horst M. 1998. Mineral solution of higher plants. Academic Press. New York.
6. Kumar A. and Purohit S.S. 1998. Plant Physiology: Fundamentals and Applications. Agro Botanica, India.
7. Taiz L. and Zeiger E. 1991. Plant Physiology, The Benjamin publishing company. California. USA.
8. Weaver R.Y. 1972. Plant Growth Substances in Agricultures. S. Chand & Comp. Private Ltd.

Bot. 608 Plant Physiology- II **100 marks**

1. Harnessing of energy by plants; Capture and fixation of light energy, assimilation of carbon dioxide, pathways of carbon dioxide assimilation, storage of energy by plants.
2. Extraction of energy from carbohydrate; energy production through oxidation of carbohydrates in aerobic and anaerobic respiration and fermentation.
3. Energy production through oxidation of lipid.
4. Coupling of respiration with other metabolic pathways in the cell.
5. Enzymes: The agents of life; Nature and mechanism of action, catalysis at active site, inhibitors of enzymes, isozymes; causes of enzyme multiplicity, enzyme localization, enzymatic analysis of plant tissue metabolites.
6. The extraction, purification and assay methods of enzyme, characters and mechanism of cellulase, xylanase, pectinase, lactase and amylase.
7. Involvement of enzymes in biodegradation of toxic pollutants and lignin, cellulose and pectin.
8. Germination; Inception of germination, enzymatic degradation of storage materials of
9. seeds, metabolism in germinating fat-rich seeds, germination and growth regulator, membrane and germination.
10. Crop production and yield; Physiological basis of yield, determination of yield, plant population and yield, effect of weed on crop yield, yield of mixed crops, efficiency of crop production.

References

1. Devlin M.R. and Witham H.F. 2001. Plant Physiology. CBS Publishers & Distributors. New Delhi.
2. Forbes J. C. and Watson R.D. 1992. Plants in Agriculture. Cambridge University Press.
3. Hillman J.H. 1978. Isolation of Plant growth substances. Cambridge University Press. UK.
4. Kumar H.D. and Singh H.N. 1976. Plant Metabolism. West Press Private Ltd., New Delhi.
5. Malick C.P. and Singh M.B. 2000. Plant Enzymology and Histo-enzymology. Kalyani Publishers. India.
6. Mukherji S and Ghosh A.K. 1996. Plant Physiology. New Central Book Agency Pvt. Ltd.
7. Ridge I. 1996. Plant Physiology. CBS Publishers & Distributors.
8. Wilkins M.B. 1989. Advanced plant Physiology. Longman scientific and technical. New York.

Bot. 609 Plant Tissue Culture-I **100 Marks**

1. Potential application of Plant Tissue Culture in agriculture and botanical research.
2. Plant regeneration through *in vitro* culture, environmental control in micropropagation, *in vitro* photo autotrophic micropropagation, its application in horticulture and forestry.
3. Production of dihaploid plants, its application in crop breeding. Advantage of monoploid production through interspecies hybridization by chromosome elimination with special reference to barley.
4. Somaclonal variation, causes, application and exploitation in agriculture and floriculture.
5. Biosynthesis of economically important secondary products through cell and tissue culture. Factors limiting the biosynthesis of secondary products in cultured cells in suspension culture.
6. Somatic hybridization through fusion of protoplast and its importance in plant breeding. Induction of cybrid, its application in developing male sterile line.
7. Application of meristem culture and heat therapy in production of virus free planting stocks.
8. *In vitro* pollination and fertilization in different hybrid combination.

References

1. Ammirato P.V., Evans D.A., Sharp W.R. and Bajaj Y.P.S. 1990. Hand Book of Plant Cell Culture V.5. Ornamental Species. McGraw-Hill Publishing Co. New York, Tokyo, Toronto, Singapore.
2. Bhadra S.K. 2002. Udvid Tissue Abad: Projukti O Proyog. Bangla Academy, Dhaka.
3. Bhojwani S.S. and Razdan M.K. 1983. Plant Tissue Culture: Theory and Practice. Elsevier Science Publishers, Amsterdam, Oxford, New York, Tokyo.

4. Chawla H.S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publsihing Co. Pvt. Ltd., New Delhi, India.
5. Gamborg O.L. and Phillips G.C. 1995. Plant Cell Tissue and Organ Culture - Fundamental Methods. Springer-Verlag, Berlin, Heidelberg. Indian Edition, 1996, Narosa Publishing House, New Delhi, Madras, Bombay.
6. Geneve R.L. and Merkle S.A. 1997. Biotechnology of Ornamental Plants. CAB International, London, New York, USA.
7. Pierik R.L.M. 1987. *In Vitro* Culture of Higher Plants. Martinus Nijhoff Publishers, Dordrecht, Boston, Lancaster.
8. Reinert J. and Bajaj Y.P.S. 1977. Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture. Springer Verlag, Berlin, Heidelberg. Indian Edition, 1988, Narosa Publishing House, New Delhi, Madras, Bombay.

