



## Detailed curriculum outline of First Year B.S. Honours Course

<b>Departmental Courses</b>	<b>Credit hours</b>
BOT 101: General Microbiology	2
BOT 102: Lower Fungi	2
BOT 103: General Phycology	2
BOT 104: Bryophyta	2
BOT 105: Angiosperm Taxonomy	2
BOT 106: Biodiversity	2
BOT 107: <b>Practical-1:</b> General Microbiology, Lower Fungi and General Phycology	2
BOT 108: <b>Practical-2:</b> Bryophyta, Angiosperm Taxonomy and Biodiversity	2
BOT 109: <b>Viva-voce</b>	2
 <b>Extra-Departmental Courses (For the students of Botany)</b>	
BMB 11 : Basic Biochemistry - I	4
ZOOL 1001: Animal Diversity	4
 <b>Extra-Departmental course for the students of Zoology and Soil, Water and Environment</b>	
BOT 1001: Introductory Botany	4

### **BOT 101: General Microbiology**

**Credit hour: 2**

#### **Introduction**

General Microbiology is a compulsory course in four years integrated BS (Hons) in Botany program. It deals with basic concept, structure, classification and importance of different types of microorganisms. It is structured in a way that the students develop clear understanding of the concept of microbiology, scope of microbiology, abiogenesis versus biogenesis, contribution of scientists in microbiology, types of microorganisms and their importance to human beings. Students also understand the infectious diseases and their causal agents.

#### **Course objectives**

- (a) define microbiology and its scope
- (b) describe the contribution of microbiologists
- (c) identify different types of microorganisms
- (d) describe the importance of microorganisms for humans
- (e) explain the causes of infectious diseases

#### **Course content**

<b>Units</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>1: Introduction</b>	Introduction, Origin of life - abiogenesis versus biogenesis, origin of life - chemical theory, Contribution in microbiology, Five-kingdom and Three-domain concept	<b>5</b>
<b>2: Bacteria</b>	Introduction, Classification, Flagella, Pili, Capsule, Cell wall, Cell membrane, Cytoplasm, Spore, Superbugs, Bacterial habitats and importance	<b>6</b>
<b>3: Archaea</b>	Introduction, Archaeal taxonomy, Phylum Crenarchaeota, Phylum Euryarchaeota, Shared features of bacteria and Archaea, Importance of archaea	<b>3</b>

<b>4: Viruses</b>	Introduction, Virus genomes, Virus proteins, Capsid, Attachment and entry of viruses into cells, Transcription, Translation and transport, Virus genome replication, Assembly and exit of virions from cells, HIV, Importance of viruses	<b>9</b>
<b>5: Viroids</b>	Introduction, Discovery, Structure, Replication, Diseases	<b>1</b>
<b>6: Prions</b>	Introduction, Discovery, Structure. The protein only hypothesis, Replication, Transmission, Diseases	<b>2</b>
<b>7: Mycoplasma</b>	Introduction, Discovery, Structure, Properties, growth, motility, Diseases	<b>1</b>
<b>8: Actinomycetes</b>	Introduction, Discovery, Taxonomy, Structure, antibiotic production, Diseases	<b>1</b>
<b>9: Rickettsia</b>	Introduction, Discovery, Structure, Transmission, War fever, Diseases	<b>2</b>

### Unit wise learning outcome

<b>Units</b>	<b>Learning outcomes</b>
<b>1</b>	<ul style="list-style-type: none"> <li>• define microbiology</li> <li>• describe the scope of microbiology</li> <li>• distinguish abiogenesis versus biogenesis</li> <li>• explain chemical theory of origin of life</li> <li>• discuss major contributors in microbiology</li> <li>• discuss the five-kingdom concept</li> <li>• explain the three-domain concept</li> </ul>
<b>2</b>	<ul style="list-style-type: none"> <li>• define bacteria</li> <li>• describe arrangement of bacterial cells</li> <li>• describe the structure, chemical composition and function of bacterial appendages</li> <li>• discuss superbugs and their importance</li> <li>• explain bacterial habitats</li> <li>• mention common bacterial diseases</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>• describe archaea</li> <li>• role of archaea in earth</li> <li>• classify archaea</li> <li>• discuss the importance of archaea</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>• discuss reasons for studying viruses</li> <li>• describe the characteristics of viruses</li> <li>• describe the components of virions</li> <li>• illustrate the variety of virus genome</li> <li>• outline the functions of virus structural and non-structural proteins</li> <li>• define the terms helical symmetry and icosahedral symmetry</li> <li>• explain how animal viruses attach to and enter their host cells</li> <li>• explain genes are transcribed and translated</li> <li>• discuss roles of virus and host proteins in virus genome replication</li> <li>• describe the assembly mechanisms for nucleocapsids with helical and icosahedral symmetry</li> <li>• explain the importance of HIV</li> <li>• write an illustrated account of the replication of HIV-1</li> <li>• describe importance of viruses</li> </ul>
<b>5</b>	<ul style="list-style-type: none"> <li>• describe discovery of viroids</li> <li>• write the characteristics of viroids</li> <li>• mention common diseases of viroids</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>• describe discovery of prions</li> <li>• define the terms prion and transmissible spongiform encephalopathy</li> </ul>

	<ul style="list-style-type: none"> <li>• evaluate the protein-only hypothesis</li> <li>• describe the characteristics of prions</li> <li>• discuss the transmission of prions</li> <li>• describe prion diseases in animals and man</li> </ul>
7	<ul style="list-style-type: none"> <li>• describe the discovery of mycoplasma</li> <li>• write the characteristics of mycoplasma</li> <li>• mention common diseases of mycoplasma</li> </ul>
8	<ul style="list-style-type: none"> <li>• describe the discovery of actinomycetes</li> <li>• write the characteristics of actinomycetes</li> <li>• describe production of antibiotic from actinomycetes</li> <li>• mention common diseases of actinomycetes</li> </ul>
9	<ul style="list-style-type: none"> <li>• describe discovery of rickettsia</li> <li>• draw a rickettsia</li> <li>• write the characteristics of rickettsia</li> <li>• describe the war fever by typhus</li> <li>• mention common diseases of rickettsia</li> </ul>

