

INSTITUTE OF FORESTRY AND  
ENVIRONMENTAL SCIENCES  
UNIVERSITY OF CHITTAGONG

SYLLABUS FOR BACHELOR OF SCIENCE  
WITH HONOURS IN  
FORESTRY

SESSION: 2015-2016 AND 2016-2017

**COURSES FOR B. Sc. (Hons.) IN FORESTRY**  
**SESSION 2015-2016 AND 2016-2017**

**First Semester**

	TH	CT/TU	PR	FM
FOR 111 Introduction to Forestry	50	25	25	100
FOR 112 Functional English	50	25	00	75
FOR 113 Advanced Algebra and Trigonometry	50	25	00	75
FOR 114 Forest Botany	50	25	25	100
FOR 115 Fundamentals of Chemistry	50	25	25	100
FOR 116 Forest Zoology	50	25	25	100
FOR 117 Field Work and Viva-voce	00	00	00	50
Total Marks				600

**Second Semester**

	TH	CT/TU	PR	FM
FOR 121 Dendrology	50	25	25	100
FOR 122 Physics	50	25	25	100
FOR 123 Advanced Geometry and Calculus	50	25	00	75
FOR 124 Sociology	50	25	00	75
FOR 125 Geology and Soil Science	50	25	25	100
FOR 126 Survey and Settlement	50	25	25	100
FOR 127 Military Science	00	00	25	25
FOR 128 Field Work and Viva-voce	00	00	00	25
Total Marks				600

**Third Semester**

	TH	CT/TU	PR	FM
FOR 211 Forest Ecology	50	25	25	100
FOR 212 Tree Physiology	50	25	25	100
FOR 213 Principles of Economics	50	25	00	75
FOR 214 Meteorology	50	25	00	75
FOR 215 Forest Entomology	50	25	25	100
FOR 216 Computer Application in Forestry	50	25	25	100
FOR 217 Field Work and Viva-voce	00	00	00	50
Total Marks				600

**Fourth Semester**

	TH	CT/TU	PR	FM
FOR 221 Wildlife Ecology and Management	50	25	00	75
FOR 222 Statistics	50	25	25	100
FOR 223 Aerial Photogrammetry, Remote Sensing and GIS	50	25	25	100
FOR 224 Biodiversity Conservation	50	25	25	100
FOR 225 Mycology, Pathology and Protection	50	25	25	100
FOR 226 Protected Area Management and Ecotourism	50	25	00	75
FOR 227 Field Work and Viva-voce	00	00	00	50
Total Marks				600

<b><u>Fifth Semester</u></b>	TH	CT/TU	PR	FM
FOR 311 Principles and Practice of Silviculture	50	25	25	100
FOR 312 Forestry Extension and Social Forestry	50	25	00	75
FOR 313 Wood Structure and Properties	50	25	25	100
FOR 314 Non-Wood Forest Products	50	25	00	75
FOR 315 Forest Mensuration and Inventory	50	25	25	100
FOR 316 Building Materials and Construction	50	25	25	100
FOR 317 Field Work and Viva-voce	00	00	00	50
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Total Marks				600

<b><u>Sixth Semester</u></b>	TH	CT/TU	PR	FM
FOR 321 Urban and Landscape Forestry	50	25	00	75
FOR 322 Rubber, Tea and Coffee	50	25	00	75
FOR 323 Research Methodology	50	25	25	100
FOR 324 Agroforestry	50	25	00	75
FOR 325 Saw Milling, Seasoning and Preservation	50	25	00	75
FOR 326 Forest Transportation Engineering	50	25	00	75
FOR 327 Horticulture	50	25	00	75
FOR 328 Field Work and Viva-voce	00	00	00	50
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Total Marks				600

<b><u>Seventh Semester</u></b>	TH	CT/TU	PR	FM
FOR 411 Forest Management	50	25	00	75
FOR 412 Forest Harvesting	50	25	25	100
FOR 413 Wood Composite, Pulp and Pulp Products	50	25	25	100
FOR 414 Plantation Silviculture	50	25	25	100
FOR 415 Tree Improvement and Biotechnology	50	25	25	100
FOR 416 Forest Resources Economics and Marketing	50	25	00	75
FOR 417 Field Work and Viva-voce	00	00	00	50
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Total Marks				600

<b><u>Eighth Semester</u></b>	TH	CT/TU	PR	FM
FOR 421 Forest Based Entrepreneurship and Community Development	50	25	00	75
FOR 422 Watershed Management	50	25	25	100
FOR 423 Forest Policy, Law and Administration	50	25	00	75
FOR 424 Land Use Planning and Management	50	25	00	75
FOR 425 Forest Accounting and Development Planning	50	25	00	75
FOR 426 Project Paper	00	00	00	75
FOR 427 Integrated Forest Management Plan	00	00	00	75
FOR 428 Field Work and Viva-voce	00	00	00	50
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Total Marks				600

**FOR-Forestry**

**TH-Theory**

**CT- Class Test / TU-Tutorial**

**PR-Practical**

**FM-Full Marks**

## FIRST SEMESTER

**Course No.** : FOR 111  
**Course title** : INTRODUCTION TO FORESTRY  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)

### Theory:

- 1. Forestry terms:** Understanding of important terms used in forestry.
- 2. Scope:** Scope, objectives and importance of forestry with particular reference to Bangladesh.
- 3. Forest classification:** Forest type, their location, distribution and species composition; legal classification of forests in Bangladesh with legal status covered by each forest type; grouping of tree species into different categories.
- 4. Flora and wildlife:** Scientific names of important flora and wildlife with existing status found in different forests of Bangladesh.
- 5. Forestry education:** Forestry education and training facilities in Bangladesh.
- 6. Forest organizations:** Historical perspectives, responsibilities, functions and administrative setup, drawback and constraints of Forest Department; functions and administrative setup of Bangladesh Forest Research Institute, Bangladesh Forest Industries Development Corporation, National Herbarium and other Forest Based Industries and forestry activity related NGOs.
- 7. Benefits:** Tangible and intangible benefits derived from forests of Bangladesh.
- 8. Uses:** Plant suitable for timber, fuel, poles, food, fodder, fertility, sports goods, household purposes, cottage industries, medicines, etc.
- 9. Suitable species:** Plant species suitable for planting at specific sites such as around houses, canals, swamps, roads, embankments, institutions etc. in villages and cities.
- 10. Protected areas:** Background and objectives for creation of protected areas and acquaintance of national parks, wildlife sanctuaries, game reserves and conservation sites declared in Bangladesh.

### Practical:

1. The course will include orientation tours to forest areas covering major forest types, and related institutions and industries to acquaint students with different forestry activities.
2. Understanding and learning meanings of commonly used terminology used in this course, identifying of each tree category in forests, various groups of vegetation and sites, various benefits derived from forests through visits to Chittagong University Campus plantations, Bangladesh Forest Research Institute (BFRI).
3. Preparing report based on field visits and field-work.

### References:

- D.S.Kabir and S. B. Muzaffar, A review of the present state of the protected areas of Bangladesh, In: Bangladesh Environment 2002 (vol. 1). pp 489-502.
- S. M. Sirajul Haque and K. M. Nazmul Islam, Forestry from Bangladesh Perspective, IFESCU and USDA, 2013.
- 1989, Gana Parjaya Brikhya Rupan-Bangladesh Forest Department.
- S. M. Sirajul Haque and Mostafa Kamal Pasha, Vegetation in upland watershed of Bangladesh, IFESCU and USDA, 2013, 302 pp.
- S. M. Sirajul Haque and Maung Hla Myant, Watershed Management Extension and Environmental Conservation in Bangladesh, IFESCU and USDA, 2011, 188 pp.

**Course No.** : FOR 112  
**Course title** : FUNCTIONAL ENGLISH  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)

**Theory:**

1. **Remedial grammar:** (a) Tense, (b) Parts of speech, (c) Sentence structure, (d) Voice, (e) Correction, (f) Narration, (g) Phrases, (h) Appropriate Preposition.
2. **Vocabulary.** Scientific and communicative (general).
3. **Reading skills:** Comprehension on topics based on scientific subject matter.
4. **Listening and speaking skills:** Practical use of listening and speaking skills.
5. **Writing:** Writing free and guided composition; Analytical writing.
6. **Communication:** Definition, types and its importance in forestry.
7. **Speech communication:** Introduction to speech communication; speech-communication process; communication model; kinds of speech communication; selection of speech subjects and topics, preparation of speech materials, presentation of speech; speaker-audience interaction.
8. **Written communication:** Description of different types of written communication: Essay, Leaflet, Pamphlets, Books, Booklets, Popular Article, Wall Paper, Poster, Banners, Festoons and Research paper.

**References:**

- Ehninger, D.; Monroe, A.H. and Gronbeck, D.E. 1978. Principles and types of Speech Communication (8th ed.), Scott, Foresman and Company, London.
- Kapp, R.O. 1973. Representation of Technical Information (2nd ed). The Anchor press Ltd., Britain.
- Kumar, S and Lata, P. 2011. Communication Skills.1st edition. Oxford University Press.
- Pyle, M. A. 1986. Test of English as a Foreign Language. Cliffs Notes, Inc. U.S.A.
- Raman, R. A. and Sharma, S. 2011. Technical Communication- principles and practice. 2<sup>nd</sup> edition. Oxford University Press.
- Taylor, C. 1978. Advancing Language Skills. The University Press Ltd. Bangladesh.
- Verderber, R. F. 1982. 5<sup>th</sup> edition. Wadsworth Publishing Company, California, USA.

**Course No.** : FOR 113  
**Course title** : ADVANCED ALGEBRA AND TRIGONOMETRY  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)

**Theory:**

**1. Algebra:**

- a. Importance of Mathematics in Forestry
- b. Theory of equations
- c. Summation of series
- d. Determinant, Cramer's rule to solve equations
- e. Matrices [Rank of matrices is not included]
- f. Application of Algebra in forestry

**2. Higher Trigonometry:**

- a. De Moivre's theorem and its applications to solve equations
- b. Summation series
- c. Simple application of all the chapters in forestry.

**3. Linear Programming:**

- a. Introduction, Constraints, Maximization and minimization, Graphical solutions
- b. Application of Linear Programming in Forestry.

**References:**

- Aufmann R.N., Barker, V.C. and Nation, R.D. College Algebra and Trigonometry. Brooks Cole; 7 edition 1080 p.
- Gass, S.I. 2010. Linear Programming: Methods and Applications: Fifth edition Dover Books on Computer Science, 544 p.
- Hall, H.S. and Knight, S.R. Higher Algebra, Macmillan and Co. Ltd. New York.
- Ray, G.C. and Hossain, M.E. Linear Programming, Titas Publications, 38 Bangla Bazar, Dhaka.
- Shahidullah, A.M.M. and Bhattacharjee, P.K. A Text Book on Algebra and Trigonometry. Gonith Prokashon, Dhaka.
- Sultan, A. Linear Programming: An Introduction With Applications (Second edition) Create Space Independent Publishing Platform. 660 p.
- Theson, G. L. Algebra and Trigonometry. Words Worth publication Company, Belmont, California. 613 p

**Course No. : FOR 114**  
**Course title : FOREST BOTANY**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical: 25 (1 cr.); Total=100(4 cr.)**

### Theory:

- 1. Importance of Botany in forestry:** Importance of taxonomy, ecology, palaeobotany, phytogeography, ethnobotany, cytology, genetics, pathology, plant breeding, physiology, microbiology, agronomy, horticulture, floriculture, apiculture, biodiversity and tissue culture in forestry.
- 2. Adaptation of plants:** Salient features of hydrophytes, xerophytes, halophytes and their adaptation.
- 3. Morphology of flowering plants:** A brief description on general morphology of roots, stems, leaves flowers, fruits and seeds.
- 4. Reproductive biology of higher plants:** Pollination, fertilization, development of embryos, types of fruits and seeds; dispersal of fruits and seeds.
- 5. Plant cell and cell division:** Ultra structure of cell and functions of cell organelles, significance of mitotic and meiotic cell divisions.
- 6. Tissue and tissue systems:** Kinds of tissues; tissue systems of vascular plants; secondary growth.
- 7. Principles of inheritance:** Mendel's Laws of inheritance, Di- and Tri-hybridization, Polyploidies, Linkage and crossing over, Transcription and Translation, Gene regulation and Mutation and Genetic Mapping.
- 8. Economic botany:** Important plant species commonly found in homestead and forests and their uses.

### Practical:

1. Study of different plant parts; leaf, organs, twigs, fruits, flowers, seeds and roots.
2. Collection and identification of fruits and seeds; germination of forest and fruit species.
3. Demonstration of morphological and anatomical structures of root, stem and leaf.
4. Survey of economic plants of a specific area.

### References:

- Bendre A. and Pande P.C. 1995. Introductory Botany, Rustogi Publication, Meerut, India
- Cobley, L. S. and Steele, W.M. 1976. An Introduction to the Botany of Tropical crops. Second edition, The English language Book Society and Longman, London, U.K.
- Dutta, A.C., 1972. A Class Book of Botany, Fourteenth edition, Oxford University Press, Fandany House, Calcutta-13, India.
- Fattah and Islam, 1976, College Biology. Jahangir Sons, 42, Bangla Bazar, Dhaka.
- Hill, A.F. 1979. Economic Botany, Tata McGraw Hill Book Publishing Company Ltd. New Delhi, India.
- Huq, A.M. 1986. Plant Names of Bangladesh. Bangladesh National Herbarium, 220, Green Road, Dhanmondi, Dhaka-5.
- Mukherji, H. 1974. Plant Groups. Allied (p) Ltd. 8/1, Chintarnidas Calcutta 9, India.
- Sharma, O.P. 1980. A Manual of Practical Botany. Vol 1. Pragati Prakashani, Begum Bridge, Neerut-25001, India.
- Tapan Kumar Dey, 2006, *Useful Plants of Bangladesh*, AvjxMo jvB†e<sup>a</sup>ix, 158 wbD gv†K©U, XvKv|
- Vidyarthi, Tripathi (Revised-2002), A Text Book on Botany, S. Chand Company Ltd., 7361-Ram Nagar, New Delhi-110055, India.

**Course No. : FOR 115**  
**Course title : FUNDAMENTAL OF CHEMISTRY**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

### Theory:

- 1. Introduction:** Introduction to Chemistry, scope and importance of Chemistry in studying to Forestry.
- 2. Solutions and Colloids:** Types of solutions concentration units, Henry's law, Nernst distribution law, solvent extraction, solution of non-electrolytes, vapor pressure lowering, boiling point elevation, freezing point depression, osmotic pressure, determination of molecular weight of solute from measurement of these properties, colligative properties of electrolytes.
- 3. Chemical Kinetics and Equilibrium:** First and Second order reactions and their simple treatment, determination of order of reactions, simple theories of reaction rate (only outline of Arrhenius and Collision theory).  
Laws of mass action, its enunciation and mathematical formulation, its application to chemical reactions; principles of mobile equilibrium and its application to industrial reaction.
- 4. The Periodic Law and Modern Periodic Table:** Some periodic properties of the elements: metallic behavior, atomic size, ionization energy, electron affinity and electronegativity, classification of elements.
- 5. General Concept of Oxidation-Reduction and Acid-Bases:** Oxidation number and oxidation-reduction processes, balancing oxidation-reduction reactions, different concepts of acids and bases, relative strengths of acids and bases.
- 6. Structure Theory of Organic Chemistry:** A knowledge of the structure of C-C, C=C, C≡C, Alcohol, Aldehyde, Ketone, Amine, Amide & Carboxylic acid group, Benzene, Glucose and Carbohydrate .
- 7. Survey of Organic Functional Groups:** Reactions with special reference to functional groups and characteristic reactions of Alkane, Alkyl, Alkenes, Alcohol, Aldehyde, Ketone, Amine, monobasic and substituted monobasic acids and its esters, Anhydrides and Amides.

### Practical:

1. Preparation of solutions and volumetric analysis.
2. Preparation and standardization of N/10  $\text{KMnO}_4$  solution with sodium oxalate solution.
3. Determination of ferrous iron with standard  $\text{KMnO}_4$  solution
4. Preparation standard N/10  $\text{K}_2\text{Cr}_2\text{O}_7$  solution and standardization of  $\text{Na}_2\text{S}_2\text{O}_3$ .
5. Oxidation reduction titration involving:
6. Water and ether soluble plant extracts.

### References:

- Ahmed, M. and Mian, A.J. 1972. A Text Book of Organic Chemistry, Third edition. Ghani Art Press, Bangla Bazar. Dhaka.
- Finar, I L. 1973. Organic Chemistry. Vol. I. English language Book Society. 6th ed.
- Haider, S.Z. 1977. Introduction to Modern Inorganic Chemistry. 5th ed. Students Publications, P.K. Roy Lane, Dhaka.
- Hoque, M.M. and Nawab, M.A. 1974. Principles of Physical Chemistry. 3rd ed. Students Publications, Dhaka.
- Khalique, A. 1971. Organic Chemistry. Ideal Library, Bangla Bazar, Dhaka.
- Morrison and Boyd, 1988. Organic Chemistry. 7th ed. Allyn and Bacon Inc. New Delhi.



**Course No.** : FOR 116  
**Course title** : FOREST ZOOLOGY  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.).

### Theory:

- 1. Introduction:** Diversity of life, scope and importance of Zoology in Forestry.
- 2. Taxonomy:** Hierarchy of classification and taxonomic categories; procedure of taxonomic works; taxonomic keys.
- 3. Classification:** Classification and morphology of annelida, arthropoda, mollusca, echinodermata, pisces, amphibia, reptilia, aves and mammalia.
- 4. Physiology:** Nervous, respiration, circulation, digestion, excretion and reproductive system; Origin, functions and deficiency symptoms of different kinds of vitamins and hormones.
- 5. Evolution:** Theories of evolution; Lamarckism; Darwinism; speciation; evolution of elephant and horse, Co-evolution.
- 6. Animal behavior:** Importance, relation with other branches of sciences, types, learning, taxes, instinct and social and reproductive behavior of elephant and gulls
- 7. Zoo-geography:** Zoological distribution of animals; Wallace and Weberian lines; Wildlives of Bangladesh.
- 8. Ecology:** Types and principles of ecology, freshwater, marine and terrestrial ecology. Population dynamics, Tropic levels, Ecosystems and conservation of animals and migration of birds.
- 9. Economic zoology:** Economically important faunas found in terrestrial and aquatic ecosystem and their importance (Economic importance arthropoda, reptilia, mammals and insects).

### Practical:

1. Study of museum specimens of Annelida, Mollusca, Arthropoda, Echinoderms, Reptila, Aves, Mamalia.
2. Study of physiological systems of frog, lizard and fish, pigeon and rat.
3. Study of skeletal system of Amphibia, Reptilia, Aves, and Mammalia.

### References:

- Jordan, E.L. and Verma P.S. 1978, (i) Chordate Zoology, (ii) Invertebrate Zoology. S. Chand & Company Ltd. Ram Nagar. New Delhi - 1100055.
- Lal, S.S. 1975. A Text Book of Practical Zoology. Vertebrate, Rastogi Publication Meerut-250002, India.
- Mayr, E. Principles of Systematic Zoology. Tata-McGraw Hill Co. Ltd. India.
- Parks, T.J. 1972. A Text Book of Zoology. 2nd ed. Macmillan & Co. New York. St. Martins Press.
- Storer, T. I. 1957. General Zoology. Tata McGraw Hill Publishing Company Ltd. Bombay, New Delhi.
- Young, J.Z. 1964. The Life of Vertebrates. Oxford University Press. New York & Oxford.