Bot. 610 Plant Tissue Culture-II 100 Marks

1. Application of micropropagation in development of agribusiness with special reference to potato, turmeric, strawberry, orchids and other ornamental plants.
2. Premature embryo culture for development of distant hybrid. Endosperm culture for development of triploid plants.
3. Cryopreservation and its success and role in exchange of disease-free stocks and propagules.
4. Mechanisms of somatic embryogenesis in cell culture- Physiology, biochemistry and molecular biology.
5. Application of anther culture and pollen culture in the production of homozygous line for superior crop varieties
6. Cellular differentiation and morpho-differentiation in cell and tissue culture.
7. Application of plant tissue culture in genetic transformation of crop plants.

References

1. Ammirato P.V., Evans D.A., Sharp W.R. and Bajaj Y.P.S. 1990. Hand Book of Plant Cell Culture V.5. Ornamental Species. McGraw-Hill Publishing Co. New York, Tokyo, Toronto, Singapore.
2. Bhadra S.K. 2002. Udvid Tissue Abad: Projukti O Proyog. Bangla Academy, Dhaka.
3. Bhojwani S.S. and Razdan M.K. 1983. Plant Tissue Culture: Theory and Practice. Elsevier Science Publishers, Amsterdam, Oxford, New York, Tokyo.
4. Chawla H.S. 2002. Intrdocution to Plant Biotechnology. Oxford & IBH Publsihing Co. Pvt. Ltd., New Delhi.
5. Gamborg O.L. and Phillips G.C. 1995. Plant Cell Tissue and Organ Culture - Fundamental Methods. Springer-Verlag, Berlin, Heidelberg. Indian Edition, 1996, Narosa Publishing House, New Delhi, Madras, Bombay.
6. Geneve R.L., J.E. and Merkle S.A. 1997. Biotechnology of Ornamental Plants. CAB International, London, New York.
7. Pierik R.L.M. 1987. In Vitro Culture of Higher Plants. Martinus Nijhoff Publishers, Dordrecht, Boston, Lancaster.
8. Reinert J. and Bajaj Y.P.S. 1977. Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture. Springer-Verlag, Berlin, Heidelberg. Indian Edition, 1988, Narosa Publishing House, New Delhi, Madras, Bombay.

Bot. 611 Plant Ecology and Environment-I 100 Marks

1. Basic concepts on Plant Ecology and Environment: Introduction, Definition, History, Functional concept, Divisions and branches, Scopes and application; Description of Biosphere.
2. Environmental factors and their ecological impacts: Introduction, Classification of environmental factors; Climatic, Edaphic, Topographic and Biotic factors and their effects; Combination of environmental factors; Interactions and significances.
3. Ecosystem dynamics and energy exchange: Introduction; Dynamic process of ecosystem and energy flow; Concept of energy; Laws of Thermodynamics; Energy transformation in nature; Model of energy flow in ecosystem; Ecological efficiencies.
4. Ecosystem productivity and its measurement: Introduction, Definition; Types of productivity; Primary and Secondary Production; Factors effecting primary production;

Methods of measuring primary production; Ecosystem types based on levels of productivity.

5. Soil environment, soil factors and soil-plant-water relationship: Introduction; Soil physical and chemical properties; Soil micro-organism; Soil factors effecting vegetation; Types of soil water; Soil-plant relationship.
6. Forest ecology and Management-Bangladesh Perspective: Introduction; Ecological significance of forest and forest resources; Forest types, habitat distribution and floristic composition of forests of Bangladesh; Causes and consequences of forest and forest resources degradation in Bangladesh and their management.
7. Environmental toxicity: Introduction; Concept, Toxic chemicals, Factors affecting toxicity, Environmental factors, Effects and response, Mechanism of toxic action, Antidote and Toxicity test.

References

1. Bannister P. 1980. Introduction to Physiological Ecology. Blackwell Scientific publication.
2. Chapman J.L and Reiss M.J. 1995. Ecology-Principles and Application Cambridge University Press.
3. Dash, M.C. 2002. Fundamentals of Ecology. Tata McGraw Hill Pub. Com. Ltd.
4. Kormondy E. J. 1999. Concept of Ecology. Prentice- Hall of India Pvt. Ltd.
5. Moore P.D and Chapman S.B. 1986. Methods in Plant Ecology. Blackwell Scientific publications.
6. Odum E.P and Barrett G.W. 2007. Fundamentals of Ecology. Thomson Books/Cole.
7. Rana S.V.S. 2005. Essentials of Ecology and Environmental Science. Prentice- Hall of India Pvt. Ltd.
8. Shukla R.S and Chandel P.S. 2000. Plant Ecology and Soil Science. S. Chands and Company Ltd. New Delhi, India.