## References

1. Alcamo IE 2000. Fundamentals of Microbiology. Jones & Bartlett Learning.
2. Frobisher M 1974. Fundamental of Microbiology. WB Saunders Company, London.
3. Pelczar MJ, ECS Chan and NR Krieg 1993. Microbiology: Concepts and Applications. McGraw-Hill Book Co., N.Y.
4. Smith KM 1979. Plant Viruses. Chapman and Hall Ltd., London.
5. Tortora GL, BR Funke and CL Case 2004. Microbiology-An introduction. Addison Wesley Longman, California.

## Instruction strategies and Learning experiences

- Attend lectures
- Question-answer
- Group discussion
- Guided discussion
- Project discussion
- Demonstration

**Assignment:** Students will be given assignment on particular units

**Assessment:** In-Course examination

- Course final examination
- Assignment
- Practical examination
- Viva-voce

## BOT 102: Lower Fungi

**Credit hour: 2**

### Introduction

This is the basic course in 4-years integrated B. S. (honors) in Botany program. It is designed in a way that the students develop clear understanding of the concept of lower fungi and its importance to mankind, different growth parameters and reproduction of fungi, origin and classification of lower fungi, general characteristics of lower fungi and their classification, details of Myxomycetes class, comparison between slime molds with protozoa, details of class Chytridiomycetes and order Chytriales, black wart disease of potato and its casual organism, details of class Oomycetes with

Saprolegniales and Peronosporales orders, late blight of potato disease and its causal agent (*Phytophthora infestans*), class Zygomycetes and order Mucorales, bud rot disease of jackfruit. Students also understand the role of Endogonaceae family fungi as biofertilizer.

### Course objectives

- (a) Importance of lower fungi to mankind in the earth.
- (b) Know about the basic features, structures, reproduction, life cycle and classification of lower fungi.
- (c) Learn salient features and classification of lower fungi.
- (d) Difference between slime molds and protozoa.
- (e) Learn habitat, somatic features and reproduction of Chytridiomycetes, Oomycetes and Zygomycetes.
- (f) Identify the important diseases of plants caused by lower fungi, even in the form of epidemics.
- (g) Use the fungi for the production of commercial products such as yeast powder, alcohol, citric acid, mushroom production, etc.
- (h) Application of fungi as biofertilizer.

### Course content

Units	Course content	No. of Lectures
<b>1: Introduction to lower fungi</b>	Historical development, scope and importance to mankind.	<b>3</b>
<b>2: Myxomycetes:</b>	Slime molds: A brief account of the habitat, structure, reproduction and importance of slime molds, comparison with protozoa.	<b>4</b>
<b>3: Structures and reproduction of fungi:</b>	Habitat, vegetative features, range of vegetative structures, growth and development, nutrition, reproduction; origin and classification of fungi.	<b>6</b>
<b>4: Classification</b>	General characteristics and classification of lower fungi.	<b>3</b>
<b>5: Studies of different classes.</b>	<b>Chytridiomycetes:</b> Chytridiales; life cycle of <i>Synchytrium endobioticum</i> .	<b>4</b>
	<b>Oomycetes:</b> Saprolegniales and Peronosporales; life cycle and importance of <i>Saprolegnia parasitica</i> and <i>Phytophthora infestans</i> .	<b>4</b>
	<b>Zygomycetes:</b> Mucorales; life cycle of <i>Rhizopus stolonifers</i> .	<b>3</b>
<b>6: Endogonaceae</b>	Occurrence, characteristics and their role as biofertilizer.	<b>3</b>

### Unit wise learning outcome

Units	Learning outcomes
<b>1</b>	<ul style="list-style-type: none"> <li>• contribution of different scientists in the field of Mycology</li> <li>• known about importance of lower fungi to mankind</li> </ul>
<b>2</b>	<ul style="list-style-type: none"> <li>• get idea about habitat, structure and reproduction of slime molds</li> <li>• importance of slime molds</li> <li>• comparative study between slime molds and protozoa</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>• basic features, structure, reproduction, life cycle and classification of fungi.</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>• salient features of lower fungi</li> <li>• classification of lower fungi</li> </ul>

<b>5</b>	<ul style="list-style-type: none"> <li>• habitat, somatic features and reproduction of the important orders and families under Chytridiomycetes, Oomycetes and Zygomycetes classes.</li> <li>• life cycle and economic significance of different pathogens such as <i>Synchytrium endobioticum</i>, <i>Saprolegnia parasitica</i> and <i>Phytophthora infestans</i>.</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>• characteristics of Endogonaceae family</li> <li>• role of the members of Endogonaceae as biofertilizer</li> </ul>

## References

1. Agrios GN 1997. Plant Pathology. 5<sup>th</sup> edition. Academic Press. Toronto.
2. Alexopoulos CJ, CW Mims and M Blackwell 1996. Introductory Mycology. (4<sup>th</sup> edition), John Wiley & Sons, New York.
3. Hawker LE 1967. Fungi. Hutchinson University Library. Cambridge Univ. Press. London.
4. Moore-Landecker E 1982. Fundamentals of Fungi. Prentice Hall, New Jersey.
5. Triggiano RT, T Mark and AS Windham 2004. Plant Pathology. Concepts and laboratory Exercises. CRC Press London.
6. Webster J 1980. Introduction to Fungi. Cambridge University Press. London.