**Course No. : FOR 117**  
**Course Title : FIELD WORK AND VIVA- VOCE**  
**Marks : Field work-25 (1cr.); Viva- voce-25 (1 cr.); Total = 50 (2cr.)**

**Field work: 25**

Tree Planting, Nursing and Reporting	-	08
Field work report	-	07
Field work examination	-	10

**Viva- voce: 25**

A plot of minimum 25 seedlings must be maintained by each student in the selected plantation sites throughout the duration of his/her B.Sc.(Hons.) course.

**The distribution of marks for the program for class attendance will be as follows:**

Attendance (%)	Marks
96 and above	5.0
91 - 95	4.5
86 - 90	4.0
81 - 85	3.5
76 - 80	3.0
71 - 75	2.5
66 - 70	2.0
60 - 65	1.5
Less than 60	00

## SECOND SEMESTER

**Course No. :** FOR 121  
**Course title :** DENDROLOGY  
**Marks :** Theory: 50 (1 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical: 25(1 cr.); Total = 100 (4 cr.)

### Theory:

- 1. Introduction:** Phenology, geographical distribution and economic importance forest tree species of Bangladesh.
- 2. Taxonomy:** Definition, fundamentals of taxonomy, short history of plant classification, kinds of classification, units of classification, some important systems of classification and their comparisons.
- 3. Identifying characters, economic importance and examples of the following families:**  
**Dicots:** Verbenaceae, Dipterocarpaceae, Mimosaceae, Caesalpiniaceae, Fabaceae, Meliaceae, Sterculiaceae, Lythraceae, Anacardiaceae, Rhizophoraceae, Moraceae, Rubiaceae, Myrtaceae and Sonneratiaceae, Loranthaceae, Euphorbiaceae, Aviciniaceae, Combretaceae, Orchidaceae.  
**Monocots:** Bambusoideae, Palmae and Gramineae, Poaceae  
**Gymnosperm:** Cycadaceae, Gnetaceae and Pinaceae.
- 4. Objectives and functions with particular reference to forestry:** Herbarium, Botanical garden, Arboretum and Community based tree groves.

### Practical:

1. Identification of woody plants on the basis of morphological and vegetative characteristics.
2. Field visits and study of families.
3. Collection, preparation and preservation of herbarium specimens.

### References:

- Bendre, A. and Pande, P.C. 1995. Introductory Botany, Rustogi Publication, Meerut, India  
Benson. L. 1957. Plant Classification. Oxford & IBH Publishing Co. New Delhi, India.  
Bore – Manual of Indian Forest Botany.  
Brandis, D. 1987. Indian Trees. Archbald Constable and Co. Ltd., 16 Jame's Street, Haymarket, S.W.  
Das, D.K. and Alam, M.K. 2001. Trees of Bangladesh. BFRI, Chittagong.  
Drury, C. H. 1985. The useful plants to India. International Book Distributors, 9/3, Rajpur Road, Dehra Dun-218001, India.  
Heywood; V.H. 1976. Plant taxonomy. Second Edition. Edward Arnold (Publisher) Ltd. 25 Hill Street, London W1X 8 LL, U.K.  
Howard, A.L. 1986. Studies of the Identification of Timbers. International Book Distributors, 9/3, Rajpur Road, Dehra Dun-248001, India.  
Jones, B.S. and Luchsinger, A.E. 1979. Plant Systematics. McGraw Hill Book Company, New Delhi, India.  
Rendle, A.B. 1979. The Classification of Flowering Plants. Volume I & II. Vikas Publishing House Pvt. Ltd. Vikas House, 20/4, Industrial Area, Sahidabad, Ghaziabad, U.P. India.  
Shrivastava M.B. 1997. Introductory to Forestry, Vikas Publishing House Pvt. Ltd. Jangpura, New Delhi 110014.  
Tapan K. D., 2006, *Useful Plants of Bangladesh*, AvjxMo jvB†e<sup>a</sup>ix, 158 wbD gv†K©U, XvKv|

**Course No.** : **FOR 122**  
**Course title** : **PHYSICS**  
**Marks** : **Theory: 50 (1 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical 25(1 cr.); Total = 100 (4 cr.)**

### **Theory:**

- 1. Introduction:** General considerations of physics and its relevance and application to other branches of forestry.
- 2. Mechanics:** Newton's law of motion, Newton's law of universal gravitation; Kepler's law, acceleration due to planets and satellites; Momentum; Work, Power and Energy; Conservation of momentum and energy; Energy in a gravitational field; Simple harmonic oscillator problems; **Renewable and non-renewable energy resources** - Hydropower, Biomass, Wind; Environmental context of energy sources; Physical perspective of global climate change;
- 3. Elasticity:** Stress and strain; Hooke's Law; Modulus of elasticity; elastic and plastic substances;
- 4. Fluid mechanics:** Rise of liquid in a capillary tube; angle of contacts; theory of capillary; capillary fundamentals and soil water; Hydrostatic equation; viscous field; Poiseuille's equation; Dispersion of pollutants in water and air
- 5. Soil physics:** Types of soil water movement; saturated flow through soils; unsaturated flow in soils; water movement in stratified soils; retention of soil moisture in the field; capillarity and root extension and its relevance to soil pollution
- 6. Sound:** Sound and sound waves; Propagation of sound wave; Intensity of sound and its measurement; Noise; Sound abatement;
- 7. Heat and thermodynamics:** Absolute temperature; specific heat; conduction, convection, and radiation of heat; mechanical equivalent of heat; first law of thermodynamics; thermodynamics processes, Thermal pollution; Heat and environment; Thermodynamics and global warming
- 8. Light:** Reflection, Refraction, Transmission, Emission and Absorption of light; Laws of reflection, Refraction; Mirrors, Lens, Prism; Electromagnetic radiation, solar spectrum; solar constant; Fluorescence; Fundamentals of spectroscopy
- 9. Electricity:** Coulomb's law; Ohm's law; Capacitance and resistance and their combinations, Kirchoff's law; D.C. and A.C. Power and their applications; Consumption and wastage calculation for electrical energy; Carbon footprint calculation in relation to electricity consumption.
- 10. Electronics:** Diode and triode valves; transmitter, receiver, transistors and microprocessors; Application of electronics in Forestry; Environmental sensors based on physical properties of matter; Data loggers;
- 11. Modern physics radioactivity** and its application, Properties of rays, principal facts, laws, application of radio-isotopes, Hazards related to radioactivity;
- 12. Theory of relativity:** Postulates of special theory of relativity; Implications and importance of the theory in Forestry

### **Practical:**

1. Compound pendulum;
2. Young's modulus;
3. Surface tension of water;
4. Calorimetric experiment;
5. Specific heat;
6. Measurement of resistances.
7. Melde's experiment
8. Newton rings experiment.

### **References:**

- Holiday and Resnick. Physics for Students of Science and Engineering, Part I and Part II. Wiley, N.Y.
- Hossain, T. 1975. A Text Book of Heat 2nd ed. Barnamala Press & Publications Ltd. 31/32, P.K. Roy Road, Bangla Bazar, Dhaka.
- Kalimuddin, M. 1974. A Text Book of Magnetism, Electricity and Modern Physics. 2nd ed., Mullick Brothers, 3/1, Bangla Bazar, Dhaka.
- Mason, N. and Hughes, P. 2001. Introduction to Environmental Physics: Planet Earth, Life and Climate, Taylor and Francis.
- Mathur, D.S. 1983. Elements of Properties of Matter. 10th ed., S. Chand & Company Ltd. Ram Nagar, New Delhi-110055.
- Seely, S. Electron Tube circuits.

**Course No.** : FOR 123  
**Course title** : ADVANCED GEOMETRY AND CALCULUS  
**Marks** : Theory: 50 (2Cr): Class Test/Tutorial 25 (1 Cr; Written: 20, Attendance: 5 ;Total= 75 (3 cr.).

**Course contents:**

**1. Advanced Geometry: [Solid geometry is not included]**

The straight line  
Changes of axes  
Pairs of straight line  
General equation of second degree  
Circles  
Parabola  
Ellipse  
Hyperbola

**2. Differential Calculus:**

Functions  
Continuity  
Differential co-efficients  
Successive differentiation  
Partial differentiation  
Tangents and normal  
Maxima and minima

**3. Integral Calculus:**

Integrations of functions of single variable  
Methods of integration  
Integration by parts  
Special integration  
Definite integrals

**4. Application of Geometry and Calculus in forestry.**

**References:**

- Anton, H., Bivens, I. and Davis, S. 2002. *Calculus: early transcendentals (7th edition)* Wiley.
- Barnett R.A., Ziegler M.R. and Byleen, K.E. 2010. *Calculus for Business, Economics, Life Sciences and Social Sciences (12th edition)*, Pearson. 704 p.
- Larson, R., and Edwards, B.H. 2013. *Calculus*. Brooks Cole; 10 edition. 1280 p.
- Mc.Dougal Little. 2007. *Holt McDougal Larson Geometry: Student edition Geometry 2008*, Mc.Dougal Little. 1st edition. 1176 p.
- Mohammad, K. and Bhattacharjee, P.K. 1988. *A Text Book on Differential Calculus*. S. Tripaty, 124 Chandanpura, Chittagong.
- Mohammad, K. and Bhattacharjee, P.K. and Latif, M.A. 2003. *A Text Book on Integral Calculus (With Differential Equations)*. Kanta Bhattacharjee, 28/A Joinagar, Chittagong.
- Rahman, A. and Bhattacharjee, P.K. 2003. *A Text Book on Co-ordinate Geometry with Vector Analysis*. S. Bhattacharjee, 28/A Joinagar, Chittagong. .
- Ruby, T.L., Sellers, J., Korf, L., VanHorn, J. and Munn, M. 2013. *Kaplan AP Calculus AB & BC 2014 (Kaplan Ap Calculus Ab and Bc)*, Kaplan Publishing, 624 p.

**Course No. : FOR 124**  
**Course title : SOCIOLOGY**  
**Marks : Theory: 50 (1 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Total = 75 (3 cr.)**

### **Theory:**

- 1. Introduction:** Subject matter of sociology; sociology as a science; social sciences and sociological research; basic methods of sociological research.
- 2. Society:** Definition, social structure, statuses, role group, institutions, types of society, hunting and gathering societies, pastoral societies, horticultural, horticultural societies, agricultural societies, industrial societies.
- 3. Culture:** Human nature and elements of culture; norms, values, cultural variation and language; characteristics of Bangladesh society and culture.
- 4. Social groups:** Types of social groups; primary and secondary groups, ethnic groups, minority groups; formal organizations; bureaucracy; function and dysfunctions of bureaucracy.
- 5. Social institutions:** Major social institutions family, religion institution, economic, political and educational institutes of Bangladesh, their structure and functions, ethnic group & ethnicity.
- 6. Social stratification:** Social class and social status and their components - property, power, prestige; social stratification of Bangladesh society and its implication in natural resource management.
- 7. Population and ecology:** Human population characteristics - birth and death rates, population density, growth, and migration; ecological aspects of human survival - land, water, energy, minerals etc.; Population and the environment - the elements of ecology, population, resource - depletion.
- 8. Application:** Application of sociological knowledge on forest and environmental resources development and management in Bangladesh.

### **References:**

- Anderson, C.H. 1971. Towards a New Sociology-A critical view. Ircoin-Dorsey Limited, Illinois.
- Bertocci, P. 1970. Elusive Villages: Social Structure and Community Organization in Rural East Pakistan. Michigan State University.
- Biesanz, M.H. and Biesanz, J. 1973. Introduction to Sociology. New Jersey, Englewood Cliffs: Prentice Hall, Inc.
- Bassis, M.S., Gelles, R.J. and Levine, A., 1980. Sociology, An introduction. Random House, New York.
- Chowdhury; Anwarullah *et al.* (eds). 1986. Sociology of Bangladesh: Problems and Prospects. Bangladesh Sociology Association, Dept. of Sociology, D.U., Dhaka.
- Frederico, R.C. 1979. Sociology. Addison Wesley Publishing Company, Philippine.
- Koenig, S. 1968. An Introduction to the Science of Society. Barnes & Noble, Inc. New York
- Phillips, B., 1979. Sociology-from concepts to practice. McGraw-Hill Book Company, New York.
- Spencer, M., 1979. Foundation of modern sociology. Second edition, Prentice-Hall International Ins. London.
- Robertson, I 1977. Sociology. Worth Publishers, Ins. USA.

**Course No.** : FOR 125  
**Course title** : GEOLOGY AND SOIL SCIENCE  
**Marks** : Theory: 50 (3 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical: 25 (1 cr.); Total = 100 (4 cr.).

### **Theory:**

- 1. Introduction:** Scope of geology and soil science in forestry; elemental, mineralogical and rock composition of the earth crust.
- 2. Mineralogy:** Definition, physical characteristics and classification of minerals; common rocks and soil forming minerals.
- 3. Petrology:** Major rock types and their formation, classification and description; kinds of soils developed from different rocks.
- 4. Fossils:** Forms and uses of fossils, geological time scale.
- 5. Geology** of Bangladesh.
- 6. Weathering** agents of rocks and minerals, soil forming processes and factors of soil formation.
- 7. Soils:** Concepts of soil, approaches of soil studies; physical, chemical and biological properties of soils; significance of important soil properties in tree growth, availability of nutrients and dominance of microorganisms.
- 8. Soil water:** Soil water constants and their relationships with plant growth.
- 9. Soil profile:** Soil profile and horizons with their sub-divisions with dominant characteristics.
- 10. Organic matter:** Humus formation and its influence on physical, chemical and biological properties of soils.
- 11. Soil classification:** Need for soil classification; kinds of classification; modern system of classifications in the world; classification of Bangladesh soils and their correlation with international systems.
- 12. Soil organisms:** Morphological description, classification and functions of organisms living in soil.

### **Practical:**

1. Identification of important physical properties of rock and mineral specimens in the laboratory.
2. Demonstration of major geological features in the field.
3. Differentiation of land materials into rock, parent materials and soils, along with collection of common rocks, minerals and fossils.
4. Study of soil profile in the field based on physical properties and methods of soil sampling.
5. Determination of soil organic matter by wet oxidation method.
6. Determination of soil bulk density, water holding capacity and pH.

### **References:**

- Bangar, M.M. A Text Book of Geology. 1981. Standard Publishers Distributors, Delhi.
- S. M. Sirajul Haque, Geology, Soil Science and Forest Soils, IFESCU and USDA, 2013, ---- pp.
- Hussain, M.S. Soil Classification (with special reference to the soils of Bangladesh), 1992. University of Dhaka.
- Brammer, H. Soil Survey Project Bangladesh. 1971. Soil Resources, AGL; SF/ PAK
- Brady, N.C. The Nature and Properties of Soil, 1996. Prentice Hall of India India, New Delhi.

**Course No. : FOR 126**

**Course title : SURVEY AND SETTLEMENT**

**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

**Theory:**

**Part A: Survey**

- 1. Introduction:** Definition, classification, scope and importance of surveying in forestry; useful data and formulae, general rules for calculation of areas and volumes.
- 2. Scales:** Different expressions, representative fractions, types of scale (plain, diagonal and vernier scales), construction of different types of scales.
- 3. Map and map reading:** Classification of maps, orientation, location of point (s).
- 4. Chain survey:** Instruments and procedures, errors and corrections in chain survey, recording and plotting, advantages and disadvantages of chain survey, linear measurements, conventional signs.
- 5. Traverse survey:** Useful terms, angular instruments, types of traverse, bearings, field procedure, plotting closing errors and adjustments, theodolites-measurement of horizontal and vertical angles, measurement of bearings, azimuth.
- 6. Plane table survey:** General instrumentation and principle, methods and procedure-setting up the table, radiation, intersection, traversing, and resection.
- 7. Levelling:** Definitions, Important terms related to leveling, instrumentation, principles of levelling, Purposes of leveling, procedures of leveling, Methods of calculating reduced level, classification of leveling-direct and indirect levelling, profile levelling, common errors in levelling.
- 8. Topographical survey:** Contouring- contour and contour lines; Characteristics of contours, methods of contouring, contour drawing, interpolation of contours, GPS.
- 9. Area computation:** Computation of area by planimeter and squares method.
- 10. Copying plans and maps:** Copying of plans of map by tracing, graphical and mechanical methods, enlargement and reduction by proportional compass, photographic and photo copying methods.

**Part B: Settlement**

1. General concepts of records of rights, khatian, parcha, deed, maps, ROR, MOR, DCR etc., Settlement procedure and preparation of records of rights, historical background of settlement, land revenue systems and different register maintained for land revenue purposes, forest settlement procedures.

**Practical:**

1. Demonstration on drawing equipment and lettering practice.
2. Construction of different types of scale.
3. Conducting chain survey in the field.
4. Demonstration of traverse surveying in the field
5. Plane Table surveying in the field.
6. Demonstration of leveling in the field.
7. Contouring in hilly area.
8. Area calculation on map and land.
9. Copying, enlargement and reduction of maps used in surveying.



## References:

- Anderson, J. and Mikhail, E. 1997. Surveying: Theory and Practice. McGraw-Hill Science/Engineering/Math; 7 edition 1200 p.
- Bannister A. and Raymond, S. 1977. Surveying. Pitman Publishing Limited, London.
- Brinker, R. C. and Paul R. W. 1984. Elementary surveying. Seventh edition. Harper and Row Publishers, Inc. New York.
- Chandra, A. M. 2007. Higher Surveying. New Age International 424 p.
- Coover L. S. 1966. Drawing and Blueprint Reading. Third edition. McGraw Hill Book Company, NY.
- Kissan, P. 1971. Surveying Practice. Second edition. McGraw -Hill Book Company, New York.
- Kjellstrom, B. 1976. Be Expert with Map and Compass- The Orienting Handbook. Fourth Edition. Charles Scribner's Sons.
- Miah, M.A.K. 2003. Bhumi Jarip O Bhumi Baybostaphona,
- Moffitt, F. H. and Harvy,B. 1982. Surveying. Seventh edition. Harper and Row Publishers, Inc, New York.
- Parkash, R. 1983. Forest surveying. International Book Distributors, Dehra Dun.
- Pugh, J.C. 1975. Surveying for Field Scientists. Methuen and Co. Ltd, London.
- Shahjahan, M.. and Aziz, M.A. 1984. A Textbook of Surveying. Hafiz Book Center, Dhaka. Dhaka-1.
- Whyte, W. and Paul, R. 1997. Basic Surveying. Taylor & Francis 335 p.

**Course No. : FOR 127**  
**Course title : MILITARY SCIENCE**  
**Marks : Practical: 25 (1 cr.); Total = 25 (1 cr.)**

## Military Science

Introduction to military science, military rank, drill, raid, ambush, hiking, capsule training program, monthly training course, annual training exercise, annual camp, blood donation, tree plantation, collection and distribution of warm cloth in winter.

**Course No. : FOR 128**

**Course title : FIELD WORK AND VIVA- VOCE**

**Marks : Field work and Viva- voce-25 (1 cr.); Total = 25 (1cr.)**

**Field work and Viva-Voce: 25**

Tree Planting, Nursing and Reporting	-	05
Field work report	-	05
Field work examination	-	05

**Viva- voce: 10**

A plantation plot of minimum 25 seedlings must be maintained by each student in the selected plantation sites throughout the duration of his/her B.Sc.(Hons.) course.