Bot. 612 Plant Ecology and Environment-II **100 Marks**

1. Sampling, Vegetation description and analysis: Introduction, Sampling methods, Description of Quadrat and Transect methods, Quantitative analysis of vegetation, Phytograph, Vegetation description based on physiognomy and floristics, Statistical analysis of ecological and environmental data.
2. Phytogeography and world major Biomes: Introduction, Principles of phytogeography, Factors affecting distribution of species, Ecological distribution and floristic composition of major biomes of the world.
3. Vegetational zones of Bangladesh and Endemism: Introduction, Classification, habitat distribution and floristic composition of major vegetational zones of Bangladesh. Endemism, Types of endemics, Endemic plants of Bangladesh.
4. Soil types of Bangladesh; soil erosion and conservation: Introduction, soil types and classification of soils of Bangladesh and their ecological distribution; Types, causes and effects of soil erosion; Importance and methods of soil conservation.
5. Global environmental problems and their ecological consequences: Introduction; Causes of major environmental problems; Types of environmental problems; Causes and consequences of Green house effects, Global warming, Sea level rise, Ozone layer depletion, Acid rain and Global Climate change.
6. Environmental problems of Bangladesh and their ecological consequences: Introduction, Causes of environmental problems in Bangladesh; Symptoms and causes of Climate change in Bangladesh and their effects, Shifting and Jhum cultivation; Use of insecticides, pesticides and chemical fertilizers; Arsenic problem in drinking water and its pollution in agro-ecosystem.
7. Application of ecology and human welfare: Introduction; Role of ecology in Agriculture, Biological control; Land management; Natural resources conservation and restoration, Wild-life management; Protected area management; Need of ecological knowledge for public awareness.

References

1. Arora M.P. 2004. Ecology, Himalaya Publishing House, India.
2. Kent M. and Coker P. 2000. Vegetation description and analysis - A practical approach. Belhaven press, London.
3. Kershow K.A. 1979. Quantitative and Dynamics Plant Ecology. The English language Book Society and Edward Arnold (Publication) Ltd.

4. Moore P.D. and Chapman B.S. 1980. Methods in Plant Ecology, Blackwell Scientific Publication.
5. Mukherjee B. 1996. Environmental Biology. Tata McGraw-Hill Publication Company Ltd.
6. Shukla R.S. and Chandel P.S. 2000. Plant Ecology and Soil Science. S. Chands and Company Ltd. New Delhi, India.
7. Singh S. 2004. Environmental Geography, Prayag Pustak Bhuban.
8. Weaver J.E. and Clement F.E. 1966. Plant Ecology, McGraw Hill Book Company.

Bot. 613 Plant Breeding-I **100 marks**

1. Plant breeding: introduction, objectives, activities, important achievements, plant breeding in 21st century.
2. Plant breeding methods: introduction, necessity, procedure, merits and demerits.
3. Distant hybridization: introduction, interspecific and intergenic hybridization, barriers of distant hybridization.
4. Heterosis breeding and inbreeding depressions: heterosis, hybrid vigors and luxuriance manifestations, heterosis in cross and self pollinated species, different basis, effects of inbreeding.
5. Hybrid breeding: introduction, development of inbreeds, evaluation of inbreeds, production of hybrid seed, limitations.
6. Polyploidy in plant breeding: introduction, natural allopolyploids, artificial allopolyploids, induction of polyploidy, limitations.
7. Mutation breeding: introduction, molecular basis of gene mutation, procedure of mutation breeding for oligogenic and polygenic traits, limitations, application of site directed mutation.
8. Breeding of field crops: Rice, Wheat, Tomato and Brinjal.
9. Seed production techniques: introduction of quality seeds, classes, production and maintenance.
10. Intellectual property rights: introduction, types, patent, plant breeder's right.

References

1. Chopra V.L. 2000. Breeding Field Crops. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, India.
2. Gupta S.K. 2010. Plant Breeding: Theory and Techniques. Agrobios, India.
3. Kenneth J.F. 1988. Plant Breeding-II, Kalyani Publishers, New Delhi, India.
4. Phoelman P. and Borthakur D. 1969. Breeding Asian Field Crops, Oxford & IBH Publishers Co. Pvt. Ltd, Ne Delhi. India.
5. Sharma J.R. 1994. Principles and Practices of Plant Breeding. Tata McGraw Hill Publishing Co. Ltd.
6. Simmond N.W. 1979. Principles of Crop Improvement, Longman Group, London.
7. Singh B.D. 1983. Plant Breeding. Kalyani Publishers, New Delhi, India.
8. Singh P. 2006. Essentials of Plant Breeding. Kalyani Publishers, New Delhi, India.

Bot. 614 Plant Breeding-II **100 marks**

1. Tissue culture techniques in plant breeding: basic requirements, important steps, techniques, importance, limitations.
2. DNA markers and marker assisted selection: introduction, DNA markers in crop improvement, procedure of markers assisted selection, merits and demerits.
3. Transgenic breeding: introduction, main features of transgenic plants, transgenic vs. conventional breeding, methods, limitations.
4. Somatic hybridizations: introduction, types, uses, steps in somatic hybridization, merits and demerits.
5. Ideotype breeding: features of crop ideotypes, factors affecting ideotypes, steps in ideotype breeding
6. Breeding for resistance to abiotic stresses: drought, salinity and heat.
7. Breeding for resistance to biotic stresses: disease and insect.
8. Breeding for quality traits: Sources of quality traits, quality traits of selected crops, and breeding approaches for quality traits.
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10. National and International institute for crop improvement: introduction, objectives, structures, activities and achievements.

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