## Instruction strategies and Learning experiences

- Group discussion on the given lecture
- Question answer
- Guided discussion
- Demonstration of fresh materials

**Assignment:** Students will be given assignment on particular units

**Assessment:** Incourse examination will be taken after completing the lectures on Unit 4.

## BOT 103: General Phycology

**Credit hour: 2**

### Introduction

Phycology is usually studied as a specialization within botany or marine science program. Phycology is the study of algae. This course is for anyone interested in learning the fundamentals of algae. The course is taught in the First year classes of four years integrated BS (Honours) program in Botany. It is a basic course of Phycology. Algae are an extremely diverse group of organisms that can be found in almost every ecosystem on the planet, and they play an essential role for life on earth. They are little bio-factories that use the process of photosynthesis to create chemical compounds that we can utilize for food, feed, medicine, and even energy. This course will cover what algae are, why they are important and their ecology.

### Course objectives

- a) What is Phycology, what algae are, why they are important and their ecology
- b) Explain the terms sporophyte, gametophyte and alternation of generations
- c) Illustrate, with a named example for each, the following types of life cycle: isomorphic alternation of generations, heteromorphic alternation of generations, no alternation of generations
- d) Essential features of the lichen symbiosis
- e) Methods for sampling algae in the field
- f) To identify algae

## Course content

Units	Course content	No. of Lectures
<b>1: Introduction to Phycology:</b>	Characteristics and importance of algae	<b>3</b>
<b>2: Classification (Lee 20 08)</b>	Bases of classification, pigments, storage products and flagella; endosymbiotic theory of chloroplast evolution; history of classification of algae, outline of the classification of Lee 2008 and characteristics of the different phylums	<b>4</b>
<b>3: Algal habitats:</b>	Aquatic (fresh, brackish and marine water); terrestrial; subaerial and special habitats (symbiotic, parasitic, cryogenic, thermal and desert algae).	<b>3</b>
<b>4: Structure and reproduction</b>	Range of vegetative structure and reproductive methods in algae.	<b>4</b>
<b>5: General characteristic and life history</b>	General characteristics of the following classes and life history of the genera mentioned below: (a) Cyanophyceae: <i>Gloeotrichia</i> (b) Rhodophyceae: <i>Polysiphonia</i> (c) Chlorophyceae: <i>Chlamydomonas</i> , <i>Oedogonium</i> and <i>Chara</i> (d) Euglenophyceae: <i>Euglena</i> (e) Bacillariophyceae: <i>Pinnularia</i> (f) Phaeophyleae: <i>Sargassum</i>	<b>15</b>
<b>5: Lichen</b>	Habitat, structure, growth forms and economic importance	<b>1</b>

## Unit wise learning outcome

Units	Learning outcomes
<b>1</b>	<ul style="list-style-type: none"> <li>able to define Phycology</li> <li>this section will cover what algae are, how they've evolved, and how they've transformed our planet. They will also go over how humans have used algae throughout the history.</li> <li>scopes of Phycology and its development in Bangladesh</li> <li>how to use algae to assess environmental problems</li> </ul>
<b>2</b>	<ul style="list-style-type: none"> <li>algae are extremely diverse, and in this section you will learn about the following different types:</li> <li>early history of Phycology</li> <li>classification of Phycology</li> <li>characteristics of the different phylum of algae</li> <li>modern thoughts on algal taxonomy</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>covers the basics of algal ecology including some of the other organisms they interact with in nature and in industrial settings.</li> <li>ecology of major groups of algae</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>brief discussion about habit and structure</li> <li>distinguish the main morphological forms</li> </ul>
<b>5</b>	<ul style="list-style-type: none"> <li>brief discussion about classification of mentioned classes</li> <li>brief discussion about life history of mentioned genera</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>brief discussion about habit, habitat and structure of lichens</li> <li>growth forms and economic importance of lichens</li> </ul>

## References

- Bold HC and NJ Wynne 1978, 1985. Introduction of the Algae. Prentice-Hall, New Jersey.
- Fritsch FE 1935, 1945. The structure and reproduction of the algae. Vols 1 and 2, Cambridge Univ. Press, Cambridge.

3. Lee RE 1980, 1989, 2008. Phycology (1<sup>st</sup>, 2nd and 3rd Edns). Cambridge Univ. Press, Cambridge.
4. Mason E H Jr 1983. The Biology of Lichens. 3rd Edn., Edward Arnold, London.
5. Round FE 1981. The Ecology of Algae. Cambridge Univ. Press. Cambridge.
6. Smith GM 1950. The freshwater algae of the United States, McGraw-Hill, N.Y.

### Instructional strategies/ Learning experiences

- Lecture followed by group discussion
- Question-answer
- Demonstration

**Assignment:** Students will be given assignment on particular units

**Assessment:** Incourse examination will be taken after completing the lectures on units 1-3.

## BOT 104: Bryophyta

**Credit hour: 2**

### Introduction

This is a basic course in four years integrated BS (Hons) in Botany program. Bryophytes constitute a significant and important group in the plant kingdom since they are the earliest diverging lineages of the extant land plants and made the colonization of land possible for the plants. Bryophytes provide insights into the migration of plants from aquatic environments to land. A number of physical features link bryophytes to both land plants and aquatic plants. Therefore, this course is undeniably one of the fundamental courses in the Department of Botany. The course presents the origin and evolution of important aspects of bryophyta with the description of taxonomy, morphology, reproductive processes, life cycle, economic importance and phylogenetic relationships of the varied groups, proceeding from the simple to the complex. Major groups of common bryophytes will be described for better understanding of the group of plants as well as their evolutionary progression.