**The distribution of marks for the program for class attendance will be as follows:**

Attendance (%)	Marks
96 and above	5.0
91 - 95	4.5
86 - 90	4.0
81 - 85	3.5
76 - 80	3.0
71 - 75	2.5
66 - 70	2.0
60 - 65	1.5
Less than 60	00

## THIRD SEMESTER

**Course No.** : FOR 211  
**Course title** : FOREST ECOLOGY  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)

### Theory:

- 1. Introduction:** Basic concepts of forest ecology; Forest ecology in relation to silviculture, forest and environmental management.
- 2. Ecosystem:** Concept and components of ecosystem; Habitat and ecological niche, trophic level, food chain, food web; trophic structure and ecological pyramids, productivity analysis.
- 3. Site factors:** Site factors and their effects on plant growth, regeneration and distribution; interrelations between site factors; Effects of forest vegetation on site factors.
- 4. Material cycling in environment:** Biogeochemical cycles, macro and micro nutrients; Nutrient cycling, nutrient uptake, mycorrhiza and nutrient uptake in plants; Nutrient input and nutrient return in ecosystems, soil organisms and their role in decomposition of organic matter; Nutrient loss from ecosystems.
- 5. Succession and retrogression:** Concept and stages of succession; concept of climax,; causes of retrogression and its relation in forest instability; succession in mangrove forests; secondary forest succession.
- 6. Synecology:** Community composition and classification; of structure of vegetation and methods of studying plant community structure, gap phase dynamics.
- 7. Autecology:** Phenology, flowering, pollination, fruiting, seed output, dispersal of fruits and seeds; seed viability, dormancy and reproductive capacity; seedling and vegetative growth; adaptation on forest trees.
- 8. Major forest ecosystems:** Village forest ecosystem, natural forest ecosystem and wetland ecosystem in Bangladesh.

### Practical:

1. Application of different methods of studying vegetation.
2. Morphological and anatomical study of different ecological adaptation of selected tree species.
3. Survey of village forest, forest and wetland ecosystems.
4. Study on the succession and retrogression processes in forest, rural and marginal homesteads.
5. Study on regeneration techniques.

### References:

- Anderson, I.M. 1981. Ecology for Environmental Biosphere: Ecosystems and Mass. Edward Arnold.
- Baubenmire, R. 1968. Plant Communities: A textbook of plant synecology. Harper & Row, Publishers. New York.
- Dash, M. C. and Das, S. P. 2009. Fundamentals of Ecology, Tata McGraw Hill, New Delhi.
- Etherington, J. R. 1975. Environment and Plant Ecology. John Wiley & Sons, London.
- Greig-Smith, P. 1983. Quantitative Plant Ecology. 3rd ed. Blackwell Scientific Publications. Oxford, London & Edinburgh.
- Grime, S. P. 1981. Plant strategies and vegetations processes. John Wiley & Sons, Chichester.
- Kamaluddin, M. 1984. Forest Ecology, Institute of Forestry, University of Chittagong, Chittagong, Bangladesh.
- Kershaw, K.A. 1969. Quantitative and dynamic ecology. Edward arnald. Publishers Ltd., London.
- Kimmins, 2003. Forest Ecology, 3<sup>rd</sup> edition, University of British Columbia, Canada.
- Kormondy, E.J. 1976. Concepts of Ecology. 2nd ed. Prentice-Hall, Inc. Englewood cliffs. New Jersey.
- Lal, J. B. 1992. Forest Ecology. Natraj Publishers, Dehradun, India.
- Mackenzie, A., Ball, A.S. and Virdee, R. 2002. Instant Notes- Ecology. 2<sup>nd</sup> edition. Bios Scientific Publishers, UK
- Puri, G.S. 1960. Indian Forest Ecology. A comprehensive survey of vegetation and its environment in the Indian Subcontinent. Vol.I & II. Oxford Book & Stationery Co. New Delhi and Calcutta (India).
- Richards, P.W. 1976. The Tropical rain forest. An ecological study. Cambridge Univ. Press, Cambridge.
- Spurr, S. H. and Barnes, B.V. 1980. Forest Ecology 3rd ed. John Will & Sons., New York
- Whitmore, T. C. 1975. Tropical Rain Forests of the Far East. Clarendon Press. Oxford.

**Course No. : FOR 212**

**Course title : TREE PHYSIOLOGY**

**Marks : Theory : 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

### **Theory**

- 1. Introduction:** General consideration of plant physiology and its relevance to plant regeneration, growth management and environmental conservation.
- 2. Plant- water relations:** Absorption and translocation of water, transpiration in plants and water use efficiency; Water stress and plant growth and productivity, water in the soil-plant-atmosphere continuum, mechanisms of salt and ion absorption.
- 3. Nutrition:** Essential plant nutrients, sources, criteria for essentiality; Forms of availability and absorption; Role of nutrients, diagnosis of nutrient deficiency and excessive supply, visual symptoms, solution culture, sand culture, plant analysis.
- 4. Photosynthesis:** Carbon balance, Introduction photosynthesis in tropical plants; Stomatal conductance, empirical model of photosynthesis; Parameter values and their variation; Carbon consumption and exports by leaves; Photorespiration, calculation of canopy photosynthesis, photosynthetic quotient, Factors regulating photosynthesis, importance of photosynthesis.
- 5. Respiration:** Types of respiration, respiratory quotient, mechanisms in aerobic respiration, anaerobic respiration, fermentation, efficiency of respiration, importance of respiration, regulators of respiration, dry matter partitioning, root mass and turnover.
- 6. Plant growth regulators:** Growth and senescence, regions of growth and growth correlations, growth curve; Measurement and analysis of growth; Phytohormone, characteristics of phytohormone, classification of phytohormone/ growth regulators; Effect of growth regulating chemicals or substances in plant growth and development; Apical dominance; Difference between growth regulators and phytohormones.
- 7. Physiology of flowering:** Photomorphogenesis, photoperiodism, critical day length; Classification of plants based on photoperiod, photoperiodic induction, importance of photoperiodism; Vernalization and its importance, biological clock.
- 8. Seed physiology:** Seed physiology and dormancy, germination, phytochrome and seed germination; Seedling growth in response to shade and light quality, red to far-red ratio; Comparative study of photosynthetic attributes in sun and shade leaves, photo-inhibition and recovery, light and shade acclimation and their significance; Respiration in sun and shade leaves and its importance in plant regeneration.
- 9. Environmental physiology:** Principles of plant response to environment; Environmental aspects of photosynthesis, plant physiological response to atmospheric pollutants.

### **Practical:**

1. Morphological and anatomical study of light and shade leaves.
2. Determination of relative growth rate, net assimilation rate, leaf area ratio, specific leaf area and leaf weight ratio, stem weight ratio, root weight ratio, root-shoot ratio of tree seedlings.
3. Demonstration of photo-inhibition and recovery in shade leaves.
4. Determination of absorption and transpiration in plants.

## References:

- Delvin, R.M. and Witham, F.H. 1983. Plant Physiology (4th ed.) Prindle Weber & Schmidt; 4th edition
- Hennessey, T.C., Dougherty, P.M; Kossuth and Johnson, T.D. 1986. Stress Physiology and Forest Productivity. Martinus Nijhoff Publishers, Dordrecht/Boston/Lancaster.
- Jain, V.K. 2005. Fundamentals of Plant Physiology. Eighth revised and enlarged edition. S. Chand & Company Ltd. New Delhi.
- Kramer, P.J. and Kozlowski, T. 1979. Physiology of woody plants. Academic press New Yourk & London.
- Landsberg. J.J. 1986. Physiological ecology of forest production. Academic Press INC (London) Ltd.
- Pallardy, S.G. 2007. Physiology of Woody Plants, Third edition, Academic Press, 3<sup>rd</sup> edition.
- Pandey. S.N. and Singha, B.K. 1979. Plant Physiology. Vikas Publishing House Pvt. ltd., New Delhi.
- Salisbury, F. and Ross, C. 1991. Plant Physiology, Brooks Cole; 4<sup>th</sup> edition
- Street, H.E. & Opik, H. 1984. The Physiology of flowering plants: their growth and development. 3rd ed., Edward Arnold, London.
- Tiaz, L. and Zeiger, E. 2010. Plant Physiology, Fifth edition, Sinauer Associates, Inc.

**Course No. : FOR 213**  
**Course title : PRINCIPLES OF ECONOMICS**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Total = 75 (3 cr.)**

**Theory:**

- 1. Introduction:** Economics and basic themes of economics-scarcity, choice, specialization and exchange; micro and macroeconomics and their importance and limitations.
- 2. Consumer behavior:** Utility analysis; total utility vs marginal utility; law of diminishing marginal utility; indifference curve approach; Assumptions of indifference curve approach, properties of indifference curve, consumer's Equilibrium, separation of price effect into income and substitution effect, Derivation of demand curve from price consumption curve.
- 3. Demand and supply:** Demand-demand curve, demand schedule and demand function; Causes of downward sloping demand curve and exceptions to the law of demand. Supply-law of supply and factors affecting supply; Equilibrium of supply and demand, changes in the equilibrium price; Concept of elasticity of demand and its importance, meaning and methods of measuring elasticity; price, cost and income.
- 4. Production:** Theory of production function; Law of variable proportions; Returns to scale and the least cost combination of inputs.
- 5. Product pricing:** Nature of cost curves in short and long runs; relation between marginal cost and average cost curves; Concept of revenue, relation between average revenue and marginal revenue; Equilibrium of firm under perfect competition and monopoly.
- 6. GDP:** Circular flow and national income; Calculation of gross national products and gross domestic product; Flaws in calculating the contribution of forestry sectors to national economy and its consequences.

**References:**

Lipsey, R. G. 1983. An Introduction to Positive Economics (6th ed.). Harper and Row.  
McGuigan, J.R. & Moyer, R.C. 1979. Managerial Economics, (2nd ed.). N.Y. West pub.  
Philpor, G. 1980, The National Economy; An Introduction to Macroeconomics, N.Y. Willey.  
Ruffin and Gregory.1979. Principles of Macroeconomics.  
Samuelson, P.A. 1976. Economics (10th ed). McGraw-Hill.  
Shapiro, E. 1978, Macroeconomic Analysis, (4th ed.). N.Y. Harcourt.

**Course No. : FOR 214**  
**Course title : METEOROLOGY**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Total = 75 (3 cr.)**

**Theory:**

- 1. Atmosphere:** Introduction to atmosphere; origin, vertical extent and composition of atmosphere; Vertical temperature distribution of atmosphere.
- 2. Atmospheric thermodynamics:** Gas laws, equation of state, mean molecular weight, geopotential and geopotential height, barometric equation, moisture variable, laws of thermodynamics in relation to dry air and moist air; Stability equations, change of states, clayperon equation, basic principle of thermodynamic diagrams, tephigram and their applications.
- 3. Cloud:** Cloud formation and classification; Precipitation formation and classification.
- 4. Dynamic meteorology:** Forces acting on a particle in the atmosphere, equation of motion of atmosphere, geotropic wind.
- 5. Synoptic meteorology:** Definition and concept of synoptic meteorology. Air masses -source regions, classifying air masses, properties of North American air masses (Continental Polar (cP) and Continental Arctic (cA) air masses, Maritime Polar (mP) Air Masses, Maritime Tropical (mT) Air Masses, Continental Tropical (cT) Air Masses). Fronts- Stationary fronts, Cold fronts and Warm fronts. Cyclone, anticyclone, hurricane, thunderstorms and tornadoes.
- 6. Weather forecasting and satellite meteorology:** Weather symbols and the station model. Beaufort wind scale (Over Land). Weather forecasting. Concept, tools, techniques and methods. Satellite- Concept and mechanism of satellite and its related terms.
- 7. Meteorology and Environment:** Meteorology and air pollution and influence of meteorology on other natural phenomena. Influence of meteorology on natural resources, Land use, forests, water resources, wild life.
- 8. Global climate change:** Reconstructing past climates- climate throughout the ages. Natural climate cycles. Possible causes of climate change. Global warming. Impacts of global warming on coastal and wetland.
- 9. Weather forecast system in Bangladesh:** Weather forecast and its related organization in Bangladesh. Weather forecasting system and information dissemination. Weather forecasting technology available in Bangladesh.

**References:**

- M. Allaby Encyclopedia of Weather and Climate, Vol. 1 & 2, (Revised ed.).  
C. Donald Ahrens, Essentials of meteorology: An invitation to the atmosphere (3<sup>rd</sup> ed.),  
H. R. Byers, General meteorology.  
C. Donald Ahrens. Meteorology today: an introduction to weather, climate, and the environment (9<sup>th</sup> ed.),  
Kevin Hile The Handy Weather Answer Book (2nd ed.).

**Course No.** : FOR 215  
**Course title** : **FOREST ENTOMOLOGY**  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)

### Theory:

- 1. Introduction:** Adaptive features of insects; scope of forest entomology, importance of insects in forestry.
- 2. Taxonomy and classification:** Identifying characters of insect orders. Classification of some common forest insects of Bangladesh.
- 3. Insect structure and morphology:** Insect structure and functions, reproduction and metamorphosis; different types of insect larvae and pupae.
- 4. Insect ecology and population dynamics:** Concept of insect ecology and population dynamics, ecological factors influencing population fluctuations and outbreaks of pests, relative susceptibilities of different forest types to insect damage. Insect damage and sign categories.
- 5. Biology of common forest insects:** Biology, nature, extent of damage and control of the major pests of forests and forest products; a) Nursery pest, b) Plantation pest, c) Wood and timber pest, d) Forest pests and e) Pest of forest tree seeds. Different types of feeding nature of insects (Defoliator, shoot, twig, fruit, seed, stem, trunk and root borer etc.)
- 6. Methods of pest management:** Ecological approach to pest management. Physical, mechanical, cultural, biological and chemical methods of control. Use of different equipments for pesticides application (Knapsack, Bucket-barrel types sprayers, foot sprayers and power sprayers etc.), Precaution and safety measures during application of pesticides.
- 7. Economic insects:** Biology, ecology and economic importance of honeybee, silk worm and lac insects.

### Practical:

1. Diagnosis of major insect pests and their nature of damage particularly for teak defoliator and skeletonizer, Sal heartwood borer, teak canker grab, mahogany shoot borer, gamar defoliator, keora defoliator, geora bee-hole borer, sissoo defoliator and rattan top shoot borer.
2. Identification of common predatory and parasitic insects of forest pests.
3. Methods of insect collection, preservation and dispatch to entomologist for advice
4. Insecticide formulations, pesticide application equipments and safety precautions.
5. Apiculture, lac culture and sericulture demonstration.

### References:

- Alam, M. Z. 1965. Modern insecticides and their uses.
- Anon. 1975. Forest Pest Control. National Academy of Science. NAS, Washington, D. C.
- Baksha, M.W. 1990. Some Major Forest Insect Pests of Bangladesh and their Control. BFRI, Chittagong.
- Baksha, M.W. 2001. Important Pests of Forest Nurseries of Bangladesh and their Management. BFRI, Chittagong.
- Baksha, M.W. and Islam, M.R. M.R. 1997. Major Defoliators of Teak in Bangladesh and their Management. BFRI, Chittagong.
- Basak, A.C. 1997. Mistletoes on Gamar and Teak and their Management. BFRI, Chittagong.
- Beeson, C. F. C. 1941. The ecology and control of forest insects of India and neighboring countries, Govt. of India Bhuiya,
- Borror, D. J. and DeLong, D. M. An Introduction to the study of insects.
- Basak, W. Forest Pest of Bangladesh and their control, Bulletin No. 1, BFRI Publication.
- Chapman, R. F. The Insects structure and function.
- Davidson, R.H. and Longman, W.F. 1979. Insect pests of farm gardens and Orchards. John Wiley & Sons, Inc.
- Findley, W. P. K. 1967. Timber pests and diseases: Pragman Press, 280 p.
- Graham, S.A. and Knight, F.B. 1965. Principles of Forest Entomology, McGraw Hill book Company.
- Harris, W.V. 1964. Termites: Their recognition and control. Longmans, London.
- Imms, A. D. A Text book of Entomology.
- Mathers, G. A. 1979. Pesticide application methods, Longman.
- Metcalf, G. L. and Flint, W. P. Destructive and useful Insects.
- Romosez, W. S. The Sciences of Entomology.
- Snodgrass, R. E. Principles of Insect Morphology.
- USDA.1952. Insects: The Year Book of Agriculture.



**Course No.** : FOR 216  
**Course title** : COMPUTER APPLICATION IN FORESTRY  
**Marks** : Theory : 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)

### **Theory:**

- 1. Fundamentals of computer:** Computers and their application in Forestry; Historical development of computer, computer system.
- 2. Hardware systems:** Number system and logic gates; CPU organization; miniframe, Mainframe and super computer; Hardware generations; Input, output, memory and other computer peripherals; form factor; Future directions in computer system – from Mainframe to wearable computing.
- 3. Software fundamentals:** Software, system software and application software; Operating system: types and functions; Cloud computing and web applications.
- 4. Computer programming:** Introduction to flowcharts, algorithms, programs and program structure, basic ideas about programming language, generations of computer languages.
- 5. Application packages for Forestry:** Productivity suits – Word processing, spreadsheets; presentations; database; statistical analysis using Excel, Minitab, SPSS; Bibliography management.
- 6. Networking and communication:** Computer networking fundamentals – topology, hardware; protocols, LAN, MAN, WAN, Internet and intranet; World wide web; Web sites and web browsers, Search engines; Electronic communications – e-mail, forums, groups, messaging; Social web – wiki, social networks and blogs
- 7. Important web links for Forest:** OARE, UNFCCC, UNEP, IUCN, Google earth, WMO, EPA, DoE.

### **Practical:**

1. Exercise on MS Word, MS Excel, PowerPoint and MS Access.
2. Exercises with software's related to Forestry Minitab, SPSS, Photoshop.

### **References:**

- Don Cassel and Jackson, M. 1980. Introduction to Computers and Information processing. Reston Publishing Company. Virginia.
- Khan, M.S. 1991. Fundamental Elements of Computers. UNDP/FAO Project BGD/ 85/011, IFCU, Chittagong.
- Khan, M.S. 1991. Applied Computer Science in Forestry. UNDP/ FAO Project BGD/85/011, IFCU, Chittagong.
- Mason, W.L. and Muetzelfield, R. 1984. Computers in Forestry. Heriot—Watt University, Edinburgh, UK.

**Course No. : FOR 217**  
**Course Title : FIELD WORK AND VIVA- VOCE**  
**Marks : Field work-25 (1cr.); Viva- voce-25 (1 cr.); Total = 50 (2cr.)**

**Field Work: 25**

Tree planting, Nursing and Reporting	-	8
Field work report	-	7
Field work examination	-	10

**Viva- voce: 25**

A plot of minimum 25 seedlings must be maintained by each student in the selected plantation sites throughout the duration of his/her B.Sc.(Hons.) course.

**The distribution of marks for the program for class attendance will be as follows:**

Attendance (%)	Marks
96 and above	5.0
91 - 95	4.5
86 - 90	4.0
81 - 85	3.5
76 - 80	3.0
71 - 75	2.5
66 - 70	2.0
60 - 65	1.5
Less than 60	00

## FOURTH SEMESTER

**Course No.** : FOR 221  
**Course title** : WILDLIFE ECOLOGY AND MANAGEMENT  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)

### Theory:

- 1. Introduction:** The interaction between wildlife, vegetation and environment; Wildlife conservation and its values.
- 2. Classification, status and distribution:** Classification of wildlife, status and distribution of important wildlife of Bangladesh; endangered, threatened, extinct and rare wildlife of Bangladesh and their causes of declining.
- 3. Conditions and resources in wildlife habitat:** Geographic patterns at large and small scales; Temporal patterns in conditions; Plants and animal resources; The effect of intraspecific competition for resources, the ecological effects of interspecific competition, evolutionary effects of competition and community structure; Terrestrial and aquatic communities and their environments.
- 4. Individuals, populations, communities and ecosystems:** Wildlife census counting individuals, births and deaths; Life cycles and life history patterns; Monitoring birth and death, dispersal, dispersion and migration, the impact of competition on populations; Wildlife habitats—types and diversity in Bangladesh, causes of habitat loss, carrying capacity; territory and home range, changes in the growth and form of host, and host behavior caused by their inhabitants; Predation, grazing and disease; Population processes, patterns in species richness, the flux of energy and matter through ecosystems.
- 5. Applied issues in wildlife ecology:** The human population problem; Harvesting living resources from the wild; the farming of monoculture, pest control, integrated farming systems; pollution; Threats to species and communities; conservation in practice.
- 6. Wildlife management and restoration:** Breeding, reintroduction and translocation, habitat assessment, importance of historic assessment, study design and fundamentals of monitoring, sampling methods, designing a reserve and developing a restoration plan.
- 7. International organization:** TRAFFIC, WWF, IUCN, CITES, IPPL, ISSC, ICBP, CNPPA, UNEP, etc. in wildlife conservation and development; world heritage sites.

