NATIONAL UNIVERSITY



Syllabus

Subject: Soil Science

Three Year B.Sc. Pass Course

Effective from the Session: 2013–2014

National University

Subject: Soil Science

Syllabus for Three Year B.Sc. Pass Course

Session: 2013-2014

Course content and marks distribution

Paper Code	Paper	Paper Title	Marks	Credits
First Year				
113301	Paper-I	Pedology and Soil Physics	100	4
113303	Paper-II	Soil Microbiology and Plant Biochemistry	100	4
Second Year				
123301	Paper-III	Soil Chemistry and Soil Pollution	100	4
123303	Paper-IV	Soil Fertility and Fertilizers	100	4
Third Year				
133301	Paper-V	Soil Management and Soil Conservation	100	4
133303	Paper-VI	Soil Survey and Crops of Bangladesh	100	4
133304	Paper-VII	Practical	100	4
		Total =	700	28

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Detailed Syllabus

First Year

Paper Code	Paper	Paper Title	Marks	Credits
113301	Paper-I	Pedology and Soil Physics	100	4

Soil science as an independent discipline, historical development of soil science, branches of soil science and their relationship with other branhces of science; Concept of soil.

Soil forming materials - Rocks, Minerals- Primary and secondary; Weathering- physical and biogeochemical; Soil profile- horizons, layers, pedon and polypedons; Master horizons in soil.

Zonality concept of soils, Study of the orders and suborders of Soil Taxonomy with special reference to Bangladesh.

Definition of soil physics, soil physical properties; soil - a three phase disperse system, description of the three phases; Mass-Volume relations of soil constituents. Soil texture- definition, primary particles, Particle size analysis and expression of results. Assumptions and limitations of Stoke's law. Determination of textural class of a soil. Soil density.
Soil structure- definition, classification and agricultural significance.
Soil consistence- Atterberg's constants and their practical significance.

Soil water- classification and determination. Soil moisture constants.
Composition of soil air, gas transport through soil, renewal of soil air and importance of soil air.
Soil temperature and Soil colour.

Books Recommended:
1. The Nature and properties of soils- Brady and Weil, 13th ed.
2. Introductory Soil science- Dilip Kumar Das- 6th ed.
3. AvaywbK g„wËKv weÁvb- †`‡jvqvi †nv‡mb nvljv`vi I ‡gvt ûgvqyb Kwei 2014|

Paper Code	Paper	Paper Title	Marks	Credits
113303	Paper-II	Soil Microbiology and Plant Biochemistry	100	4

Soil Organisms- Flora and fauna. Soil as a habitdat for flora and fauna, significance of organisms in soil enviromment. Position of microorganism in the living world.
Soil flora- Actinomycetes, Bacteria, Algae and Funig- their structure, and simple classification. Growth and reproduction of bacteria. Environmental requirements of microorganisms. Biological nitrogen fixation (BNF) and their importance in agriculture, Elementary idea about nitrogen cycle.
Carbohydrate- definition, classification & synthesis in plants.
Respiration- aerobic and anaerobic respiration with its importance.
Enzyme- definition, classification and enzyme activity in soil. Factors affecting enzyme activity in soil.
Nucleic acids- Composition, Classification and functions.

Books recommended:
1. AbyRxe weÁvb- †gvt iwdKzj Bmjvg
2. Fundamentals of Biochemistry- Dr. J.L Jain, S.Jain & N.Jain.

Second Year

Paper Code	Paper	Paper Title	Marks	Credits
123301	Paper-III	Soil Chemistry and Soil Pollution	100	4

Concept and scope of soil chemistry. **Soil organic matter**- composition, characteristics and functions in soil. **Humus**- origin and importance. **Clay minerals**- structure, classification and importance. **Ion exchange properties of soil** - origin of ion exchange Properties, CEC of soil, importance of ion exchange in agriculture. Concept of soil pH and soil solution, importance of pH on soil porperties and plant growth.

Plant nutrient- soil as a medium for plant growth, nutritional requirements of plants.
Essential plant nutrients - Criteria of essentiality, classification, source, function & deficiency sypmtoms of nutrient (specially N. P. K. S & Zn). Basic concepts of mechanisms of nutrient uptake in plants.

Soil pollution- concept and types of soil pollution.
Uses and impact of pesticides - fungicides on soil and water ecosystem. Adverse effects of heavy metals on plant growth. Control of soil pollution.