### Course objectives

- (a) Differentiate Bryophyta from other groups of plant and thereby learn the importance of studying bryophytes.
- (b) Develop an idea about the origin and evolutionary progression of thalloid to leafy plants, stomata and reproductive structures among different groups of bryophytes.
- (c) Know the diversity of sporophytic and gametophytic structure of major groups of bryophytes along with their reproduction, life cycle and economic importance.
- (d) Gain a general knowledge of transition in plant phylogeny from lower to higher gradation.

### Course content

Units	Course content	No. of Lectures
<b>1: Introduction</b>	Definition, characteristic, distribution, habitats and economic and biological significance of bryophytes.	<b>2</b>
<b>2: Classification of bryophytes</b>	Classification proposed by different bryologist and discussion on general characters of three main divisions of bryophyta with diagnostic features.	<b>2</b>
<b>3: Origin and evolution</b>	Theories and debates regarding the origin of bryophytes; Evolution among different groups of bryophytes.	<b>3</b>
<b>4: Genera of bryophytes</b>	Distribution, habitat, habit, external and internal features, asexual/vegetative and sexual reproduction, life cycles and spore dispersal mechanism of the following genera: (a) <i>Sphaerocarpos</i> , (b) <i>Riccia</i> , (c) <i>Marchantia</i> , (d) <i>Porella</i> , (e) <i>Anthoceros</i> , (f) <i>Sphagnum</i> and (g) <i>Funaria</i> .	<b>18</b>

<b>5: Alternation of generations</b>	Diversity of gametophyte and sporophyte structures and alternation of generations in bryophytes.	<b>5</b>
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### Unit wise learning outcome

Units	Learning outcomes
<b>1</b>	<ul style="list-style-type: none"> <li>define bryophyta and identify plants of this groups</li> <li>idea about general characters of bryophytes</li> <li>investigate the distribution and habitats of bryophytes</li> <li>recognize economic and biological importance of bryophytes</li> </ul>
<b>2</b>	<ul style="list-style-type: none"> <li>analyze detailed classification of bryophytes proposed by different bryologists</li> <li>characterize three different classes of bryophyta</li> <li>known plants from three different classes of bryophyta</li> <li>differentiate among three classes of bryophyta</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>know about two schools of thoughts about the origin of bryophytes</li> <li>debate among the two schools of thoughts about the origin of bryophytes</li> <li>Inspect the origin of sporophytic generation from the gametophytic thallus of bryophytes</li> <li>interpret evolution among the three different classes of bryophytes</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>acquire in depth knowledge on external features, anatomy, developmental biology, reproduction and spore dispersal mechanism of important representatives of bryophytes in addition to their specific importance.</li> </ul>
<b>5</b>	<ul style="list-style-type: none"> <li>analyze diversity in gametophytic and sporophytic structures of different bryophytes</li> <li>discuss alternation of generations in bryophytes with respect to their evolution</li> </ul>

### References

- Bapna KR and Kachroo P 2000. Hepaticology in India-I & II. Himangshu Publications, Udaipur, Delhi.
- Parihar NS 1956. An Introduction to Embryophyta. Vol. I, Central Book Depot, Allahabad.
- Scagel RF, Bandoni RJ, Rouse GE, Schofield WB, Stein JR and Taylor TMC 1965. An Evolutionary Survey of Plant Kingdom. Wadsworth Publishing Company Inc. Belmont, California.
- Schofield WB 1985. Introduction to Bryology. Macmillan Publishing Com., New York.
- Smith GM 1955. Cryptogamic Botany. Vol. II. McGraw-Hill, New York.
- Vashista BR, Sinha AK and Kumar A 2007. Botany for degree students part III Bryophyta. S Chand & Co. Ltd., New Delhi.

### Instruction strategies and Learning experiences

- Lecture followed by group discussion
- Question-answer
- Guided discussion
- Project discussion
- Demonstration

**Assignment:** Students will be given assignment on particular units

**Assessment:** Incourse examination will be taken after completing the lectures on units 1-3.

## BOT 105: Angiosperm Taxonomy

Credit hours: 2

### Introduction

Angiosperm taxonomy is the study description, identification, nomenclature and classification of angiosperm plants. The topics covered include i) basic ideas of angiosperm taxonomy, historical development and importance of angiosperm taxonomy, ii) detailed basis of angiosperm taxonomy including description, identification techniques, nomenclatural rules and classification systems, iii) angiosperm flora diversity of Bangladesh, how to study angiosperm flora, herbarium techniques, information of world largest herbaria and their roles, iv) molecular systematic techniques viz. molecular markers, DNA bar coding and cladistics. Special attention will be paid in the individual research project development.

### Course objectives:

- describe angiosperm plant species
- identify plants using different techniques
- provide scientific name using ICBN rules
- survey angiosperm flora and to make herbarium sheet
- arrange angiosperm species using classification systems
- use molecular techniques to demonstrate phylogenetic systems of classification
- conduct individual project related to flora survey in natural habitats

### Course content

Units	Course content	No. of Lectures
<b>1: Introduction</b>	Introduction to angiosperm taxonomy and systematic, history plant taxonomy development, importance and application of angiosperm taxonomy	<b>4</b>
<b>2: Description of Angiosperm flora</b>	Roots, stems, leaves, inflorescences, flowers and fruits	<b>2</b>
<b>3: Techniques of identification of plants</b>	Introduction to the keys, type of keys and construction of keys, Major plant families and their identifying characters, importance: Dicot plant families viz. Acanthaceae, Apocynaceae, Fabaceae, Moraceae, Rubiaceae, Euphorbiaceae, Lamiaceae, Myrtaceae, Solanaceae and Astertaceae. Monocot plant families viz. Poaceae, Cyperaceae, Liliaceae and Orchidaceae.	<b>6</b>
<b>4: Approaches to nomenclature</b>	ICBN/ICN, Rules of Nomenclature, steps followed new species to science	<b>4</b>
<b>5: Classification</b>	Types of Major classification system, emphasis on phylogenetic systems	<b>4</b>
<b>6: Study of angiosperm flora</b>	Introduction to angiosperm flora of Bangladesh, Qualitative and quantitative survey methods of flora, Herbarium techniques, world largest herbaria and modern role of herbaria	<b>6</b>
<b>7: Molecular systematic</b>	Type of PCR-based of molecular markers for phylogenetic analyses. Application of DNA-bar coding in taxonomy, cladistics method.	<b>4</b>