### References:

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- Anon. 198. Report of the Wildlife Task Force the Forest Department Bangladesh, Ban Bhavan, Dhaka.
- Anon. 1986. Report of the Wildlife Task Force, - The Forest Department Bangladesh, Ban Bhaban, Dhaka.
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- Woodroffe, R. Thirgood S. and Rabinowitz A. 2005. People and Wildlife, Conflict or Co-existence? Conservation Biology 9. Cambridge University Press.
- Hosetti, B. B. 2008. Concepts in wildlife management. Daya Publishing House, Delhi, India.
- Ranga, M. M. 2005. Wildlife Management and Conservation. Agrobios, Jodhpur, India.
- Reddy, M. V. 2008. Wildlife Biodiversity Conservation. Daya Publishing House, Delhi, India.
- Khan, M. M. H. 2008. Protected Areas of Bangladesh: A Guide to Wildlife. USAID.
- Mallya, A. 2006. Wildlife Tourism and Conservation. GNOSIS, Delhi, India.

**Course No.** : FOR 222  
**Course title** : STATISTICS  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical: 25 (1 cr.); Total = 100 (4 cr.)

**Theory:**

1. Definition, scope and importance of statistics in Forestry; Recent development of statistics use in Forestry
2. Population and sample; data, attributes and variables; accuracy and precision; frequency distribution and its graphical representation; categorical data, ordinal data; random variables, explanatory and response variables, dummy variables
3. Measures of Central Tendency: Expected value, mean, median and mode
4. Measures of Dispersion: Mean deviation, standard deviation, variance, standard error of mean, coefficient of variation, parameters and statistic; skewness and kurtosis.
5. Probability theory: Different approaches of probability, addition and multiplication rules; normal, binomial and Poisson distributions; Calculation of areas under normal curve; Sample space and predicting probabilities; probability density function; cumulative probability density function; CI
6. **Correlation and regression:** Simple correlation coefficient and its properties; Coefficient of determination, linear regression analysis, residual error, standard error, regression coefficient and estimation of future values; OLS assumptions, violation of assumptions, BLUE, consistency, asymptote, homoskedasticity, heteroskedasticity, collinearity, autocorrelation, choice of regression types based on data, regression for categorical data, regression for ordinal data, model specification.
7. **Sampling theory:** Simple random sampling, stratified sampling, systematic sampling. Sample size, sample vs. census, sampling intensity
8. **Sampling distributions and test of significance:** Formulation of null and alternative hypotheses, testing hypotheses, paired and unpaired t-tests, normal test (z-test), DMRT Chi-square test, F- test, confidence limit, choice of a test
9. **Experimental designs:** Definition, principles, important steps of experiments, sample selection, Completely Randomised Block Design, Randomised Block Design, Latin Square Design, and Factorial Design, choice of a design, design for behavioural science

**Practical:**

1. Laboratory exercises in the calculation of means, variance, standard deviation, confidence intervals, *t*- test, Chi-square test.
2. Calculation of Correlation and regression coefficients. Determining variance covariance matrix
3. Simple and multiple regression analysis and interpretation of results
4. ANOVA, *F*-test.
5. Field layout of experimental Design and Analysis of variance.

**References:**

- Campbell, R.C. Statistics for Biologists., Cambridge University Press; 3rd edition  
Freese, F. . Elementary Statistical Methods for Foresters. USDA Forest Service.  
Lapin, L.L. Statistics Meaning and Method. Harcourt Brace Jovanovich Inc. USA.  
Lewis, A. . Biostatistics DeMYSTiFied, McGraw-Hill Professional; 1<sup>st</sup> edition  
Mostafa, M.G. Methods of Statistics. Karim Press & Publications, Dhaka.  
Shokal, R.R. and Rohlf, F.J. Introduction to Biostatistics. W.H. Freeman and Company, New York. 4<sup>th</sup> edition  
Snedecor, G.W. and Cochran, W.G. Statistical Methods. 7<sup>th</sup> edn. Iowa State University Press, Ames, Iowa.  
Townend, J.. Practical Statistics for Environmental and Biological Scientists, Wiley; 1<sup>st</sup> edition  
Waipole, R.E. Introduction to Statistics. 3<sup>rd</sup> edn. Millan Prb. Co. Inc. New York.  
Zar, J.H. Biostatistical Analysis, Books a la Carte Edition, 5th edition Pearson.  
Gujrati, D.N. and Sangeetha. 2007. Basic Econometrics, 4<sup>th</sup> ed. Tata Mc Graw-Hill Publishing Company Ltd, New Delhi, India.  
Kutnr, M.H., Nachtsheim, C.J. Neter, J. and Li, W. 2005. Applied linear statistical Models, 5<sup>th</sup> edition. Mc Graw-Hill, NY.

**Course No. : FOR 223**  
**Course title : AERIAL PHOTOGRAMMETRY, REMOTE SENSING AND GIS**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Practical: 25 (1 cr.) ; Total = 100 (4 cr.)**

### **Theory:**

- 1. Introduction:** Scope, importance, historical development of remote sensing
- 2. Electromagnetic energy:** Nature, propagation of electromagnetic radiation, interaction of EMR with atmosphere (scattering, reflection, absorption, atmospheric, windows, irradiance, exitance) and matter, spectral properties and reflectance characteristics of earth surface features: Vegetation, soil and water: Spectral signature: Red edge, vegetation indices
- 3. Aerial photography:** Cameras, films and filters used in aerial photography; Planning, taking and handling of aerial photographs; Determination scale of aerial photographs, supervised and unsupervised data, ground truthing.
- 4. Photo mosaics:** Controlled and uncontrolled mosaics, mapping from remote sensing data with emphasis on triangulation method.
- 5. Photo interpretation:** Principles and elements of image recognition; Topographical study, drainage assessment and road planning from aerial photographs.
- 6. Satellite imagery:** Types of imagery, satellite technology and imagery production; Digital and manual image analysis, multi-concept of remote sensing and MSS data.
- 7. Major remote sensing systems and sensor technology:** Spaceborne systems (Landsat, IRS, SPOT, ENVISAT, Terra and Aqua etc.) and their sensor characteristics, airborne sensors, types, platforms.
- 8. Introduction to GIS:** Concepts, scopes and components of GIS; Map data representation.
- 9. Geographic database:** Concepts, data input, verification and storage.
- 10. Spatial data analysis:** Acquisition of data from different resources, analytical tools and analysis; Digital terrain model and satellite data processing, spatial data set management using GIS; GPS technique.

### **Practical:**

1. Orientation of aerial photographs for stereo viewing and scale determination.
2. Visuals image interpretation –delineation of areas, measurement of height and canopy cover.
3. Practical works using GIS software's and GPS.
4. Field visits for mapping and computerized image analysis to Remote Sensing and Mapping Institutions SPARSO, RIMS and Office of the Survey General of Bangladesh.

### **References:**

- Akthar, S. and Karki, A.S. 1999. Application of GIS to Mountain Land-use planning. International Center for Integrated Mountain Development. Kathmandu, Nepal.
- Avery, T.F. and Berlin, G.L.. 1985. Interpretation of aerial photographs. 4th edn. Burgess publishing co. Minneapolis, Minnesota.
- Buhmann, S. 1996. Geographic Information System. Bruenig, E.F. and Bossel, H. (eds.). Natural Resource Systems Analysis.
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- Chrisman, N. 1997. Exploring Geographic Information Systems. John Wiley & Sons.
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- Colwell, R.N.; Esters, I.C. and Thorley, G.A. (eds.). 1983. Manual of Remote Sensing Vol. 2. Interpretation and Application. Amer. Soc. of Photogrammetry, Virginia.
- De Mers, M.N. 1999. Fundamentals of geographic information systems. Second edition. New York.
- EGIS. 2000. Geo-spatial tools for analysis of floodplain resources. UPL.
- IDRISI. 1997. IDRISI for WINDOWS ver 2. IDRISI resource center, Clark University, Worchester, MA, USA.
- Korte, P and George, B. The GIS Book. Onward press.
- Lillesand, T.M. and Kiefer, R.W. 1987. Remote sensing and Image Interpretation. Second edition. John Wiley and Sons. New York, USA.
- Lo, C. P. and Yeung A. K. W. 2002. Concepts and techniques of Geographic Information Systems. Prentice-Hall of India.
- Moffit, F.H. and Mihalil, G.W. 1980. Photogrammetry. 3rd edn. Harper and Row Publishers N. York.
- Paine, D.P. 1981. Aerial Photogrammetry and Image Interpretation for Resource Management. John Wiley & Sons. New York, USA.
- Sharma, M.K. 1986. Remote Sensing & Forest Surveys. International Book Distributors. Dehra Dun, India.
- Simonett, D.S. and Ulaby, F.T. (eds). 1983. Manual of Remote Sensing. Volume One. Second edition. American Society of Photogrammetry. USA.
- Walford, N. 1995. Geographical data analysis. John Wiley & Sons.

**Course No.** : FOR 224  
**Course title** : BIODIVERSITY CONSERVATION  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)

### Theory:

- 1. Biodiversity: Concept and overview** of current state of biological diversity--global and regional context, the value of biodiversity, human dependence on biological diversity, genetic variation within plant populations, species and ecosystem diversity, biodiversity and evolution of species.
- 2. Biological diversity:** Species richness within communities, terrestrial and aquatic biodiversity, key elements of the global biodiversity strategy; essential elements of the convention on biological diversity.
- 3. Threats to biodiversity:** Biodiversity and extinctions/, extinctions as a natural process; Anthropogenic losses of species richness, unsustainable exploitation, species extinct on and endangered through over harvesting, introduced species, habitat destruction; Deforestation and loss of biodiversity in tropical forests and in Bangladesh; Increasing diversity by restoring damaged ecosystems.
- 4. Biodiversity conservation principles, strategies and methods:** Rational, conservation activities, challenges to biodiversity conservation , conservation of biodiversity in botanical gardens, policies to protect diversity, international development and protection of biological diversity; Methods for measuring and monitoring of species diversity, ex-situ and in-situ conservation, participatory approach in the biodiversity conservation, ecosystem approach to conservation, biodiversity friendly practices and technologies, developing and implementing National Biodiversity Strategies and Action Plans (NBSAP) in Bangladesh and in South-east Asian countries, World Heritage and the Sundarbans; Forest genetic resources conservation and utilization in Bangladesh.
- 5. Homestead biodiversity:** Topographical features and importance of homestead forests; Special features of homestead flora; livestock and fisheries diversity and conservation approaches.
- 6. Biodiversity conservation efforts:** International, national, NGO, community and individual efforts of biodiversity; Agenda 21 and CBD; CBD principles and Articles for biodiversity conservation; Institutes and Organizations related to biodiversity conservation programs- IUCN, MAB, ITTO, IPGR, CIFOR, BNBG, BRGB and WWF.

### Practical:

1. Assessment of biodiversity in forest and homestead ecosystems
2. Monitoring of biodiversity hotspots

### References:

- Agarwal, S.K. Tiwari, S. and Dubey, P.S. 1996. Biodiversity and Environment. A. P. H. Publ. India.
- Boyle, T. J.B. and Boontawee, B. (eds.). 1994. Measuring and monitoring biodiversity in tropical and temperate forest. Proceedings of IUFRO Symposium, Thailand.
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- Tewari, D. N. 1994. Biodiversity and Forest Genetic Resources. International Book Distributors, India

**Course No. : FOR 225**  
**Course title : MYCOLOGY, PATHOLOGY AND FOREST PROTECTION**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

**Theory:**

**PART -I Introduction to Mycology and Microbiology:**

- 1. Introduction:** Scope of mycology, classification of fungi, vegetative and reproductive structures of fungi and their dispersal; nutrition of fungi. Economic importance of fungi.
- 2. Mycorrhizae:** Mycorrhizae and its importance in forestry.
- 3. Life history:** Life history of selected fungi representing major groups associated with tree diseases - *Phytophthora*, *Fusarium*, *Phythium.*, *Nectria*, *Rhizophus*, *Ganoderma*, *Phomopsis*.
- 4. Bacteria:** General accounts of bacteria and viruses.

**PART -II Forest Pathology**

- 1. Introduction:** Objectives and historical perspectives of forest pathology, plant diseases and its importance.
- Pathogenicity and factors of disease development, classification of plant diseases.
- General symptoms of plant diseases and diagnosis of diseases.
- 4. Disease diagnosis:** Diagnosis of diseases, symptoms and control measures of root rot, dieback, damping off, canker, wilting, leaf spot, heart rot, wood decay, mistletoes, mildews, rust, smut, defoliation, gall, witches broom, stain, blight and other important diseases of forest and homestead trees; pathogenicity and factors of disease development.
- 5. Nursery diseases:** Diseases in forest nurseries- seeds and seedlings, and their symptomatology, causes, prevention and/or control.
- 6. Forest diseases:** Detailed study of major diseases in forests - top dying of sundri, bamboo blight in village groves, wilting of sissou, mistletoe infection of gamar, dieback of keora, sap and blue stain in timber.
- 7. Wood diseases:** Decay of wood and its prevention; heart rots in trees; sap and /or blue stain in timber; dry rot of timber in construction.
- 8. Management:** Principles of forest disease management and control, knowledge of major fungicides and their application, natural resistance of plants against diseases and ecology of diseases.

**PART- III Forest Protection:**

- 1. Forest injurious:** Classification of agencies injurious to forest.
- Nature and extent of damage due to forest fire, wildlife, grazing and human interference with measures to prevent them.

**Practical:**

- Identification and collection of samples consisting of major disease.
- Identification and collection of major disease symptoms of seeds, seedlings and trees damping off, dieback, root rot, wilting, leaf blight, leaf spot, seed rot etc.
- Identification of important tree disease pathogens and wood decay fungi.
- Technique of isolation of fungi.
- Methods of collection and preservation of fungi.
- Field trips.

**References:**

- Alexopoulos, C.S. and Mims, C.W. 1979. Introductory Mycology. Wiley Eastern Limited, New Delhi.
- Ashrafuzzaman, M.H. 1976. Laboratory manual of plant pathology, Chapagar, Mymensingh,
- Baksha, M.W. 2003 (ed). Mortality of Sissoo (*Dalbergia sissoo*) and Top Dying of Sindri (*Herittera fomes*) in Bangladesh. BFRI, Chittagong.
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- Manion, P.D. 1981. Tree diseases concept. Prentice Hall Inc., New Jersey.
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- Seyesta, B. Rahman, M.A. and Khisa, S.K. 1999. Checklist and Host Index of Parasitic algae, Bacteria, Fungi and Mistletoes on Trees and Timber in Bangladesh. BFRI, Chittagong.
- Shrivastava, M. B. 1997. Introduction to Forestry, Vikas Publishing House Pvt. Ltd. Jangpura, New Delhi, 110014.
- Singh, R.S. 1984. Introduction to Principles of plant pathology, Oxford & IBH Publishing Co. Calcutta.

**Course No. : FOR 226**  
**Course title : PROTECTED AREA MANAGEMENT AND ECOTOURISM**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)**

### **Theory:**

- 1. Introduction:** The role of protected areas in biodiversity conservation; changing social expectations for protected area management; threats to biodiversity and their implications for protected area management; Gaining support for protected areas and strategies to gain support for protected areas.
- 2. Protected areas and society:** Brief historical overview of protected areas in Bangladesh; stakeholders and the local community; the issues - protected areas and society; impact of people on protected areas; Impact of protected areas on people; benefits from protected areas; Indigenous peoples and local community rights and protected areas; Managing the interface and meeting the challenge; linking development and conservation through protected areas, protected area categories; Management structures and systems, protected area governance and models of management, adaptive management and challenges.
- 3. Linking protected areas with the surrounding landscape:** Bioregional planning and protected areas; system planning; bioregional planning, putting systems and bioregional planning into practice; ecosystem management; lessons from experiences with ecosystem management and implications for protected area management practice; Principles of ecosystem management proposed for the Convention on Biodiversity.
- 4. Tourism in protected areas:** Wildlife tourism in protected areas; Ecotourism: towards recreation and conservation, problems and prospects of sustainable tourism growth; alternate sustainable tourism, adventure tourism and wilderness, coastal ecotourism and mass tourism and their ecological effect; Coastal tourism and ecological aspects, tourism issues related to socio-culture, hospitality and authenticity, economic and environmental accessibility, strategies of different types of tourism issues, economic significance of tourism, tourism as an element in sustainable development, environmental codes of conduct for tourism.
- 5. Tourism planning and management in protected areas:** Historical perspective, scope, nature and evolution of tourism; the dimensions of tourism and their relation with environment; implications of climate change for tourism; organizations of tourism; principles of tourism planning, goals and methods; purpose and approaches of tourism planning; Essentials of tourism planning, elements of tourism, regional planning concepts, planning process, implementation and monitoring of tourist plan, cost-benefit analysis; Elements, trends and scope of tourism management; Tourism issues and management strategies, tourism impact assessment, environment tourism management and policy, modes of travel and services, travel pattern and management, demand and motivation and their marketing and management.
- 6. Tourism Impact Assessment:** Models and variability in tourism, national, regional and international structure of tourism; Economic, ecological and socio-cultural impact of tourism development; Measuring and assessment of ecotourism impact.
- 7. Tourism marketing, research, policy and regulation:** Prospects of tourism marketing; Methods, planning and management of tourism marketing, tourism services, guides and information systems and identification and evaluation of tourist resources, publicity and promotion in tourism, tourism policy consideration and structure planning, formulation of tourism policy, towards sustainable tourism policy.

### **References:**

- Bornemeier, J., Victor, M. and Durst, P. (eds.). 1997. Ecotourism for Forest Conservation and Community Development: Proceedings of an International Seminar, held in Chiang Mai, Thailand, 28-31 January, 1997. FAO/RAP publication: 1997/26; RECOFTC Report No. 15. Bangkok, Thailand.
- Feeroz, M.M., Hasan, M.K., Khan, M. M. 2011. Biodiversity of Protected Areas of Bangladesh. Vol. I: Rema-Kalenga Wildlife Sanctuary. Bio Track. Arannayak Foundation, Dhaka, Bangladesh.
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- Gill P. S. (ed.). 1999. Dynamics of Tourism. Vol. I-IV. Anmol Publications PVT LTD, New Delhi, India.
- Kumar, R. B. 1995. Coastal Tourism and Environment. APH Publishing Corporation, New Delhi, India.
- Malhotra, R. K. 1998. Socio-Environmental and Legal Issues in Tourism. Encyclopaedia of Hotel Management and Tourism Series. Anmol Publications PVT LTD, New Delhi, India.
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- Sarker, S. U. 1992. Parks and Wildlife Management UNDP/FAO Project BGD/85/011, IFCU, Chittagong.
- Sethi, P. (ed.). 1999. Handbook of Sustainable Tourism. Anmol Publications PVT LTD, New Delhi, India.
- Sethi, P. (ed.). 1999. Handbook of Modern Tourism. Anmol Publications PVT LTD, New Delhi, India.
- Sinha, P.C. (ed). 1997. International Encyclopaedia of Tourism Management. Vol. 1-12. Anmol Publications PVT LTD, New Delhi, India.