Books Recommended:
1. The Nature and properties of soils - Brady and weil-2012
2. AvaywbK g„wËKv weÁvb- †`‡jvqvi †nv‡mb nvljv`vi I †gvt ûgvqyb Kwei 2014
3. Environmental soil science-Tan
4. Introductory soil science- Dilip Kumar Das-6th ed 2010

Paper Code	Paper	Paper Title	Marks	Credits
123303	Paper-IV	Soil Fertility and Fertilizers	100	4

Concepts of soil fertility & soil productivity. Factors affecting plant growth and development. Maintenance of soil fertility. Nutrient interactions- antagonistic- synergistic activity.
Preparation and application of Compost Green manure and Farm yard manure.
Fertility status of the soils of Bangladesh.

Fertilizer materials- source and manufacture of major fertilizer materials. Time and methods of fertilizer application. Single, compound and mixed fertilizer. Nutrient contents and chemical formulae of major chemical fertilizer's. Fate of added nutrient in soil, residual effects of fertilizers, fertilizer law, balanced fertilization. Fertilizer grade & fertilizer ratio.

Books Recommended:
1. Soil Fertility and Fertilizer- Tisdale & Nelson-2009
2. Soils and Soil Fertility- L.M Thompson & F.R. Troch
3. Soil Fertility Management for Sutstainable Agricutlture- R. Prasad.
4. AvaywbK g„wËKv weÁvb- †`‡jvqvi †nv‡mb nvljv`vi I †gvt ûgvqyb Kwei 2014

Third Year

Paper Code	Paper	Paper Title	Marks	Credits
133301	Paper-V	Soil Management and Soil Conservation	100	4

Objectives and Principles of Soil Management – Preparation and application of Compost, Green manure and Farm Yerd manure, Main components of Soil management – Tillage, irrigation, quality of water in irrigation, application of organic matter, fertilizer and pesticide.

Formation, properties and management of Problematic Soils – Saline Soils, Acid sulphate soils, Waterlogged soils, Organic soils and Hilly soils.

Soil as a basic and irreplaceable resource, Population versus resource base of the world.
Soil degradation: types and processes of soil degradation, factors affecting soil degradation.
Soil erosion – classification and harmful effects of soil erosion. Factors affecting water and wind erosion. Principles of soil conservation practices in the field.
Sustainable Land Use – definition and sustainable land use system.

Books Recommended:
1. Soil Conservation and Sustainable Land Use – T.H. Khan.
2. Problem Soils of Bangladesh - BARI
3. Manual of Soil and Water Conservation Practices – Gurumel Singh.
4. AvaywbK g„wËKv weÁvb- †`‡jvqvi †nv‡mb nvljv`vi I †gvt ûgvqyb Kwei - 2014

Paper Code	Paper	Paper Title	Marks	Credits
133303	Paper-VI	Soil Survey and Crops of Bangladesh	100	4

Soil survey- Definition and importance of soil survey. Agricultural and non-agricultural uses of soil survey. Types of soil survey- Techniques of Exploratory, Reconnaissance and Detailed soil survey. Soil survey work plan & soil survey report. Base materials used in soil survey.
Cropping pattern, corp rotation and cropping intensity. Classification of crops.

Agronomy of different crops of Bangladesh: Origin, improved varieties, Climate, Soil requirements, Cultural practices. Fertilization, harvesting and storing Rice, Wheat, Jute, cotton, Potato and Pulse.

Books recommended:
1. Soils: their survey and taxonomic classification of soil- SRDI-2013
2. K…wl cÖhyw³ nvZeB- BARI-2012
3. AvaywbK g„wËKv weÁvb- †`‡jvqvi †nv‡mb nvljv`vi I †gvt ûgvqyb Kwei-2014

Paper Code	Paper	Paper Title	Marks	Credits
133304	Paper-VII	Practical	100	4

1. Precautions to be taken in the laboratory.
2. Collection, preparation and storage of soil sample.
3. Determination soil moisture by gravimetric method.
4. Determination of soil Bulk density and Particle density.
5. Preparation of standard solution of $K_2Cr_2O_7$, Oxalic acid, NaOH and $FeSO_4$.
6. Determination of organic carbon present in soil by wet oxidation method.
7. Determination of soil pH and Free carbonates.
8. Determination Glucose of a supplied sample.
9. Determination of total and Available nitrogen in soil.
10. Preparation of culture media for Microorganisms.
11. Gram staining and spore staining.

Books Recommended:
A Hand book on Analysis of SOIL, PLANT and WATER - S. M. Imamul Huq and Md Didar ul Alam.