### Unit wise learning outcome

Units	Learning outcomes
<b>1</b>	<ul style="list-style-type: none"><li>will be able to define taxonomy of angiosperm and systematics, able to know historical background of angiosperm taxonomy, importance of taxonomy in the contemporary</li></ul>

	world.
2	• will be able to describe angiosperm plant species using taxonomic characters of plants
3	• will be able to prepare taxonomic keys to identify plant families, identification characters of some selected families
4	• will be capable to know the basic principles of botanical nomenclature and how to report new species to scientific world
5	• will be able to know the modern classification systems of angiosperms.
6	• will be able to learn the techniques of flora survey of particular ecosystem both qualitative and quantitative ways, how to prepare herbarium sheets, importance of herbaria of the world, also to know.
7	• will be able to learn the basic principles molecular systematics and cladistics.

### References

1. Albert E. Radford 1974 . Vascular plant systematic, Harper and Row Publishers, New York.
2. Dirk R Walters, David J Keil, and Zack E Murrell 2006. Vascular Plant Taxonomy, 5th edition, Kendal/Hunt Publishing Company.
3. Harris JM and MW Harris. Plant Identification Terminology. Spring Lake Publishing, Spring Lake, UT. (a very useful book with illustrations!).
4. Soltis PS, Soltis DE and Doyle JJ 1998. Molecular Systematics of Plants II: DNA Sequencing. Kluwer Academic Publishers Boston, Dordrecht, London. ISBN 0-41211-131-4.
5. Smith J 1977. Vascular Plant Families. Mad River Press. Nice all-purpose plant taxonomy text. Good bibliography of local floras. Many CA families, each with floral formulae.
6. Stace C 1980. Plant Taxonomy and Biosystematics. Arnold. Readable, brief treatment of basic plant taxonomy, along with other aspects of plant evolution.
7. Cronquist A 1988. The Evolution and Classification of Flowering Plants. New York B G. An excellent, albeit one-sided, view of evolutionary relationships and evolution of characters, with family descriptions.

### Instructional strategies

- Lecture followed by
- Group discussion
- Question-answer
- Guided discussion
- Project discussion
- Demonstration in the field

**Assignment:** Individual project on particular angiosperm plant species/habitat

**Assessment:** Mid-term, Class attendance, final examination, assignment, practical and viva-voce

## BOT 106: Biodiversity

**Credit hour: 2**

### Introduction

This is a basic course in 4-years integrated BS (Hons) in Botany Program. Since Biodiversity is very important for the existence and well-being for our planet, it is structured in a way that the students develop clear understanding of the concept of biodiversity, types of biodiversity, creation of biodiversity, importance of time in biodiversity creation, history of earth's origin and its changes in terms of physical, chemical and biological properties with time period in different geological era. Students also understand the reasons of losses and ways of protection of biodiversity through various ways including national and international organizations and importance of biodiversity from the evolutionary point of view.

### Course objectives:

- (a) To understand the concept of biodiversity & explain it with reference of geological era
- (b) Know the importance of biodiversity
- (c) Measures of biodiversity components of the world since the earth is born

- (d) Identify the different factors and their effects responsible for creation of biodiversity
- (e) Explore of different types of biodiversity components and their local as well as worldwide distribution
- (f) To find out the causes of biodiversity losses and extinction, conservation strategies for biodiversity conservation.
- (g) Role of some important organizations working for biodiversity conservation worldwide

### Course content

Units	Course content	No. of Lectures
<b>1: Concept of biodiversity</b>  <b>Geological era</b>	Definition, unity and diversity, requirements, early and modern concepts, potential, importance of time, the age of bacteria; nature's experiment with animals, founding dynasties and terminal disasters, species of the past and the current crisis. Prehistoric periods of the earth and the representative plant groups belonging to those periods supported by fossil evidences	<b>5</b>
<b>2: Creation of biodiversity</b>	Factors, earth's origin, surface features, continental drifts, geographical positioning system, seasonal cycles, climate and biodiversity, glaciation, effects of natural calamities on biodiversity; re-colonization/colonization of biota in volcanic islands and in a newly emerged island; biodiversity and future changes in climate.	<b>4</b>
<b>3: Types of biodiversity</b>	Genetic and sub-cellular, taxonomic, ecological, wetlands, domestic. Measuring biodiversity, the number of species known to us, endemism, mega-diversity countries of the world/biodiversity Hot spots and biodiversity pattern in Bangladesh.	<b>3</b>
<b>4: Loss and conservation of biodiversity</b>	Causes of biodiversity, loss and extinction, conservation and its measures ( <i>in situ</i> and <i>ex situ</i> ). Role of some important organizations for biodiversity conservation such as IUCN, UNEP, MAB, Green Peace, CITES, WCMC, WWF and Ramsar Convention Bureau for biodiversity conservation, threatened ecosystems of Bangladesh.	<b>3</b>
<b>5: Importance and threats</b>	Importance and threats to biodiversity	<b>15</b>