**Course No. : FOR 227**  
**Course Title : FIELD WORK AND VIVA- VOCE**  
**Marks : Field work-25 (1cr.); Viva- voce-25 (1 cr.); Total = 50 (2cr.)**

**Field Work: 25**

Tree planting, Nursing and Reporting	-	8
Field work report	-	7
Field work examination	-	10

**Viva- voce: 25**

A plot of minimum 25 seedlings must be maintained by each student in the selected plantation sites throughout the duration of his/her B.Sc.(Hons.) course.

**The distribution of marks for the program for class attendance will be as follows:**

Attendance (%)	Marks
96 and above	5.0
91 - 95	4.5
86 - 90	4.0
81 - 85	3.5
76 - 80	3.0
71 - 75	2.5
66 - 70	2.0
60 - 65	1.5
Less than 60	00

## FIFTH SEMESTER

**Course No. : FOR 311**  
**Course title : PRINCIPLES AND PRACTICE OF SILVICULTURE**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

### Theory:

- 1. Forests, Forestry and Silviculture:** Classification of forests, history of forests and forestry in Bangladesh, Role of forests; Objectives and application of silviculture.
- 2. Form and Life of Trees and Crops:** Trees, form of crowns, architectural forms of trees, foliage, stem, taper, forking, clean bole, buttressing, fluting, root, heartwood etc.
- 3. Growth of Trees and Crops:** Growth of trees, growth regions, factors affecting height growth, growth in volume, growth in uneven-aged stands, phenology and growth, crop morphology.
- 4. Natural Regeneration Methods:** Ecological basis of natural regeneration; natural regeneration by seed, coppice and root sucker in relation to Bangladesh forests; ensuring successful natural regeneration; Natural regeneration procedure for important species and forest types; Importance of aided natural regeneration.
- 5. Tending:** Weeding, cleaning, climber cutting, girdling, pollarding, release cutting, salvage cutting.
- 6. Thinning:** Objectives of thinning; tree classification based on canopy level; methods of thinning and conditions under which each one applied; thinning carried out in various forests of Bangladesh and their effects on growth and yield.
- 7. Silvicultural characteristics:** Silviculture of mixed stands; Silvicultural characteristics of teak, sal, garjon, gamar, mahogany, dhakijam, chaplaish, telsur, kanthal, akshmoni, sissou, raintree, eucalyptus, koroi, neem, sundri, keora, gewa, baen, babla, mango, coconut, bamboo, rattan and pati-pata.
- 8. Silvicultural systems:** Classification of silvicultural systems and their description; silvicultural systems practiced in the forests of Bangladesh and other tropical countries. Special references from different management plans of Bangladesh Forest Department. Bamboo forest resources and their management.
- 9. Homestead forest:** Silviculture and management of species in homestead forests of different biodynamic zones of Bangladesh.
- 10. Mangrove Forests:** Scope, status, management and potentials of mangrove forests in Bangladesh. Potentials of coastal afforestation.
- 11. Urban forestry:** Necessity of greening the urban areas; species selection and planting designs for urban forestry programs.

### Practical:

1. Collection identification and storage of fruit, seed and seedlings of common plantation tree species in Bangladesh.
2. Field studies of a natural regeneration.
3. Schematic practice in a thinning operation.
4. Tending operations in forest plantations.

### References:

- Champion, H.G. and H.K. Seth. 1969. General Silviculture of India. Manager of Publication, Delhi.
- Dwivedi, A. P. 1993. A Text Book of Silviculture. International Book Distributors, Dehra Dun-248001, India.
- Evans, S. 1986. Plantation Forestry in the Tropics. Clarendon press Oxford.
- Hossain M.K. and F.U. Ahmed. wecbæcÖvq e,¶ cÖRvwZi bvm©vix g`vby†qj, AviY`K dvD†Ûkb I Bbw÷wUDU Ae d†iw÷<sup>a</sup> GÛ Gbfvqib†g>Uvj mv†q†Ým, PÆMÖvg wek|we`vjql
- Nyland, R. D. 1996. Silviculture, Concept and Application. McGraw Hill Book Co. International Editions.
- Prakash, R. and Khanna, L.S. 1983. Theory and Practice of Silvicultural Systems. International Book Distributions. Dehra Dun, India.
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- Zabala, N.Q. 1990. Principles and practice of Silviculture. UNDP/FAO/BGD/85/011, Field Document No. 25.
- Zabala, N.Q. 1990. Principles of Silviculture. UNDP/FAO/BGD/85/011, Field Document No. 7.
- Zabala, N.Q. 1991. Silvicultural Systems. UNDP/FAO/BGD/85/011, Field Document No. 27.

**Course No.** : FOR 312  
**Course title** : FORESTRY EXTENSION AND SOCIAL FORESTRY  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Total = 75 (3 cr.)

### Theory:

- 1. Introduction:** Concept and principles of social forestry; Analysis of social forestry programme in Bangladesh and lessons learned from social forestry projects; Social forestry as resources system; Social forestry as a vehicle for rural development; benefits from social forestry.
- 2. Social forestry elements:** Physical and socio-economic environment of social forestry; Targets, goals, and objectives of social forestry; Production systems and appropriate technologies for social forestry;
- 3. Forestry Extension:** Introduction of Forestry Extension, components of a forestry extension programme; Goals and principles in forestry extension, role of forestry extension.
- 4. Extension education and the teaching learning principles:** Teaching and learning, educational principles of adult psychology, characteristics of learning, basic principles of psychology, factors affecting the teaching and learning; Motivation, attribution, emotion, diffusion, adaption. The adaption process, characteristics of adapter groups.
- 5. Extension communication principles and strategies:** The communication process, elements of communication process; Forestry communicator, message, message treatment, channel, audience, principles and theories of communication. **Forestry extension teaching methods:** Individual methods, group methods, mass methods, approaches to extension, information and education, development support communication (DSC).
- 6. Institutional development:** Delivery system and institutional development of social forestry; social forestry extension and education; Social and environmental aspects/impacts of social forestry. **Organizational/institutional development in forestry extension:** Institutional approach in extension; organizational structure, organizational development, empowerment, decentralization, development, financing forestry extension programs.
- 7. Developing Social forestry and Forestry extension programs:** Initial approach, preliminary organization, starting-up community level programmes, developing a social forestry and forestry extension programme, managing the extension organisation.
- 8. Planning, designing, monitoring and evaluation:** Planning, designing, participatory monitoring and evaluation of social forestry; People's participation, land and tree tenure system, efficiency, equity and sustainability.
- 9. Tools and techniques:** Tools and techniques of rural appraisal through Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA), Participatory Action Research (PAR), Diagnosis and Design (D&D), Social Impact Assessment (SIA) and Gender Analysis (GA).
- 10. Social forestry practices:** Social forestry practices in Bangladesh and other Asian countries; NGO activities in social forestry.

### References:

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- FAO. 1987. Forestry Extension Methods, FAO Forestry Paper No. 80. Rome, Italy. 155p.
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- Mercado, C.M. *et al.* Communication and adoption in rural development (Philippine Caso). University of the Philippines Community Development Research Council and Institute of Mass Communication and Department of Agricultural, Quezon City, Philippines.
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- Rebugio, L.L. (ed.). 1990. Readings on Rural Development Social Forestry and Forestry Extension, vol. 3 (Social Forestry). UNDP/ FAO/ 85/011. Field Document No. 23. IFCU.

**Course No. : FOR 313**  
**Course title : WOOD STRUCTURE AND PROPERTIES**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical: 25 (1 cr.); Total =100 (4 cr.)**

### **Theory:**

- 1. Wood anatomy:** Source of wood; Woody plants and their parts; Formation of wood, types of plant cell in wood formation, cross sectional view of different parts of log, different kinds of wood and bamboo.
- 2. Gross features:** Growth rings, colour, lusture, odour, taste, grain, texture, figure etc. in wood and their effects on wood utilization.
- 3. Physical properties:** Weight, Density, specific gravity, permeability of wood to water and other liquids, porosity
- 4. Minute structure of softwood and hardwood:** Conducting tissues, strengthening tissues, storage tissues, inclusion resin canals, tyloses and other features etc.
- 5. Elastic properties of wood:** Stress, strain and Hook's law, elastic limit; modulus of elasticity, modulus of rigidity.
- 6. Strength properties of wood:** Flexibility, stiffness, toughness, brittleness, hardness, maximum load, measurement of strength properties - compression, tension, shear, bending. Static and impact bending tests, factors affecting strength properties of wood and utilization.
- 7. Wood and moisture relations:** Forms of water, MC, MMC, movement of water in wood, EMC, FSP, shrinkage and swelling.
- 8. Chemical properties of wood:** Major chemical constituents of cell wall - cellulose, hemicellulose, lignin, extractives- inorganic and organic etc. and their influence on wood properties.
- 9. Ultra structure of wood:** Mycells, microfibrils, cell-wall layers and its chemical composition, pits, perforations etc.
- 10. Defects in wood :** Natural defects - Reaction wood, blemish wood,
- 11. Thermal and electrical properties of wood**
- 12. Wood properties:** Properties of wood of major timber species of Bangladesh

### **Practical:**

1. Collection and identification of commercial timbers of Bangladesh with hand lens;
2. Determination of strength properties of wood samples;
3. Determination of colour, lusture, grain, texture and figure of wood;
4. Demonstration of wood sectioning, slide preparation and collection of wood.

### **References:**

- Anon.1970. Indian Forest Utilization (Vol. 1) FRI, India.
- Desch, H.E. 1977. Timber its structure and properties. (5th ed.). Macmillan Press Ltd. London.
- Farmer, R.H. 1967. Chemistry - in the utilization of wood. 1st ed. Pergamon Press, London.
- John, G.H. and Jim L.B. 1982. Forest Products and Wood Science: An Introduction. Iowa State University Press.
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- Rowell, R. 1984. The Chemistry of Solid Wood. American Chemical Society, Washington, D.C.
- Tsoumis, G. 1968. Wood as a raw material. 1st edition, Pergamon Press. London.

**Course No. : FOR 314**  
**Course title : NON-WOOD FOREST PRODUCTS**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Total = 75 (3 cr.)**

### **Theory:**

- 1. Introduction:** Definition and classification of non-timber forest products; Importance of non-timber forest products of the world with special reference to Bangladesh.
- 2. Fibers and flosses:** Definition, fibers and flosses yielding forest species; Status and uses.
- 3. Forest species:** Forest species for paper making, fodder, matting, ropes, thatching; Status and uses.
- 4. Common non-timbers:** Bamboos, Goalpata, Rattans/Canes and Patipata Identification, distribution, propagation and cultivation; Status and uses of bamboo, cane, goalpata and patipata growing in Bangladesh.
- 5. Oils:** Oil yielding forest species and their parts used; Distribution of important species, methods of distillation and extraction of oils, status and their uses of tans and dyes.
- 6. Tans and dyes:** Tans and dyes yielding forest species and their parts used; Distribution of important species; status and uses.
- 7. Gums, resins and oleoresin:** Gums and resins yielding forest species and their parts used; distribution of the important species, status and uses of the products.
- 8. Khair:** Distribution of Khair yielding species; Country method of manufacturing khair in Bangladesh; Status and uses of Khair.
- 9. Agar:** Distribution of agar yielding species; Propagation, cultivation, management, extraction and processing of agar.
- 10. Medicinal plants:** Identification, distribution, status, propagation, cultivation and management of medicinal plants in natural forests and homesteads; Parts used in the treatment of various diseases.
- 11. Honey:** Status and method of collection of honey from natural forests; Artificial cultivation procedure and uses.
- 12. Lac:** Definition, history and status of lac cultivation in Bangladesh; Host plants for lac cultivation and their grading; Lac crops cultivation, collection and storage of lac; manufacturing process of shellac and their uses.
- 13. Silk:** Important silk worms and their artificial culture; propagation, cultivation and management of Mulberry and their common diseases and pests; Silk production process.
- 14. Charcoal:** Methods of production, status; Properties and uses of charcoal. Advantages and disadvantage of using charcoal over firewood.
- 15. Marketing:** Problems, prospects, management and marketing of non timber forest products in Bangladesh.

### **References:**

- Alam M.K. 1982. A guide to eighteen species of Bamboo from Bangladesh, Forest Research institute, Chittagong.
- Anon, 1950. The Wealth of India. Council of Scientific & Industrial Research, Delhi, 16 Vol.
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- Ara, R., Merry, S.R. and Siddiqi, N.A. 1996. Cultivation and Uses of twelve Medicinal Plants of Bangladesh, BFRI,
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- Rashid, M.H., Mohiuddin, M. and Ara, R. 1990. Medicinal plants and their cultivation. Minor Forest Products, Series-4, BFRI, Chittagong, Bangladesh.
- Rashid, M.H.; Mohiuddin, M. and Chowdhury, R.A. 1988. Brief description of medicinal plants of Bangladesh. Minor Forest Products, Series-1, BFRI, Chittagong, Bangladesh.

**Course No. : FOR 315**

**Course title : FOREST MENSURATION AND INVENTORY**

**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Practical: 25 (1 cr.); Total= 100 (4 cr.).**

**Theory:**

**PART-I (Mensuration)**

1. Definition, objectives, scope and importance of Mensuration in Forestry.
2. Principles, methods and instruments for measurements of diameter and height of trees; Errors of measurements and variations.
3. Principles and uses of Relaskope in forest mensuration; Basal area factors and its uses.
4. Forms and shapes of trees; taper functions and taper equations.
5. Measurement of logs and tree volume; Stack volume estimation, different formulae for calculating volume of logs; Construction and testing of volume table, types of volume tables.
6. Stand variables and measurements of basal area, canopy cover and dominant height; stock measurement.
7. Stem analysis; estimation of age and growth rate of trees in plantations.

**PART-II (Inventory)**

1. Revision of statistical procedures in sampling and objectives of inventory.
2. Types of forest inventory. Inventory Planning.
3. Sampling designs commonly applied in forest inventories—random, systematic, cluster, two phase, multistage and stratified sampling designs; relative efficiency of sampling designs; subjective and objective sampling designs; Principles and application of point sampling.
4. Choice of plot size and shape, permanent sample plots. Application of remote sensing technique in forest inventory; Forest inventory planning and procedure; Collection of data from field processing and report writing.
5. Estimation of growth and yield, yield table, uses of yield table, MAI and CAI, dominant height, Rotation age fixation, site assessment in plantations for forecasting growth and yield.

**Practical :**

1. Practice of commonly used instruments in forest mensuration and inventory: Diameter tape, Spiegel Relaskope, Wedge prism, Sunto clinometer, Haga Altimeter etc .
2. Field exercises in tree and stand measurements, estimation of log volume, standing tree volume, form factor, crown diameter, crown area etc.
3. Use of different sampling techniques in forest inventory.
4. Construction and testing of volume tables, biasness in volume table.
5. Planning and executing an inventory in forests.

**References:**

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- Bruce, D. and Schumacher, F.X., Forest mensuration, McGraw-Hill book Company, Inc., New York.
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- Philip, M. S. Measuring trees and Forests. Division of Forestry, Univ. of Dar es Saalaam.
- Temu, A.R. Forest Mensuration. UNDP/ FAOBGD/ 85/011. Field document No. 3. IFESCU.

**Course No. : FOR 316**  
**Course title : BUILDING MATERIALS AND CONSTRUCTION**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

### **Theory:**

#### **PART-I Building Materials:**

- 1. Introduction:** Introduction of materials used in construction.
- 2. Stones:** Classification, sources and uses; Quarrying, dressing and storing characteristics of good stones and their tests.
- 3. Bricks and tiles:** Description, classification, composition, sources and uses; Characteristics of good bricks and tests; clay suitable for manufacturing of tiles and uses of tiles.
- 4. Cement and lime:** Classification, composition, uses and characteristics of good cement and lime, and their test and storage.
- 5. Sand and surki:** Description, classification, composition, sources and uses; characteristics, grading properties and storage of sand and surki.
- 6. Mortar and plaster:** Function, preparation and uses of mortar and plaster; colour washing and distempering.
- 7. Concrete:** Ingredients, proportion and mixing; grading, laying and curing of concrete.
- 8. Timber and panel products:** Timber and panel products; bamboo, thatch, paints and varnishes; Structural steel used as building materials.

#### **PARA-II Building Constructions:**

- 1. Site selection:** Factors to be considered in selecting a building site.
- 2. Building foundation:** Various types and construction of foundation; bearing power of soils; causes of failure of foundation.
- 3. Brick masonry:** Principles in construction of brick masonry, bonds in brick walls.
- 4. Roof:** Types and specification of different types of roofs and their construction procedures.
- 5. Floors:** Specification and construction of different types of floors.
- 6. Doors and windows:** Types and standard sizes of doors and windows and their fixtures and fittings.
- 7. Beams and columns:** Types, specification and construction procedure of beams and columns.
- 8. Stair and stair cases:** Types and specification of stairs and stair cases.
- 9. Plumbing:** Names of water supply and sanitary fittings; specification of water storage tank, septic tank, drains and manholes.
- 10. Electricity:** Service entry and distribution board; Wiring system and electric fittings.
- 11. Building materials and construction cost estimation:**
- 12. Strength:** Introductory knowledge on strength, factor of safety, working stress, bending moment and shear force of materials.
- 13. Maintenance:** Maintenance commonly required in a building to increase its durability.

#### **Practical:**

1. Identification and testing of common building materials.
2. Drawing and construction of foundations brick walls, columns, lintels, beams, floors, roofs and stairs.
3. Observation of different types of doors and windows.
4. Drawing of plan, elevation, section and foundation plans of Forest Bungalow.
5. Preparation of a building estimate.

#### **References:**

- Aziz, M. A. 1973. A text book of Engineering materials. Hafiz Book Centre, 167, Govt. New Market, Dhaka.
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- Singh, G. 1979. Standard Handbook of Civil Engineering (3rd ed.), Standard Publishers Distributors, 1075-B, Nai sarak, Delhi-6, P.O. Box-1066.
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**Course No. : FOR 317**  
**Course Title : FIELD WORK AND VIVA- VOCE**  
**Marks : Field Work-25 (1cr.); Viva- voce-25 (1 cr.); Total = 50 (2cr.)**

**Field Work: 25**

Tree Planting, Nursing and Reporting	-	08
Field work report	-	07
Field work examination	-	10

**Viva- voce: 25**

A lot of minimum 25 seedlings must be maintained by each student in the selected plantation sites throughout the duration of his/her B.Sc.(Hons.) course.

**The distribution of marks for the program for class attendance will be as follows:**

Attendance (%)	Marks
96 and above	5.0
91 - 95	4.5
86 - 90	4.0
81 - 85	3.5
76 - 80	3.0
71 - 75	2.5
66 - 70	2.0
60 - 65	1.5
Less than 60	00

## SIXTH SEMESTER

**Course No.** : FOR 321  
**Course title** : URBAN AND LANDSCAPE FORESTRY  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Total = 75 (3 cr.)

### Theory

1. Introduction: Evolution of Cities; Social Needs and Values of Urban Society; Urban Forestry, Components and Uses of Urban Vegetation
2. Appraisal and inventory of urban vegetation: Values of Urban Vegetation; Street Tree Inventory; Park and Other Urban Natural Resources Inventories
3. Planning for and Management of Urban Vegetation: Urban Planning and Urban Forestry; Existing plantation acts/rules; Choice of tree species for planting; Management of Street Trees: planning, planting and maintenance; Management of Park and Open Space Vegetation; arboriculture
4. Protection of Urban forests: Pests, diseases, non-pathogenic, construction and other man-made and natural damage of urban forests and their management
5. Urban Forestry practices in Bangladesh: Major cities of Bangladesh and scope of urban forestry in those cities; urban forestry in town planning with its potential in Bangladesh
6. Urban forestry in South and South-east Asian countries: urban forestry practices in Thailand, India, China, Malaysia
7. Tree planting in Non-forest landscapes: significance, classification of non-forest landscapes; choice of species for planting in different classes of landscapes; utility of trees/plantations in different types of landscapes
8. Landscape Forestry: Definition, its relationship to other areas of forestry, Causes of changes in landscape pattern (abiotic, biotic, human land use and disturbance), landscape planning, management and conservation.

### References

*Urban Forests and Trees: A Reference Book* (2005). Editors: Konijnendijk, C.C., Nilsson, K., Randrup, Th.B., Schipperijn, J.

**Urban Forestry: Planning and Managing Urban Greenspaces** (2007). [Robert W. Miller](#), Waveland Press

**Course No. : FOR 322**  
**Course title : RUBBER, TEA AND COFFEE**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)**

**Theory:**

**Rubber:**

- 1. Introduction:** Natural vs. artificial rubber; soil and climatic requirements of rubber; Importance and history of rubber cultivation in Bangladesh; international rubber organizations:
- 2. Nursery:** Site selection and preparation of land, types of nursery, seed collection, germination and nursery bed preparation; bud bank and bud grafting; Poly bag soil preparation and transfer of ramet to poly bag, important clones of rubber;
- 3. Planting site:** Preparation of planting site and planting of ramet; cultural operations; pests and diseases of rubber in nurseries and plantations, and their control measures.
- 4. Tapping and processing of crude rubber:** Tapping techniques and rules in tapping; Collection and processing of latex; grades of final products.
- 5. Processing and utilization of rubber wood:** Felling, Prophylactic treatment, Saw milling, Preservation and utilization of rubber wood.

**Tea:**

- 6. Introduction:** Genesis structure and growth of Bangladesh tea; Tea growing zones and area of tea gardens, Statistics of tea in Bangladesh and other countries; Environmental requirements for tea growing selection and management of tea gardens.
- 7. Plant:** Botanical description and agrotypes of tea in Bangladesh; Field key to recommend clones; Shade management and its importance in tea cultivation; Common shade tree species and their characteristics; Green manuring, cover crop, mulching and windbreaks in tea culture.
- 8. Nursery management:** Propagation of tea by seeds and vegetative parts; Field technique for selection of mother bush; nucleus clone plot and its maintenance; selection of nursery sites, land preparation and nursery bed preparation; planting procedure of tea cuttings in nursery and their maintenance and hardening; nursery maladies and remedies; pre-planting soil sterilization.
- 9. Crop management:** Young tea crop management—land preparation, planting techniques placement of plants; Layout of tea/ shade / green crops, bringing-up young tea, pruning, plucking, manuring and pest control; Mature tea crop management –pruning, pruning cycle, tipping and plucking, fertilizer application.
- 10. Crop protection:** Tea protection technology; tea pest management –adaptive and technological strategies; tea pests and diseases and their control measures; Manual and chemical weeding, economics of weeding, preventive and eradicated measures for weed control.
- 11. Manufacture:** Manufacture of black and green tea—plucking and leaf handling, withering, processing, fermentation, drying, sorting and grading, storage and packing, tea tasting and manufacture of green tea; Tea marketing.

**Coffee:**

- 12. Historical background:** Importance of coffee cultivation and its future in Bangladesh; botanical description of the plant and its climatic and edaphic requirements for cultivation; Manufacture of parchment coffee; prospects of coffee marketing in Bangladesh.

**References:**

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- Eden, T. 1965. Tea, 2<sup>nd</sup> ed. Longman's Green. London.
- Edgar, A.T. 1960. Manual of rubber planting. Malaya, Kuala Lumpur, Inc. Society of planters.
- Grammer, P.J.S. 1957. Review of literature of Coffee Research in Indonesia, Turrialba, Costa, Rica. Inter-Amer, Inst. Agric. Res., Misc. Bull. 15.
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- Harper, A.E. 1962. Modern Coffee Production 2nd Ed. Leonard Hill London.
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- Rao, B.S. 1975. Maladies of Heavea in Malaysia, Rubber Research Institute of Malaysia, Kuala Lumpur,
- Sana, D.L. 1988. Tea Science, Ashrafia Boi Ghar, 36 Bangla Bazar, Dhaka 1000.

**Course No.** : FOR 323  
**Course title** : RESEARCH METHODOLOGY  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)

**Theory:**

- 1. Introduction:** Introduction to research; objectives and types of research, research design and planning.
- 2. Research ethics:** Concepts of research ethics; Its importance; Codes and policies of research ethics; Ethical and legal misconducts; Common ethical misconducts; authorship dispute and its resolution; Promoting ethics in research and its benefits; Some important violation of research ethics in the history (1932-2012).
- 3. Research steps:** Problem identification; Literature searching- necessity and procedure (both off- and online searching); Research gap and justification for research; objectives and hypothesis formulation; methodology – experimental designs, sampling methods, collection, manipulation, validation, and analysis of data, procedure with particular reference to various fields of forestry; use of secondary data-when why and how to use secondary data, preparation of questionnaire and schedules; data, and results; Interpretation and presentation of data/results.
- 4. Proposal writing:** concepts and necessities; ways to keeping an eye on funding/scholarship opportunities; steps involved in proposal writing (motivation, reading, preplanning writing the proposal, submitting, awaiting the decision, and resubmission); necessity to maintain quality in a research proposal, points not to be forgotten while writing a good proposal.
- 5. Writing report:** Types of reports, their contents and formats; write up style, clients/beneficiaries of research reports; procedures and rules followed in writing various parts, viz. introduction-the single most important part of a research report-why, materials and methods, results, discussion, conclusion, recommendations and references in a report; Special precautions in publishing of research results.
- 6. Application of software in statistical analysis in research:** Need for software application in the present context; Advantages of software use in data analysis; Statistical knowledge and software use; facts and reasons behind executing a program; risk of improper/incorrect use of software; practical demonstration of data analysis through Excel, R, and SAS (examples/assignments on reading, manipulating, analyzing datasets,); exporting software outputs to expected locations or word files; interpretations of the output- what do those number in the results mean?
- 7. Research problems:** Recent developments in forestry research, problems common in forestry research , probable solutions to outcome of the problems.
- 8. Bibliography management:** Concept and importance of bibliography management; manual versus electronic management of biography; uses of reference writing software; software and researchers- an obvious interface; some commonly used bibliography management software, how to use EndNote/Zotero- creating library, adding-deleting references, import and export of references, editing reference in the text, and creating list of references; risk in using bibliography software and possible solutions.

**Practical:**

1. Writing a dissertation research proposal.
2. Analysis of small datasets through software packages (SAS, R, Excel)
3. Writing references (both manually and electronically) from given bibliographic situations
4. Writing a sample research paper.

**References:**

- Cochran, W.G. 1963. Sampling Techniques, 2<sup>nd</sup> edition John Wiley & Sons Inc. New York. 413p.
- Kothari, 2001. Research Methodology
- Kothari, C. R. 1990. Research Methodology- methods and techniques.2<sup>nd</sup> edition. Wishwa Prakashan, India
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- Zar, J.H. 1984. Biostatistical Analysis. Prentice-Hall inc. Engle Wood Cliffs, New Jersey, USA.

**Course No.** : FOR 324  
**Course title** : AGROFORESTRY  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)

### Theory:

- 1. Introduction:** Historical development and concept of agroforestry, Role of agroforestry in rural development and environment; Agroforestry for multiple production
- 2. Classification of Agroforestry systems:** Structural basis, functional basis, socio-economic basis and ecological basis of classification of agroforestry systems.
- 3. Basic principles:** Basis principles in agricultural crop production; Classification of agronomic crops based on use, horticultural crops and cultural management; Pest and disease control of agronomic crops;
- 4. Tree-crop interaction:** Concepts of resource sharing and tree crops interaction in agroforestry; Positive, negative and complex interactions; Below and above ground interactions; Methods for quantification of tree-crop interactions; Characteristics of an ideal tree and agricultural crops; Livestock animals reared in agroforestry systems.
- 5. Agroforestry in Bangladesh:** Historical perspectives of agroforestry in Bangladesh; General pattern types, structure and diversity in Bangladesh, indigenous management techniques in each types of agroforestry; Selected case studies from different agroecological zones of Bangladesh.
- 6. SALT:** Shifting Cultivation and Sloping Agricultural Land Technology (SALT): Introduction historical perspectives, characteristics and significance of SALT. Shifting cultivation vs. SALT; selected case studies of SALT from Bangladesh other tropical countries.
- 7. Agroforestry initiatives:** Historical perspectives of agroforestry improvements and NGO intervention in non timber forest products in Agroforestry of Bangladesh:
- 8. Economics:** Financial and economic analysis of agroforestry projects in Bangladesh; Time value of money, ex-ante analysis and post evaluation in agroforestry.
- 9. Agroforestry in other countries:** Agroforestry practices in Ghana, Kenya, Nigeria, Trinidad, Indonesia, Thailand, India, Sri Lanka and Phillipines.

### References:

- Ahmed and Ali. 1994. Agroforestry: Bangladesh perspective Plan.
- Chy, and Stunler. Tree-crop Interaction-A Physiological Approach.
- Gupta, J.P. and Sharma, B.M. Agroforestry for sustainable productivity in Arid Regions. Scientific Publication, Jodi Press, India.
- Huxley, P.A. 1983. Plant Research and Agroforestry, ICRAF, P.O. Box No. 30677, Nairobi, Kenya. 617p.
- ICRAF. Agroforestry today. ICRAF House, Nairobi, Kenya.
- Jarvis, P.G.. 1999. Agroforestry Principles and Practices.
- Nair, Sholz & Duryea. 1990. Agroforestry Systems, vol. 12. An International Journal in Cooperation with ICRAF. Kluwer Academic Publishers. AD Dordrecht, the Netherlands.
- Raintree, J.B. 1987. D & D User's Manual: An Introduction to Agroforestry Diagnosis and Design, ICRAF, Nairobi, Kenya.
- Singh, M.P. and Tewari, D.N. 1996. Agroforestry and wastelands. Anmol Publication Pvt. Ltd. New Delhi, India.
- Zabala, N.Q. 1990. Agroforestry. UNDP/FAO/ BGD/ 85/011, Field Document No.1. Institute of Forestry, Chittagong University, FAO, Rome.

**Course No.** : FOR 325  
**Course title** : SAW MILLING, SEASONING AND PRESERVATION  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)

**Theory:**

- 1. Saw milling and workshops:** Storage with classification, Types of saws, sawmills and their advantages and disadvantages; Saw teeth and their geometry; Methods of sawing; wood working machines; saw doctoring; selection and layout of saw mills.
- 2. Grading of timber:** Scope and purpose of grading, systems of grading, classification of logs and poles
- 3. Wood seasoning:** Introduction, objectives, principles and importance of seasoning, air seasoning, kiln, solar seasoning, special seasoning methods, dehumidification methods.
- 4. Degradation of wood:** Seasoning defects - Types, causes and prevention; Wood decaying and sap staining fungi, insects.
- 5. Wood preservation:** Introduction of wood, bamboo, rattans and sun-grass; Objectives and benefits from preservation; Types and characteristics of good wood preservatives; Preservation methods; Preparation of wood for preservative; Steps involved in introduction new preservatives; cause of wood deterioration.
- 6. Ergonomics:** Safety requirements in sawmilling industry; Importance of ergonomics in sawmilling and processing workplace.

**References:**

- Anon. 1970. Indian Forest Utilization, Forest Research Institute and Colleges, India.  
Brown, W. H. Introduction to the Seasoning of Timber Vol. 1.  
Findlay, W.P.K. 1985. Preservation of Timber in the Tropics. Martinus Nijhofs Publisher, Lancaster.  
Kollmann, F.P.P and W.P. Cote. Jr. Principles of Wood Sciences and Technology.  
Pratt, G. H. Timber Drying Manual.  
Sattar, M. A. *et al.* 1999. Physical and Mechanical Properties and Uses of Timbers of Bangladesh, BFRI, Chittagong.

**Course No. : FOR 326**  
**Course title : FOREST TRANSPORTATION ENGINEERING**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.).**

### **Theory:**

- 1. Introduction:** Introduction and necessity of forest road; Forest road geometry nomenclature, forest road classification; road network and pattern in valley, midslope and ridges; Switchback and serpentine patterns.
- 2. Road alignment:** Route survey for road layout (P-line survey); traverse, grade location, cross-section and construction survey.
- 3. Road design:** Road curves, sight distances, road grades, geometric and non-geometric design, super elevation, curve widening and off tracking; shoulders, intersections and turnouts.
- 4. Earthwork:** Earthwork calculation; mass diagram as a tool of balancing earthwork; haul computation; borrow and waste; Compaction factor; road construction methods and equipment.
- 5. Walls:** Types of retaining walls and breast walls; Materials used and forces acting upon them; Condition of stability, thumb rule for retaining wall design.
- 6. Drainage and culverts:** Types of road drainage and culverts; Selection and design of culvert for specific drainage discharge.
- 7. Bridges:** Site and waterway selection for bridge; Types of forest bridge with components of each; Materials used in construction; forces acting on bridge; design of bridges.
- 8. Road maintenance:** General wear of roads and road surface maintenance; Improving of existing roads and renewal of surface, road deactivation, road signs.
- 9. Cost estimate:** Estimating of earthwork, retaining walls, culverts and bridges associated with roads.
- 10. Equipment maintenance:** Sources of energy, conversion of energy, introduction about the major systems of diesel and petrol (gasoline) engines; maintenance of forest transportation equipment.

### **References:**

- Bindra S.P. 1981. A course on Highway Engineering, Dhanpat Rai and Sons, 1682, Nai Sarak, Delhi-110006.
- Castaneda, F. 1989. Forest Transportation Engineering, UNDP/FAO/BGD/85/011, Institute of Forestry, Chittagong University, Chittagong.
- Castaneda, F. 1991. Maintenance of Forest Engineering Equipment, UNDP/FAO/BGD/ 85/011, Institute of Forestry, Chittagong University, Chittagong.
- Crouse, W. H. 1981. Automotive Mechanics. 8th edition. Tata McGraw-Hill Pub. Co. Ltd. New Delhi.
- FAO. 1977. Planning Forest Roads and Harvesting Systems. FAO Forestry Paper 2. FAO, Rome.  
Forestry Commission: Forest Records No. 75. 49 High Holborn. London WC1V 6HB.
- Grandfield, E.F. 1972. Design, Construction and Maintenance of Earth Dams and Excavated Pronds.
- Rowan, A.A. 1976. Forest Road Planning. Forestry Commission Booklet 43.49. High Holborn, London WC1V 6HB.
- Roy, K.P. 1976. An Introduction to Heat Engines. Vol. I Asia Publishing House. New York..
- Singh, G. 1979. Standard Handbook of Civil Engineering. (3<sup>rd</sup> ed.) Standard Publishers Distributors, 1075-B, Nai Sarak, Delhi-6, P.O. Box 1066.
- Wegner, E. 1984. Forestry Handbook, (2nd ed.). John Wiley and Sons. New York.



**Course No. : FOR 327**  
**Course title : HORTICULTURE**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)**

**Theory:**

1. **Overview:** Definition. Brief history of horticulture, Divisions of horticulture; Scope and opportunity of studying horticulture in Forestry. Principles, methods, problems and prospects of horticulture plants in hilly regions of Bangladesh.
2. **Classification of horticultural plants:** Fruit, vegetables, ornamental and spices and medicinal plant crops.
3. **Methods of propagation of horticulture plants:** Seeding, cutting, layering, grafting, budding and their merits and demerits; Use of root inducing substances in stem cutting propagation.
4. **Nursery management:** Types, objectives, establishment and management of nursery and its structures; calendar of nursery activities, layout of a nursery; use of nursery equipments; methods of planting horticultural crops; preparation of seedbed and nursery bed; practices on potting, deporting and repotting.
5. **Horticultural aspects, cultivation and management of the following horticultural crops:** Mango, Jackfruit, Litchi, Papaya, Guava, Pineapple, Brinjal, Plum, Rose, Dahlia, Grasses and leafy ornamental plants etc.
6. **Propagation:** Importance, methods and techniques for propagation of tree crops with advantages and disadvantages; Use of growth regulators in propagation; Propagation practices of different forest crops; pruning and training of important horticultural crops practicing different methods of application of manure, fertilizer, and intercultural operations.
7. **Pre- and Post care of seedlings:** Transplantation of seedlings, fertilizer application and Irrigation, Objectives, methods, merits and de-merits.
- 8: **Post-harvesting handling and marketing of horticultural products:** Different methods of harvesting, sorting, grading, packaging, transportation and marketing of horticultural crops.

**References:**

- Adams, C.R., K.M. Bamford and M.P.Early. 1993. Principles of Horticulture (2<sup>nd</sup> ed.). Linacare House, Jordan Hill, Oxford.
- Anonymous. 1991. Training Manual on Post harvest Handling and Marketing. HRD Project. FAO/UBDP/ASDB Project: BGD/87/025.
- Bakhshai, J.C., D.U. Uppal and H.N. Khajuria. 1997. (2<sup>nd</sup> edn.). The Prunning of Fruit Trees and Vines. Kalyani Publishers. India.
- Bose, T.K., S.K. Mitra and M.K. Sadhu. 1986. Propagation of Tropical and Sub-tropical Horticultural Crops. Naya Prokosh, Calcutta.
- Chhadha, K.L. 2001, Hand Book of Horticulture. ICAR, New Delhi.
- Davidson, H. R. Meckienburg , and C. Peterson, 1994. Nursery management: Administration and culture (3rd edn.). Englewood clitts, J.J. Prentice-Hall
- Hartmann, H. T., D.E. Kester and F.T. Davies Jr. 1990. Plant Propagation: Principle and Practices. Prentice-Hall, International editions.
- Mondal, M.F.2000. Nursery and Plant Propagation (in Bangla). Mrs. Afia Mondal, BAU Campus, Mymensingh.
- Prasad, S. and U. Kumar, U. 1999. Principles of Horticulture in India. Agro Botanica, New Delhi.
- Randhawa, G.S. and A. Mikhopadhyay. 1994. Floriculture in India. Allied Publishers Limited, New Delhi.
- Rao, K.M. 1995. Text Book of Horticulture. Macmillan India Limited.
- Sadhu, M. K. 1996. Plant Propagation, New Ag. Int. Ltd., Publishers, New Delhi.
- Sandini, M.G. 1995. Training Manual of Plant Propagation and Nursery Management. HRD Project and DAE, Khamarbari, Dhaka.

**Course No. : FOR 328**  
**Course Title : FIELD WORK AND VIVA- VOCE**  
**Marks : Field Work-25 (1cr.); Viva- voce-25 (1 cr.); Total = 50 (2cr.)**

**Field Trip: 25**

Tree planting, Nursing and Reporting	-	08
Field work report	-	07
Field work examination	-	10

**Viva- voce: 25**

A plot of minimum 25 seedlings must be maintained by each student in the selected plantation sites throughout the duration of his/her B.Sc.(Hons.) course.