### Unit wise learning outcome

Units	Learning outcomes
<b>1</b>	<ul style="list-style-type: none"> <li>• concept of biodiversity, requirements of biodiversity, early and modern concepts</li> <li>• importance of time in relation to biodiversity abundance and loss</li> <li>• know about the dynasties and terminal disasters, massive extinction and current crisis</li> <li>• prehistoric periods of the earth by fossil evidences.</li> </ul>
<b>2</b>	<ul style="list-style-type: none"> <li>• scientific evidences of earth's origin and its biodiversity</li> <li>• factors responsible for creation of biodiversity</li> <li>• effects of natural calamities and climate change on biodiversity</li> <li>• how to protect precious biodiversity components from the adversity of nature</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>• know about the types of biodiversity</li> <li>• how to measure biodiversity</li> <li>• know about the total species number of the world and about different countries those are rich in biodiversity components and playing significant role to conserve biodiversity</li> <li>• biodiversity pattern in different localities of the world as well as Bangladesh</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>• acquire knowledge about the causes of biodiversity loss and extinction</li> <li>• conservation methods of biodiversity</li> </ul>

	<ul style="list-style-type: none"> <li>know about different organizations function and role in conserving biodiversity worldwide</li> </ul>
5	<ul style="list-style-type: none"> <li>acquire knowledge about the threats to biodiversity</li> <li>why biodiversity is so important for our survival in this universe</li> </ul>

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1. Ashthana DK and M Ashthana 1998. Environment: Problems and Solutions. S. Chand, New Delhi.
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3. Jeffries MJ 1997. Biodiversity and Conservation. Routledge, New York.
4. Laetsch WM 1979. Plants. Basic concepts in Botany. Little Brown & Co., Boston.
5. Starr C and Taggart 1984. Biology – The unity and diversity of life. Wordsworth Publ. Co. Belmont, California.
6. Thornton IWB 1984. Krakatau – The Development and Repair of a Tropical Ecosystem. AMBIO 13(4): 217-225.

## Instruction strategies and Learning experiences

- Lecture followed by group discussion
- Question-answer
- Guided discussion
- Project discussion
- Demonstration

**Assignment:** Students will be given assignment on particular units

**Assessment:** Incourse examination will be taken after completing the lectures on units 1-3.

## BOT 107: Practical - 1

**Credit hour: 2**

### A. General Microbiology, B. Lower Fungi and C. General Phycology

#### A. General Microbiology

Units	Title	Learning outcomes
1	Microscopic observation of living bacteria by hanging drop method	<ul style="list-style-type: none"> <li>Observe live bacterial cells under compound microscope</li> </ul>
2	Microscopic observation of curd bacteria by simple staining	<ul style="list-style-type: none"> <li>Observe curd bacteria under compound microscope</li> </ul>
3	Study of nodule bacteria by simple staining	<ul style="list-style-type: none"> <li>Observe nodule forming bacteria under compound microscope</li> </ul>
4	Isolation of air borne bacteria by exposure plate technique	<ul style="list-style-type: none"> <li>Isolate bacteria from air</li> </ul>
5	Preparation of subculture onto agar slants	<ul style="list-style-type: none"> <li>Prepare subculture into a slant from bacterial colony</li> </ul>

#### B. Lower Fungi

Units	Title	Learning outcomes
1	To acquaint with the techniques for preparing temporary slides of fungal specimens for microscopic examinations	<ul style="list-style-type: none"> <li>To know how to handle the microscope.</li> </ul>
2	Morphological studies of the non-mycelial and mycelial vegetative bodies of the fungi, fungal tissues, special	<ul style="list-style-type: none"> <li>Observe the non-mycelial and mycelial vegetative bodies of the fungi, fungal tissues, special somatic structures, asexual</li> </ul>

	somatic structures, asexual and sexual spores	and sexual spores under compound microscope.
3	Laboratory studies of the locally available members of the Myxomycetes and fungi covered in the theory	<ul style="list-style-type: none"> <li>Observe the members of Myxomycetes and fungi under microscope.</li> </ul>
4	Leaf and stem of Bhat ( <i>Clerodendrum viscosum</i> ) infected with <i>Synchytrium</i> , Leaf of <i>Amaranthus/Boerrhaavia/ Ipomea</i> (kolmi) infected with <i>Albugo</i> spp., Leaf of colocasia/potato infected with <i>Phytophthora</i> , Bud of jackfruit infected with <i>Rhizopus</i>	<ul style="list-style-type: none"> <li>To know about the different diseases caused by fungal pathogens.</li> </ul>
5	Field trip to collect fungi and diseased plant materials	<ul style="list-style-type: none"> <li>To know how to collect the diseased sample from local area.</li> </ul>

### C. General Phycology

Units	Title	Learning outcomes
1	Visiting Curzon Hall Campus to show some algal habitats and study of some of the representatives	<ul style="list-style-type: none"> <li>To know about the algal habitats and how to collect the algal samples from different habitats</li> </ul>
2	Study of the genera covered in the theory with emphasis on both vegetative and reproductive structures	<ul style="list-style-type: none"> <li>To observe algal material under compound microscope and herbarium specimen.</li> <li>To know the different algal habits and identify algae</li> </ul>
3	Study of morphological forms of chloroplasts in algae	
4	Study of planktonic, benthic, terrestrial, subaerial, epiphytic, epizoic, endophytic, symbiotic, marine, brackish water and edible algae	
5	Study of lichens	<ul style="list-style-type: none"> <li>To Identify different growth forms of lichens</li> </ul>
6	Local Excursion to show algal habitats and collection of algal samples	<ul style="list-style-type: none"> <li>To expedition of collection of algal materials from natural habitats and exploration of algal ecology</li> </ul>

**Note:** During study students have to describe each genus with diagrams, mention identifying characters and classification

### BOT 108: Practical - 2

**Credit hour: 2**

#### A. Bryophyta

#### B. Angiosperm Taxonomy

#### C. Biodiversity

#### A. Bryophyta

Units	Title	Learning outcomes
1	Observation of morphology and anatomy of the following bryophytes: <i>Riccia</i> , <i>Marchantia</i> , <i>Dumortiera</i> , <i>Plagiochasma</i> and <i>Bryum</i> .	<ul style="list-style-type: none"> <li>Acquire in depth practical knowledge on external and internal features and characterize and compare with others to distinguish and identify up to genus.</li> </ul>
2	Identify the following bryophytes: <i>Riccia</i> , <i>Ricciocarpus</i> , <i>Anthoceros</i> , <i>Notothyllus</i> , <i>Barbula</i> and <i>Fissidens</i>	<ul style="list-style-type: none"> <li>Acquire quick identification ability of the common bryophyta found in nature.</li> </ul>

## B. Angiosperm Taxonomy

Units	Title	Learning outcomes
1	Survey techniques of flora, plant collection and preservation of plant specimens; Tour to herbarium	<ul style="list-style-type: none"><li>Students will be learn flora survey techniques both qualitative and quantitative ways and will also learn modern herbarium techniques</li></ul>
2	Dissecting flowers and describing floral forms and structures using scientific terms, floral formula and diagram	<ul style="list-style-type: none"><li>Students will learn how to make plant species profile using taxonomic terms</li></ul>
3	Plant Identification: Using and constructing botanical keys	<ul style="list-style-type: none"><li>Student will learn how to construct identification keys</li></ul>
4	Constructing phylogentic tree with hypothetical data by hand and computer program	<ul style="list-style-type: none"><li>Students will learn how to classify plants species using modern computer tools</li></ul>

## C. Biodiversity

Units	Title	Learning outcomes
1	Display of specimens from the major plant groups (one example in each from algae to angiosperms), their characteristic features. Study of some fossil specimens	<ul style="list-style-type: none"><li>Study of diversified plant groups including prokaryotic organisms to eukaryotic; including bacteria, prokaryotic to eukaryotic algae and their reproductive structures, endosymbionts, bryophytes, pteridophytes, lichens, coral reefs, gymnosperms, angiosperms, giant and endemic algae, their characterization, classification, uses and geographical distribution.</li><li>Exploration of fossil evidence of the prehistoric periods of earth's origin.</li></ul>
2	Plants showing some unique diversities (one representative from each category): Cyanellae, endosymbionts, lichens, littoral macrophytes, marine benthic plants and brackish water plants	
3	Field visits. To acquaint with the major plant of Departmental Botanical Garden, Curzon Hall Campus	<ul style="list-style-type: none"><li>To be acquainted with the plants of Departmental Botanical Garden, Curzon Hall campus, D. U.</li></ul>

BOT 109: **Viva-voce**

**Credit hour: 2**

## Extra Departmental Courses

**BOT. 1001: Introductory Botany**

**Credit hour:**

**04**

(For the Students of Department of Soil, Water and Environment and Zoology)

### Introduction

This is an extra-departmental course designed for the 1<sup>st</sup> year B.S. Honors students of the Department of Zoology and Department of Soil, Water and Environment under the University of Dhaka. Since the 1<sup>st</sup> year Honors students of those departments will be

requiring some basic knowledge on plants during their studies in their respective departments, the present course has been offered from the Department of Botany. Considering the style and content of the offered course on Botany, the students will be able to acquire knowledge on the classification system of the plants together with the exposure of lower and higher organisms starting from prion to bacteria and algae to angiosperms. Apart from this, the overall knowledge regarding the concept and utility of biodiversity and its conservation will also be taught to them. The students will be able to learn the concept of the subject of ecology where forests of Bangladesh and plant's adaptive features towards various environmental factors and the flow of energy via food chains and food webs are dealt. Lessons on plant diseases their causes, symptoms and controls will be given. The students will be able to identify and learn the scientific names of plants with plant parts yielding medicines, oil, fiber and timbers. Cultivation and processing of tea will also be a part of their curriculum.

### Course objectives

- (a) learn the five kingdom system of classification and distinguish eu- and prokaryotes.
- (b) study economic importance of lower organisms: prion, viroid, virus, bacteria, cyanobacteria, etc.
- (c) know algae and phytoplankton
- (d) classify and characterize fungi and lichen, know their economic importance
- (e) characterize bryophytes, pteridophytes and gymnosperms and learn their habitats and economic importance
- (f) study angiosperms with the salient features of three selected families
- (g) know salient features of five selected genera starting from algae to gymnosperms
- (h) learn different aspects of biodiversity, its conservation and role of IUCN, UNEP, MAB, WWF, etc.
- (i) define ecology, ecosystem, food chain, food web and energy flow; gather knowledge on adaptive features of plants and forests of Bangladesh
- (j) know – how crop plants get diseased, what are the causal organisms and how could you control disease.
- (k) know scientific- and local names of 10 each of medicinal, oil, fiber and timber yielding plants of Bangladesh; how tea is cultivated and processed.

### Course content

Units	Course content	No. of Lectures
<b>1. Classification</b>	Five kingdoms and their characteristics.	<b>2</b>
<b>2. Prokaryotes and others</b>	Characteristics and economic importance of the following groups: Prion, Viroid, Rickettsia, Virus, Mycoplasma, Cyanobacteria and Bacteria.	<b>10</b>
<b>3. Algae</b>	Characteristics, habitat, classification - up to class according to Lee (2008) and economic importance.	<b>3</b>
<b>4. Phytoplankton</b>	Characteristics, classification and economic importance.	<b>3</b>
<b>5. Fungi</b>	Characteristics, classification - up to class according to Alexopoulos and Mims and economic importance.	<b>3</b>