**The distribution of marks for the program for class attendance will be as follows:**

Attendance (%)	Marks
96 and above	5.0
91 - 95	4.5
86 - 90	4.0
81 - 85	3.5
76 - 80	3.0
71 - 75	2.5
66 - 70	2.0
60 - 65	1.5
Less than 60	00

## SEVENTH SEMESTER

**Course No. : FOR 411**

**Course title : FOREST MANAGEMENT**

**Marks : Theory : 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)**

### Theory:

- 1. Forest resources:** Classification of resources; scope of forest management; peculiarities and principles of forest management; multiple-use forestry; management of homesteads and alternative sources of wood in Bangladesh.
- 2. Management objectives:** Purpose and policy; need for having a dynamic forest policy; choice of objectives; owner's attitudes and decisions on policy and objectives; social role of forestry.
- 3. Sustained yield:** Sustained yield concept; progressively increasing levels of yield on a sustained basis; definition and explanation of related terms-felling series, rotation, felling cycle, cutting series, etc.
- 4. Rotation:** Meaning and kinds of rotations for forest crops; factors affecting choice of rotation; discussion on rotations.
- 5. Normal forest:** Concept of normal forest; need for an ideal standard for monitoring; effect of silvicultural systems on normality; normal even-aged and normal unevenaged forest; discussion: volumes, values, and types of normal forests.
- 6. Growing stock:** Estimate actual growing stock and its increment; General considerations and need for repeated inventories; distribution of age gradations or classes in regular forests; normal and actual distribution of age classes estimation and reduction factors for density, quality, etc.; volume and increment of stands; factors affecting quality and price increment; choice of final felling time.
- 7. Yield regulation:** Yield regulation and yield planning; yield regulation and silviculture; regulation yield of services, organic sequestration; Yield regulation in forests of Bangladesh.
- 8. Forest Management in Bangladesh:** Evolution of forest management in Bangladesh; Silvicultural treatment (s); Status of preparation of working plans (M.P.S.) for various Forest Divisions of Bangladesh; Management of bamboo forests; Sustainable forest management; integration of local level planning processes in forest management planning process.
- 9. Collaborative forest management:** Approaches of collaborative forest management, Different sorts of collaborative forest management, forest co-management, History of forest Co-management in Bangladesh, co-management systems in PAs of Bangladesh, Co-management Council and Co-management Committee, Success and criticisms of Co-management in forest management of Bangladesh, Criteria Indication
- 10. Joint action with development organization in implementing forest management plan prescriptions.**
- 11. RIM:** Resource Information Management System in managing forests of Bangladesh, Forest certification.

### References:

- Clutter *et al.* 1983. Timber Management: A quantitative Approach, John Willey and Sons.
- Davis, K.P. 1968. Forest Management: Regulation and valuation, Second edition, McGraw Hill, U.S.A.
- Davis, L. S. and Johnson, K.N. 1987. Forest Management. McGraw Hill Book Company, New Delhi, India.
- Duerr, W.A., Teegarden, D.E., Christian Sen, Gutterberg S. 1999. Forest Resource Management., W. B. Saunder Company, Philadelphia, London, Toronto, 612p.
- Jerram, M.R. K. 1983. Text Book on Forest Management, International Book Distributors, 9/3, Rajpur Road, Dehra Dun- 248001.
- Osmaston, V.C. 1984. The Management of Forests. George Allen and Unwin Ltd. London.
- Pant, M.M. 1990. Forest Resource Management. Field Document No.2: UNDP/FAO/ RGD/ 85/011, Institute of Forestry, Chittagong University.
- Prakash, R. 1986. Forest Management. M/S. International Book Distributors, Rajpur Road, Dehra Due-248001, India.

**Course No. : FOR 412**  
**Course title : FOREST HARVESTING**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical – : 25 (1 cr.); Total = 100 (4 cr.)**

### **Theory:**

- 1. Introduction:** Introduction and scope of forest harvesting.
- 2. Logging preparation:** Road construction and demarcation of logging area; procurement of equipment; labour supply and preparation of the camp.
- 3. Felling operations:** Preparation and methods of felling; equipment required for felling operation.
- 4. Conversion:** Procedure of delimiting, topping and bucking operations; equipment required in the operations.
- 5. Extraction:** Methods of log extraction –kidding and yarding; log landing, its location and characteristics; skid trail patterns; traditional semi-mechanized and mechanized system of skidding; assortment, tree length and whole tree method of skidding; methods of cable yarding systems and their merits and demerits.
- 6. Log transportation:** Types of land, water and aerial transportation of logs; traditional and mechanized systems of land and water transportation; types of loading and unloading of logs at landing and mill sites.
- 7. Reduced impact logging:** History of reduced impact logging in the tropics; logging in tropical versus temperate forests; Basic requirements of reduced impact logging; Issues of reduced impact logging.
- 8. Maintenance:** Maintenance of felling, bucking extraction and transportation equipment.
- 9. Log storage and depot:** Dry and wet storage of logs with their merits and demerits; types of depot; maintenance of depot records; stock taking at depot; methods of stacking; measures for protection of timber in depot.
- 10. Sale and disposal:** Different systems of sale and disposal of forest produce; departmental versus private agency in harvesting of forest produce.
- 11. Logging plans and costs:** Preparation of a logging plan; procedures of production and cost calculation of logging operation; production planning in logging; production standard.
- 12. Safety and ergonomics:** Safety requirements in logging operations; protective dress, ergonomic problems in harvesting activities.

### **Practical:**

1. Demonstration on use and maintenance of felling and bucking equipment.
2. Execution of felling conversion and skidding operations and establishment of relationship between time required in each operation with quantity of converted materials.
3. Preparation of a logging plan.
4. Maintenance of log transportation equipment

### **References:**

- Brown, N. 1949. Logging. John Willey and Sons, New York
- Castanedia, F. 1989. Logging and Transportation. UNDP/FAO/BGD/85/011, Institute of Forestry. Chittagong University, Chittagong.
- Conway, 1982. Timber Cutting Practices. Third edition. Miller Freeman Publishers, Inc. USA.
- FAO. 1974. Logging and Log Transport in Tropical High Forest-manual on production and cost FAO Forestry Series 5: FAO Forestry Development Paper 18, Rome.
- FAO. 1977. 1977. Planning Forest Roads and Harvesting Systems. FAO Forestry Paper 2. FAO. Rome.
- FAO. 1985. Logging and Transport in Steep Terrain. FAO Forestry Paper 14. Rev. I. FAO, Rome.
- FAO/ILO. 1980. Chainsaw's in Tropical Forests. FAO Training Series No. 2. FAO Rome.
- Heinrich, R. 1982. Logging on Mountain Forests, FAO Forestry Paper 33. FAO, Rome.
- Samset, Ivar. 1985. Winch and Cables Systems. Martinus Nijhoff/Dr. W. Junk Publishers, Kluwer Academic Publishers, Marylang, USA.
- Satoo, T and. Madgwick, H.A.I. Forest Biomass. Martinus Nijhoff/Dr. W. Junk Publishers, Kluwer Academic Publishers, Marylang, USA.
- Seppanen H. and D. Malvas, 1986. Case Study on Self-Loading Winch Trucks in the Tropical High Forests of Vietnam. FAO, Rome.
- Staaf, K.A.G. and N.A. Wiksten. 1984. Tree Harvesting Techniques. Martinus Nijhoff/Dr. W. Junk Publishers, Kluwer Academic Publishers, Marylang, USA.
- Wegner, Karl. E. 1984. Forestry Handbook. Second edition. John Wiley and Sons. New York.

**Course No. : FOR 413**  
**Course title : WOOD AND BAMBOO COMPOSITES, PULP AND PAPER**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

**Theory:**

1. **Introduction:** History and prospects of wood composites, wood structure and fiber composition, pulp and pulp products.
2. **Plywood and laminated wood:** Introduction to various terms on plywood and laminated wood, raw materials used, manufacture-pretreatment of bolts, peeling, slicing, drying of veneers; mixing and spreading of glue; pressing, condition and post manufacturing treatment, uses, manufacturing tea chest.
3. **Particleboard and fiberboard:** Explanation of the terms on particleboard and fiberboard; raw materials used, manufacturing processes; uses and parameters affecting board properties.
4. **Pulp and paper:** Raw materials, sources of raw materials, harvesting, Procurement of raw materials, pulping, manufacturing process of pulp and paper and matches.
5. **Bamboo composite.**

**Practical:**

1. Identification of different composite wood products.
2. Manufacture of boards.
3. Determination of pulp freeness.
4. Determination of physical strength properties of paper.
5. Determination of KMnO<sub>4</sub> and Kappa No. of pulp for bleaching demand.

**References:**

- Aktharuzzaman, A.F.M. 1984. Standardization and Quality Control of Paper and Paperboard. BFRI, Chittagong.
- Anon. 1970. Indian Forest Utilization (Vol. I) FRI. India.
- Bose, S.K. 1983. Different Grades of Paper. BFRI, Chittagong.
- Britt, K.W. 1984. Handbook of Pulp and paper technology. 1<sup>st</sup> ed., CBS Publisher's & Distributors, Delhi.
- Pansh, A.J. ; Harrar, E.S. ; Bethell, J.S. and Baker, W.J. 1962. Forest Products: their Sources, Production and Utilization. McGraw Hill book Company, London.

**Course No. : FOR 414**  
**Course title : PLANTATION SILVICULTURE**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

### Theory:

- 1. Introduction:** Forestry situation in Bangladesh and need for forestation; scope, objectives and role of plantation silviculture.
- 2. Tree seeds:** Sources of seeds, seed collection time and procedure; extraction, drying cleaning, storing procedure of forest tree seeds; pre-treatment of seeds; seed testing and seed certification; use of seeds from seed orchards.
- 3. Seed production area:** Requirement for seed production area, criteria for selection of trees to be retained; thinning and management of seed production area.
- 4. Reforestation planning:** Introduction, pre planning activities; ecological survey; economic survey; community survey and reforestation plan.
- 5. Choice of species:** Criteria for selection of species; species site matching, indigenous knowledge in selection of species.
- 6. Nursery practices:** Importance and types of forest nursery; site selection; nursery establishment; seedling raised in nursery bed; ploy bag, containers and root trainers; sowing and pricking out; care and maintenance of seedlings, watering; shading, mulching, weeding, root pruning and hardening of seedling; morphological grading; transport of seedlings.
- 7. Plantation establishment and Management:** Planting survey; site preparation; out planting procedures; cultural practices, mulching; growing of cover crops and nurse crops; use of fertilizers, method and season of application and environmental implications; under planting and enrichment plantation; pure and mixed plantations development and their management and protection; Maintenance of record and preparation of plantation journals. Rotation length, harvesting their first rotation areas and preparation for the next silvicultural considerations.
- 8. Artificial regeneration:** Plantation and artificial regeneration techniques of indigenous and exotic tree species particularly in Bangladesh with general description, origin and distribution; and environmental requirements: Garjan, sal, teak, gamar, koroi, mahagoni, eucalyptus, akashmoni, neem, koroi, bamboo, cane etc.
- 9. Coastal afforestation:** Mangrove and coastal forest of Bangladesh; recent development in the coastal afforestation in Bangladesh; techniques in coastal afforestation programs.
- 10. Threatened native tree species:** Identification, nursery raising and plantation techniques of threatened tree species in Bangladesh.

### Practical

1. Seed collection, identification and storage, Seed testing, Seed treatments, germination.
2. Collection of potting media, preparation of seed bed, sowing and nursing, care and maintenance of seedlings in the nursery, stump preparation.
3. Participation in plantation activities.

### References:

- Chowdhury, M.R. 1995. The forest nursery and plantation manual. GOB. Forest Department, office of the conservator of Forests, Development circle.
- Davidson, J. 1985. Species and sites. What to plant and where to plant. Field Document No-5, UNDP/FAO project BGD/79/017, Assistance to Forestry sector, Dhaka Bangladesh.
- Davidson, J. and Das, S. (eds.) 1985. Eucalyptus in Bangladesh. BFRI, Chittagong.
- Evans, S.1982. Plantation Forestry in the tropics, Clarendon press, oxford.
- Hossain M.K. and F.U. Ahmed. wecbœcÖvq e,¶ cÖRvwZi bvm©vix g˘vby†qj, AviY˘K dvD†Ûkb I Bbw÷wUDU Ae d†iw÷ª GÛ Gbfvqib†g>Uvj mv†q†Ým, PÆMÖvg weklwe˘˘vjql
- Islam, Q.N. and Neven, K. 1989. Review of on-going Tree Species Elimination, Provenance and Growth Trials. Working Paper-9, FAO/UNDP/BGD/83/010.
- Zabala, N.Q. 1990 Plantation Silviculture .UNDP/FAO/BGD/85/011. Field Document No.19
- Zabala, N.Q 1990, Practice of silviculture. UNDP/FAO/BGD//85/011.Field Document No.30
- Zabala, N.Q, 1990 Silviculture of Species, UNDP/FAO/BGD/85/o11.Field Document No.14
- Zabala, N.Q.1990.Principals of Silviculture. UNDP/FAO/BGD/85/011.Field Document No.7

**Course No. : FOR 415**  
**Course title : TREE IMPROVEMENT AND BIOTECHNOLOGY**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.)**

**Theory:**

- 1. Introduction:** Scope, factors, relevance of tree improvement to plantation silviculture.
- 2. Evolution genetics:** Breeding concept; genetic changes due to selection, mutation, migration, and isolation; mechanism of inbreeding, and against inbreeding; causes of hybrid vigor and inbreeding depression.
- 3. Variations:** Environmental and genotype variations in individuals; measurement of variability.
- 4. Approach to forest tree improvement:** Selection and crossing of superior individual tree, testing and selection of tree from different geographic sources; introduction of exotic species; hybridization between species and races; polyploidy breeding, clonal selection and propagation.
- 5. Improvement methods:** Tree improvement method through mass selection, individual tree selection and recurrent selection; species and provenance trials; seed orchard establishment and management; progeny testing; gene conservation.
- 6. Germplasm:** Germplasm selection, collection, maintenance and conservation.
- 7. Clonal forestry:** Relative importance of clonal forestry; species suitable for clonal propagation; clonal propagation methods, factors and multiplication potential; establishment, management and economic aspects of clonal plantation; operational use of clonal plantation in production forestry and homestead agroforestry; tissue culture and biotechnology.

**Practical:**

1. Field demonstration on tree Improvement and hybridization techniques.
2. Field demonstration on emasculation and hybridization.
3. Practice on vegetative propagation using different methods.
4. Field practice on selection of individual plus trees.
5. Practice of tissue culture.

**References:**

- Burley, J. and P.S. Wood. 1976. A manual on species and provenance research with particular reference to the tropics Tropical Forestry paper No.10, Dept. Forestry Comm. Forestry Institute, University of Oxford.
- Eaulkner, R. 1975. Seed Orchards. Forestry Comm. Bull. No.54. London. Her Majesty's Stationery office.
- Elsh, J. R. 1981. Fundamentals of Plant Genetics and Breeding. John Wiley and Sons, New York.
- Haque, M.A. *et al.* 2000. Seed Orchards and Tree Improvement in Bangladesh. BFRI, Chittagong.
- Rashid, M.H. *et al.* 2000. Vegetative Propagation of Forest Trees in Bangladesh. BFRI, Chittagong.
- Wright, J. W. 1976. Introduction to Forest Genetics. Academic press. New York.
- Zabala, N.Q. 1990. Genetics and tree Improvement. UNDP/FAO/BGD/85/011, Field Document No.18. Institute of Forestry, Chittagong University, Chittagong & FAO, Rome.
- Zoble, B. and J. Talbert. 1984. Applied Forest Tree Improvement. John Wiley and sons. New York.

**Course No. : FOR 416**  
**Course title : FOREST RESOURCES ECONOMICS AND MARKETING**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Total = 75 (3 cr.).**

**Theory:**

- 1. Introduction:** Concept of resource economics; forest economics in aid of forestry decision; limitations of economics.
- 2. Demand and supply:** Demand and supply of forest products in Bangladesh; Elasticity of the forest products in Bangladesh (demand, supply, conjectural, land); demand supply research in the forestry sector of Bangladesh.
- 3. Cost:** Production function; Cost functions, law of variable proportions; returns to scale the least cost combination of inputs, Social cost and competitiveness of forest economy (local, regional, and interregional perspective).
- 4. Market:** Market structure and its classification into perfect competition, monopolistic competition, duopoly, oligopoly, monopoly; monopsony, oligopsony, short-run and long-run price and output for the industry; price and quota fixing in the forestry sector.
- 5. Forest products marketing:** Role and scope of marketing of forest products in Bangladesh; classification of forest products and their marketing characteristics; marketing analysis and research; carbon sequestration and trading; marketing channels and profit sharing mechanism, types of markets; price and quota fixing for supplies to BFIDC, KPM, and other industries; open and black markets; wood from village groves/ homesteads
- 6. Stumpage appraisal:** Forest product's marketing systems in Bangladesh; stumpage appraisal methodology; natural and general problems of stumpage appraisal; appraisal problems.
- 7. Forestland valuation:** Purpose of valuation; Faustmann's soil expectation value formula; problems of forestland value.
- 8. Nonmarket valuation of forest services**
- 9. Value chain:** Profitability of forest products; factors affecting forest product valuation, changes in value at different stages of production.
- 10. Development planning:** Forest and business development plan; external economics and diseconomics; cost benefit analysis.

**References:**

- Baumol, W.J. 1970. Economic theory & Operation Analysis. Prentic – Hall of India Private Ltd. New Dhlhi.
- Davis and Johnson. 1987. Forest Management. McGraw Hill Book Company.
- Duerr, W.A. 1960. Forestry Economics. McGraw Hill Book Company. N.Y.
- Gregory, G. R. 1972. Forest Resource Economics. The Ronals Press Company New York, USA.
- Howe, C.W. 1979. Natural Resource Economics. John Willey & Sons. N.Y.
- Kibria, M.G. *et al.* 2000. Forest Statistics of Bangladesh. BFRI,Chittagong.
- Leigh, J. H. 1971. The Timber Trade: An Introduction to Commercial Aspects. (2nd ed.), Pegamon Press, Oxford.
- Pant, M.M. 1986. Forest Economic & Valuation. Medhawi Publishers, Dehra Dun. 512p.
- Pant.M.M. 1990. Marketing of Forest Products in Bangladesh, UNDP/FAO/ BGD/85/011. Field Document No.16, IFESCU & FAO.
- Rich, S. U. 1970. Marketing of Forest Products: Texts and Cases. McGraw Hill Book Company.



**Course No. : FOR 417**  
**Course title : FIELD WORK, AND VIVA- VOCE**  
**Marks : Field Work-25 (1cr.); Viva- voce-25 (1 cr.); Total = 50 (2cr.)**

**Field Work: 25**

Tree planting, Nursing and Reporting	-	08
Field work report	-	07
Field work examination	-	10

**Viva- voce: 25**

A plot of minimum 25 seedlings must be maintained by each student in the selected plantation sites throughout the duration of his/her B.Sc.(Hons.) course.

**The distribution of marks for the program for class attendance will be as follows:**

Attendance (%)	Marks
96 and above	5.0
91 - 95	4.5
86 - 90	4.0
81 - 85	3.5
76 - 80	3.0
71 - 75	2.5
66 - 70	2.0
60 - 65	1.5
Less than 60	00

## EIGHTH SEMESTER

**Course No.** : FOR 421  
**Course title** : FOREST BASED ENTREPRENEURSHIP AND COMMUNITY DEVELOPMENT  
**Marks** : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr.: Written-20, Attendance-05); Total = 75 (3 cr.)