<b>6. Lichen</b>	Characteristics, classification and economic importance.	<b>3</b>
<b>7. Bryophyta, Pteridophyta and Gymnosperm:</b>	Characteristics, habitat and economic importance.	<b>5</b>
<b>8 Angiosperm</b>	Characteristics, types of classification of plant kingdom, differences between monocot and dicot; salient features of Asteraceae, Fabaceae and Poaceae.	<b>2</b>
<b>9.Salient features</b>	<i>Gloeotrichia, Agaricus, Marchantia, Selaginella</i> and <i>Cycas</i> .	<b>2</b>
<b>10.Biodiversity</b>	Introduction, causes, types and importance of biodiversity, global status of biodiversity and mega-diversity countries of the world.	<b>4</b>
<b>11.Conservation of biodiversity</b>	Causes of loss of biodiversity, <i>in situ</i> and <i>ex situ</i> conservation. Role of IUCN, UNEP, MAB, Green Peace, CITES, CMC and WWF on biodiversity conservation Bureau.	<b>3</b>
<b>12.Plant Ecology</b>	(a) Adaptation and characteristics of hydrophytes, halophytes and xerophytes. (b) Structure and components of an ecosystem; food chain, food web, energy flow in ecosystem; (c) Forests of Bangladesh; dominant plants of mangrove and deciduous forests.	<b>6</b>
<b>13.Plant Pathology</b>	Concept of disease in plants, causes of plant diseases; how do plant pathogens cause disease in plants, symptomatology and elementary knowledge of plant disease control. Causal organisms, symptoms and control measures of the following plant diseases: (a) Brown spot of rice (b) Late blight of potato (c) Stem rust of wheat (d) Red rot of sugarcane	<b>8</b>
<b>14.Economic Botany</b>	(a) Local and scientific names, parts used and importance of at least ten important medicinal, oil, fibre and timber yielding plants of Bangladesh. (b) Cultivation and processing of tea.	<b>6</b>

### Unit wise learning outcome

Units	Learning outcomes
<b>1</b>	<ul style="list-style-type: none"> <li>gather knowledge on how five kingdom namely, archaea, protista, plantae, fungi and animalia are placed and characterized</li> </ul>
<b>2</b>	<ul style="list-style-type: none"> <li>understand characteristic features and economic importance of lower organisms</li> </ul>

3	<ul style="list-style-type: none"> <li>learn characteristics, classification and economic importance of algae</li> </ul>
4	<ul style="list-style-type: none"> <li>learn characteristics, classification and economic importance of phytoplankton</li> </ul>
5	<ul style="list-style-type: none"> <li>learn characteristics, classification and economic importance of fungi</li> </ul>
6	<ul style="list-style-type: none"> <li>get to know characteristics, classification and economic importance of lichens</li> </ul>
7	<ul style="list-style-type: none"> <li>learn characteristic features, classification, habitat and economic importance of liverworts, mosses, ferns and naked seeded plants</li> </ul>
8	<ul style="list-style-type: none"> <li>gather knowledge on characters of angiosperms, monocot and dicots and salient features of families namely, Asteraceae, Fabaceae and Poaceae</li> </ul>
9	<ul style="list-style-type: none"> <li>learn salient features of <i>Gloeotrichia</i>, <i>Agaricus</i>, <i>Marchantia</i>, <i>Selaginella</i> and <i>Cycas</i></li> </ul>
10	<ul style="list-style-type: none"> <li>update knowledge on biodiversity, causes, types importance, mega diversities</li> </ul>
11	<ul style="list-style-type: none"> <li>learn conservation of biodiversity and know the role of several international organizations promoting biodiversity</li> </ul>
12	<ul style="list-style-type: none"> <li>get concepts of ecology and adaptation of plants in water, saline habitat and in deserts; structure and function of ecosystem, food chains and webs, energy flow; forests and mangroves of Bangladesh</li> </ul>
13	<ul style="list-style-type: none"> <li>learn about Plant Pathology and plant diseases, pathogens causing diseases in plants, symptoms, disease control for rice, potato, wheat and sugarcane</li> </ul>
14	<ul style="list-style-type: none"> <li>learn scientific names, local names of medicine, oils, fiber and timber yielding plants of Bangladesh; growing processing of tea.</li> </ul>

## References

1. Agrios CN 2002. Plant Pathology, Academic Press, London.
2. Bannister P 1976. Introduction to Physiological Plant Ecology. Blackwell Scientific Publications.
3. Bashar MA and MR Islam MR 2005. Degree Botany, Hassan Book House, Dhaka.
4. Bell PR and CLF Woodcock 1983. The diversity of green plant. Edward Arnold, London.
5. Etherington JR 1971. Environmental and Plant Ecology. John Willey and Sons.
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7. Laetsch WB 1979. Plants: Concepts in Botany, Little Brown & Co., Boston.
8. Pandey BP 1980. Economic Botany. S. Chand & Company Ltd.
9. Smith GM 1955. Cryptogamic Botany. Vol. I and II. McGraw-Hill Co., Ltd., New York..

## Instruction strategies and Learning experiences

- Lecture followed by group discussion
- Question answer
- Guided discussion
- Project discussion
- Demonstration

**Assingment:** Students will be given assignment on particular units

**Assessment:** Incourse examination will be taken after completing the lectures on units 1-

## Practical

Units	Title	Learning outcomes
1	Study of diversity of habit and habitat of plants in nature.	Able to know the habitat of different plants
2	Demonstration of common algae, fungi, lichen, bryophytes, pteridophytes, gymnosperms and angiosperms.	Will be able to identify different types of plant groups
3	Study of angiosperm families: Poaceae, Asteraceae, Fabaceae and Nymphaeaceae.	Learn to identify different important families of angiosperms
4	Identification of economic plants and plant products.	Know the economically important plants of Bangladesh
5	Study of common hydrophytes, halophytes and xerophytes.	Learn the extreme habitat of plants with examples
6	Study of brown spot of rice, stem rust of wheat, red rot of sugarcane and tikka disease of groundnut	Will be able to know the important plant diseases of Bangladesh