### Theory:

- 1. Introduction:** Overview of forest-based rural Industries/ enterprises Definition of small-scale forest-based rural enterprises; Basic characteristics of forest based-rural enterprise technology, location, size, entrepreneurship, labour, role of forest based rural enterprises in community development-employment and income generation; Other socio-economic impact.
- 2. Types of forest based rural industries:** Wood- based rural industries/enterprises types, classification, current availability, processing facilities, markets, employment, other social benefits, impact on rural economy, bamboo-based rural industries, rattan (cane) and pati-pata based rural industries, wild fruits and nuts based rural industries, medicinal plants, mushroom, tannins, gums, and essential oils, resin industry, sericulture.
- 3. Strategies to promote forest based rural industries:** Markets and market development; Financing; developing and promoting technology and technical skills; improving management and managerial skill; institutional support for small scale rural based processing enterprises; Extension services for small scale industries, promoting communal small- scale forest based processing enterprises, promoting patipata and rattan industries.
- 4. Entrepreneurship development:** Entrepreneurship-concept, categories. Factors facilitating entrepreneurship development, Institutional and organizational arrangement to support potential and existing entrepreneurs.

### References:

- Arnold, J. E. , *et. al.* 1987. The importance of small forest-based processing enterprises in developing countries. UNASYLVA, Vol. 39 No.3 &4. Rome, Italy.
- FAO, 1981. Small and Medium Sawmills in Developing countries. FAO Forestry Paper No. 28. Rome, Italy.
- FAO, 1986. Appropriate Forest Industries. FAO Forestry Paper 68. Rome, Italy.
- FAO, 1987. Forest-based Rural Enterprises: Pakistan. RAPA Publication 1987/3, Bangkok, Thailand.
- FAO, 1987. Small-Scale Forest-Based Processing Enterprises. FAO Forestry paper No.79, Rome, Italy.

**Course No.** : FOR 422  
**Course title** : WATERSHED MANAGEMENT  
**Marks** : Theory: 50 (1 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Practical : 25 (1 cr.); Total = 100 (4 cr.).

### Theory:

- 1. Introduction:** Concepts of watershed, its management, objectives, importance and classification in Bangladesh; Important surface and underground features of watershed; Classification of soil mantle and nomenclature of various components of underground water; Hydrological characteristics of rocks and sediments, ground water depth in Bangladesh.
- 2. Hydrology:** Hydrology and forest hydrology; Hydrological cycle, factors influencing infiltration; Measuring infiltration rates; infiltration rates under varied micro-environmental situations, water balance equation and water balance in Bangladesh; Influences of forests on infiltration, rainfall, interception and water storage.
- 3. Water quality:** Water quality and importance of water to quality life of humans, palatability of water, common impurities in water with their effects; Comparative advantages of ground water and surface water, water quality standards and parameters.
- 4. Erosion and sedimentation:** Geologic and accelerated erosion; agents, types and causes of erosion; forms of water erosion; Estimating erosion rates, erosion rates under different land covers, universal soil loss equation, erosivity and erodibility; Conditions, phases, causes and control measures of wind erosion, sediments and sedimentation process, causes of flood in Bangladesh.
- 5. Shifting cultivation:** Shifting cultivation worldwide and in CHTs, land administration system, extent, intensity and causes of shifting cultivation in CHTs.
- 6. Soil conservation:** Aim and principles of soil conservation; mechanical, vegetative, agronomic and management based measures of soil conservation in upland watershed of Bangladesh; low cost and expensive soil conservation structures and which one to be applied under which situation; contour and contouring; effects of different forest management activities on watershed health; SALT in soil conservation; indigenous technology knowledge for watershed management in Bangladesh and mouza forest.
- 7. Planning for watershed development:** Need for planning, procedure of watershed planning, data requirements for an integrated plan, economic analysis and watershed work plan for watershed development.

### Practical:

1. Field demonstration on concepts and important features of a watershed.
2. Laying out of contours on hill slope and measurement of hill slopes.
3. Surveying and identifying various forms of soil erosion including gullies.
4. Demonstration of techniques and procedures to reduce various soil erosions related problems.
5. Measurements of discharge and sediment loads in streams.
6. Determination of watershed characteristics, such as length of stream, stream density, and drainage density of watershed using maps of river systems in Bangladesh.
7. Determination of infiltration rates in the field under different land uses and topographical positions, and drawing graphs with collected data.
8. Preparation of report based on collected information from laboratory and field.

### References:

- S. M. Sirajul Haque, C-sequestration and CO<sub>2</sub> release in upland watershed of Bangladesh, IFESCU and USDA, 2013, ----pp.
- S. M. Sirajul Haque, Hill cutting in and around Chittagong city, IFESCU and USDA, 2011, 90 pp.
- S. M. Sirajul Haque, Infiltration in upland watershed of Bangladesh, IFESCU and USDA, 2012, 75 pp.

- Raeder-Roitzsch, J. E Lectures on Watershed Management and Forest Hydrology.. 1968, Pakistan Forest College, Peshawar.
- Notes on soil Erosion and specification of basic structural and vegetative control measures. Geyilk, M. P. Field Document No. 6. Nepal. UNDP/FAO.37. 1983
- Principles of Forest Hydrology, Hewlett, J. D. 1982
- Soil and water in upland watershed of Bangladesh, S. M. Sirajul Haque, IFESCU and USDA, 2013, 350 pp.
- Soil Conservation. Hundson, N. 1971, B. T. Batsford Limited.
- Soil Conservation. Kohake, H. and A. R. Bertrand 1959, McGraw Hill Book Co.NewYork.
- Soil erosion in upland watershed of Bangladesh, S. M. Sirajul Haque, IFESCU and USDA, 2012, 131 pp.
- Vegetation in upland watershed of Bangladesh, S. M. Sirajul Haque and Mostafa Kamal Pasha, IFESCU and USDA, 2013, 302 pp.
- Watershed Management Extension and Environmental Conservation in Bangladesh, S. M. Sirajul Haque and Maung Hla Myant, IFESCU and USDA, 2011, 188 pp.
- Watershed Management from Bangladesh Perspective, S. M. Sirajul Haque, IFESCU and USDA, 2013, ---- pp.

**Course No. : FOR 423**  
**Course title : FOREST POLICY, LAW AND ADMINISTRATION**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)**

### **Theory:**

#### **PART I: Policy**

1. **Introduction:** History, principles and procedures in formation and formulation of forest policy.
2. **Bangladesh forest policies:** Forest policy of 1894; forest policy resolution of 1955; directives on forest policy of 1962; national forest policy 1979 and 1994; energy policy, methods of policy analysis.
3. **Need for forest policy:** Need for developing a political will of the people; impact of national and international conventions on forest policies.
4. **Implementation of forest policy:** Implementation and monitoring of forest policies in Bangladesh and organizations related in implementation.
5. **Laws for Wildlife conservation:** Legislation, administration and training on parks and wildlife management; new laws and amendment of existing laws; training on species status, distribution, patrolling, education, use of arms, dogs, elephants, tracking, capturing transplantation reintroduction etc.; salient feature of Bangladesh wildlife act, creators of national parks, wildlife sanctuary and game reserves; formation of Bangladesh wildlife advisory board and making of rules for putting into effect.
6. **Access to Information**

#### **PART II: Law**

1. **Legislative measures:** Necessity and limitation of a special forest law.
2. **Legal terms:** Explanation of commonly used terms in forest administration such as abatement, cognizable and non-cognizable offenses, collusion, compounding offense, confiscation, confession, criminal breach of trust, criminal misappropriation, mischief, mistake of fact, leading question, pre-emption, recognizance, right, royalty, salvage, search warrant, seizure, servitude, summary trials, warrant causes, waif wood, wasteland, government property acquisition and requisition, royal tree, rights and ownership.
3. **Act and rules:** Section by section study of Forest Act, 1927 and Forest (amendment) Act 2000; sawmilling act., seed ordinance 1977; private forest ordinance 1959.
4. **Transit rules:** Transit rules of various forest divisions; Transit rules 2012
5. **Constitution :** Constitution of reserve forest and Constitution of protected forests.
6. **Organization services:** Organizational structure, stillness, services responsible for forest management.

#### **PART III : Administration**

1. **Public administration:** Basics, concepts, characteristics and history of public administration in Bangladesh.
2. **Legal organization:** Organizational structure, manpower, skillness responsible for forest management.
3. **Changes needed:** Need for changes in policy, law and administration etc. to cope with the changing socio-economic conditions of Bangladesh.

#### **References:**

- Al-Huainz, S.M. 1989. Major Environmental problems of Bangladesh: An overview.
- Anon, 1969. Compilation of various Acts, Rules and Regulations pertaining to Forest Management and Administration. Agriculture (Forest) Department Govt of East Pakistan, Dhaka.
- Anon, 1977. Proceeding of the First Bangladesh National Conference on Forestry. Dept of Forestry, Govt. of Bangladesh
- Anon, 1979. Forest Policies of 1979. (Booklet). Govt. of Bangladesh.
- Anon, 1982. Proceeding of the Second National Forestry Conference Bangladesh. Dept of Forestry. Govt. of Bangladesh.
- Anon, 1989. The Forest (Amendment) Ordinance. Bangladesh Gazette, Sept. 4, 1989. Govt. of Bangladesh
- Anon, 1990. Environmental problems in Bangladesh: An NGO perspective for policies and action. ADAB-Environment Advisory Group.
- Asaduzzaman, M. 1989. Socio-economic issues in Environment Management in Bangladesh.

- Choudhury, A. 1989. The Forest Act, 1927 (As modified upto December, 1989). Published by New Warnings Book Corporation 14, Banga Bandhu avenue, Dhaka-1020.
- Clawson, M. 1974. Forest Policy for the future, papers and discussion from a forum on Forest Policy for the Future May 8-9, 1974, Washington, DC, USA.
- Clawson, M. 1977. Research in Forest Economics and Forest policy, papers resulting from a symposium. January 13-14, 1977. Washington DC, USA.
- Hummel, F.C. 1984. Forest Policy, Martinus Nijhoff/Dr. W. Junk Publishers, Boston.
- Khan, S.A. 1978. An Introduction to the National Forest Policy of Bangladesh (Unpublished).
- Pant, M.M. 1989. Forest Resource Management; Field Document No.2, UNDP/FAO/ BGD/85/011, IFCU. 18-53p.
- Sedjo, R.A. 1984. Resources for the future. Proceedings of a Workshop on Forest Policy Education, Jan. 13, 1984. Washington D.C., USA.
- Worrell, A.C. 1970. Principles of Forest Policy. McGraw Hill, Inc.

**Course No. : FOR 424**  
**Course title : LAND USE PLANNING AND MANAGEMENT**  
**Marks : Theory: 50 (2 cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05); Total = 75 (3 cr.)**

### **Theory:**

- 1. Land:** Land and its characteristics; land tenure- ownership rights; land use conflicts
- 2. Land use:** Combined and multiple land uses, irreversible and reversible land uses, Land use change, drivers/factors and effects and history of land use change, land use models and examples; Importance of land use study, agrarian transformation, land reforms and some experiences.
- 3. Land use planning:** Nature, scope, usefulness, planning goals and focus of land use planning, levels of planning, and planning process and steps in land use planning.
- 4. Land and land use policy in Bangladesh:** Land use policies, Principles and national policies and covering land and land use in Bangladesh
- 5. Land assessment:** Description of land factors considered for land evaluation; simplified methods for site classification and site suitability assessment; framework for land evaluation; soil information systems, parametric methods, and the land system methods.
- 6. Capability classification:** Understanding the terms land capability, crop suitability, traditional system of land classification in Bangladesh, main land capability classes and subclasses in Bangladesh and description of land capability classes selected for forests.
- 7. Site quality:** Site and Site quality, significance of site quality in forest management; site and forest productivity and site factors that influence productivity; modification of site productivity; approaches for determination of site quality; site qualities recognized for the forests of Bangladesh,
- 8. Agroecological and dendroecological regions:** Background information for creation of agroecological and dendroecological regions in Bangladesh, description of the main components of agroecological regions; Description of dendroecological classification in Bangladesh.
- 9. Landscape management:** Characteristics, objectives and procedures of landscape management.
- 10. Urban planning:** Factors consideration, principles for urban planning.

### **References:**

- Brammer, H. 2002. Land Use and Land Use Planning in Bangladesh. The University Press Limited, Dhaka.
- Davidson, D.A. 1982. Soil and Land Use Planning. Longman, London.
- Davies, K.P. 1976. Land Use. McGraw-Hill Inc. USA.
- FAO, 1988. Land Resources Appraisal of Bangladesh for Agricultural Development, UNDP/FAO Project BGD/81/035, Technical Reports 1-7, FAO, Rome.
- FAO. 1993. Guidelines for Land-use Planning. Food and Agriculture Organization of the United Nations, Rome (FAO/UNDP. 1971. Bangladesh Soil Resources, Soil Survey Project, AGL: SF/PAK 6 Technical Report 3.
- Hassan, M.M. 1999. Soils of Bangladesh: Their genesis, classification and use potential. March Printers Ltd., Dhaka.
- Mandal, R.B. 1990. Land Utilization: Theory and Practice. Concept Publishing, New Delhi.
- OECD, 1976. Land use policies and agriculture. Organization for Economic Co-operation and Development, Paris.
- Richards, B.N. and Hassan, M.M. 1988. A Co-ordinate Forest Soil Research Program for Bangladesh.
- Richards, B.N. and Hassan, M.M. 1989. Dendroecological regions of Bangladesh: A land capability assessment for tree species. FAO/UNDP Project BGD/81/010, Working Paper- 7, BFRI, Chittagong.
- Sabrousse, R. 1984. Preliminary Report on the Ecological Classification of Plantations in the Chittagong and Chittagong Hill Tracts District. Working Paper No. 2, FAO/UNDP Project BGD/79/017.
- Stevens, P.R. 1987. A simplified field manual for site classification and site suitability assessment in Bangladesh forests. FAO/UNDP Project BGD/81/011- Assistance to the second Agricultural research Project.

**Course No. : FOR 425**  
**Course title : FOREST ACCOUNTING AND DEVELOPMENT PLANNING**  
**Marks : Theory: 50 (2cr.); Class Test/Tutorial: 25 (1 cr. : Written-20, Attendance-05);Total = 75 (3 cr.).**

**Theory:**

1. Planning and operation of accounting systems flow charting of financial and cost data movement.
2. Definition of Book keeping; object and advantages of Book – keeping; Principles of double entry book-keeping.
3. The nature of a transaction, classification of accounts, rules for debit and credit.
4. Transaction of capital, drawings bad debts, discount, acquisition and disposal of property, Improvement of property, repairs, depreciation; Cheque – its kinds and treatment in accounts.
5. Journal, Cash book with “Bank” column, bank reconcillation statement; Imprest system of petty cash.
6. Ledger; posting, balancing and closing.
7. Trial Balance; Functions, Preparation of Trial Balance, Limitations of trial Balance.
8. Final Accounts: Preparation of statement of profit and loss and statement of assests and liabilities, provisions and simple adjustments.
9. Forest accounts as followed in the Forest Department.
10. Principal features of development planning, the planning process, organizing planning.
11. Formulating objectives for forestry development.
12. Measuring social costs and benefits- Benefit- cost analysis; limitations of cost- Benefit analysis; Externalities of the forestry sector.

**References:**

- Pant, M.M. 1991. Planning Forestry Development in Bangladesh. IFCU. 137p
- Gittinger, J.P. 1982. Economic analysis of agricultural projects published for the Economic Development Institute of the World Bank. The John Hop King University Press, London.
- Odum, H.T. & Nilsson, P.O. 1996. Environmental accounting: energy and environmental decision making.
- Schaltegger, and Burritt, R. 2000. Contemporary Environmental Accounting: Issues, Concepts and Practice. Greenleaf Publishing Limited, UK
- Kurth, H., Gerold, D. & Ulbricht, R. 1994. Forest Management planning: Sustainable regulation of forests. OLV Deutscher, Berlin Gmb H.



**Course No.** : FOR 426  
**Course title** : PROJECT PAPER  
**Marks** : Project paper =50 (2 cr.); Seminar/ Practical-25 (1 cr.); Total = 75 (3 cr.).

- 1. Review of relevant literature** or scientific publications on a selected issue in forestry, and /or conduct of simple research/ study on a forestry problem. The text of the review paper topic should be between seven thousand and twelve thousand words excluding references and table of content. Topic of the review paper should be presented by the students in the seminar. Review paper could be evaluated on the basis of the following criteria:
- 2. Logic and organization:** Problem well defined, rationale clearly stated; Methods clearly described; Data collection, analysis and guided an appropriate conceptual framework; Conclusions/Recommendations based on observation and/or analysis.
- 3. Relevance:** Topic is directly related to current forestry issues; Materials/ Information presented are appropriate.
- 4. Simplicity and clarity:** Ideas are expressed clearly and simple; Correct grammar used and rules of composition observed.
- 5. Originality and creativity:** Diverse information/ideas are well integrated or synthesized into a new form/ structure; Interesting and relevant insights are drawn form study results.
- 6. Conducting simple research /study on a particular forestry problem**
- 7. Data collection, analyzing, interpretation and report writing.**

**Course No. : FOR 427**

**Course title : INTEGRATED FOREST MANAGEMENT PLAN**

**Marks : (Field Assessment -10; Management Plan (Field work Report): 50; Viva-voce: 15; Total =75)**

**1. Before field work, theoretical background will be given on:**

- i. Definition and object of Forest Management plan (FMP).
- ii. Management Plan components.
- iii. Working circles.
- iv. Forest Regulation: Long rotation and short rotation.
- v. Difference between FMP and working skills
- vi. Need for FMP;
- vii. Relevance of FMP with local national and regional plans.
- viii. Socioeconomic survey.
- ix. Procedure for preparation of FMP.
- x. Forest Inventory Planning and procedure.

**2. Collection of actual field data from forests/homesteads/ roadside plantations covering materials sufficient for preparation of at least four working circles.**

**3. Collection of Secondary information from concerned authority.**

**4. Socio economic survey and local market survey.**

**5. Compilation of collected data.**

**6. Each student will write FMP according to Balmforth/Cananizado latest format based on collected data.**

**7. Students will submit FMP in bound form for evaluation.**

**8. Field assessment will be done by guide teacher(s) directly in the field, based on each student's overall performance; prepared management plan will be evaluated by two examiners—one guide teacher and one external; Viva-voce examination will be evaluated by the examination committee including at least one guide teacher.**

### **References:**

Balmforth. Manual of Forest Management Plan.

Davis, P.K. 1966. Forest Management, 2<sup>nd</sup> edition, McGraw Hill Book Company, New York.

Ganss. Manual of Forest Management Plan.

Osmaston, F.C. 1994. The Management of Forests

Canonizads, J.A. and Rahman, S.M. 1998. Integrated Forest Management plan for the Sylhet Forest Division. GoB/WB, FRMP.

Canonizads, J.A. and Hossain, M.A. 1998. Integrated Forest Management plan for the Sundarbans Reserved forest. GoB/WB, FRMP.

**Course No. : FOR 428**  
**Course title : FIELD WORK AND VIVA- VOCE**  
**Marks : Field Work-25 (1cr.); Viva- voce-25 (1 cr.); Total = 50 (2cr.)**

**Field Work: 25**

Tree planting, Nursing and Reporting	-	08
Field work report	-	07
Field work examination	-	10

**Viva- voce: 25**

A plot of minimum 25 seedlings must be maintained by each student in the selected plantation sites throughout the duration of his/her B.Sc.(Hons.) course.

**The distribution of marks for the program for class attendance will be as follows:**

Attendance (%)	Marks
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Less than 60	00