

BOTANY

Syllabus

Undergraduate Courses (Under Choice Based Credit
SYSTEM)

Subject: Botany



Year-2020

Bodoland University

Debaggaon, Kokrajhar (b.T.a.D.)

BOTANY

B.Sc. in Botany (Honours) CBCS Course Bodoland University, Kokrajhar

Semester	CORE COURSE(14)	Ability Enhancement Compulsory Course (AECC)(2)	Skill Enhancement Course (SEC)(2)	Discipline Specific Elective (DSE)(4)	Generic Elective (GE) (4)
I	CC-1: Phycology and Microbiology	English/ Hindi/MIL Communication			GE-1: Biodiversity (Microbes, Algae, Fungi and Archegoniate)
	CC-2: Biomolecules and Cell Biology				
II	CC-3: Mycology and Phytopathology	Environmental Science			GE-2 Plant Ecology and Taxonomy
	CC-4: Archegoniate				
III	CC-5: Anatomy of Angiosperm		SEC-1: Biofertilizers		GE-3 Plant Anatomy and Embryology
	CC-6: Economic Botany				
	CC-7: Genetics				
IV	CC-8: Molecular Biology		SEC -2 Mushroom Culture Technology		GE-4 Plant Physiology and Metabolism
	CC-9: Plant Ecology and Phytogeography				
	CC-10: Plant Systematics				
V	CC-11: Reproductive Biology of Angiosperm			DSE-1 Analytical Techniques in Plant Sciences	
	CC-12: Plant Physiology			DSE-2 Bioinformatics	
VI	CC-13: Plant Metabolism			DSE -3:Natural Resource Management	
	CC-14: Plant Biotechnology			DSE-4: Industrial and Environmental Microbiology	

Structure of B.Sc. Honours Botany under CBCS

Core Courses

1. Phycology and Microbiology
2. Biomolecules and Cell Biology
3. Mycology and Phytopathology
4. Archegoniate
5. Anatomy of Angiosperm
6. Economic Botany
7. Genetics
8. Molecular Biology
9. Plant Ecology and Phytogeography
10. Plant Systematics
11. Reproductive Biology of Angiosperm
12. Plant Physiology
13. Plant Metabolism
14. Plant Biotechnology

Discipline Specific Electives

DSE 1: Analytical Techniques in Plant Sciences

DSE 2: Bioinformatics

DSE 3: Natural Resource Management

DSE 4: Industrial and Environmental Microbiology

Generic Electives

GE 1: Biodiversity (Microbes, Algae, Fungi and Archegoniate)

GE 2: Plant Ecology and Taxonomy

GE 3: Plant Anatomy and Embryology

GE 3: Plant Physiology and Metabolism

Ability Enhancement Course Compulsory

1. Environmental Science
2. English/MIL Communication

Skill Enhancement Courses Elective

SEC 1: Biofertilizers

SEC 2: Mushroom Culture Technology

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Curriculum Structures

Department of Botany

No. of papers =14+12=26, Total Credits= 140

Total Marks = 2400

SEM I						
Paper code	Course title	Credit	Credit distribution (L+T+P)	End semester marks	Internal marks	Total marks
BOT-101H	CC1-Phycology and Microbiology	6	4+0+2	60 (Theo)+20 (Pract)	20	100
BOT-102H	CC2- Biomolecules and Cell Biology	6	4+0+2	60 (Theo)+20 (Pract)	20	100
BOT-103HR	GE1- Biodiversity (Microbes, Algae, Fungi and Archegoniate)	6	4+0+2	60 (Theo)+20 (Pract)	20	100
COMM-104HR	AEC: AECC1: English/Hindi/MIL (Communication)	2	2+0+0	50	--	50
Total		20	20	290	60	350

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Semester-I

CC-1: Phycology and Microbiology

(Credits: Theory-4, Practical-2)

THEORY

Lectures: 40

- Unit 1:** Introduction to microbial world (1 lecture)
- Unit 2: Viruses** (6 lectures)
Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).
- Unit 3: Bacteria** (6 lectures)
Discovery, general characteristics; Types-archaeobacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).
- Unit 4: Algae** (10 lectures)
General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups); Significant contributions of F.E. Fritsch. Role of algae in the environment, agriculture, biotechnology and industry.
- Unit 5: Cyanophyta and Xanthophyta** (5 lectures)
Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of *Nostoc*.
- Unit 6: Chlorophyta and Charophyta** (6 lectures)
General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of *Volvox* and *Chara*.
- Unit 7: Phaeophyta and Rhodophyta** (6 lectures)
Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of *Ectocarpus* and *Polysiphonia*.

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PRACTICAL

Microbiology

1. Electron micrographs/Models of viruses – T-Phage and TMV, Photographs of Lytic and Lysogenic Cycle.
2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, root Nodule.
3. Gram staining.

Phycology

Study of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas* Volvox, *Chara*, *Ectocarpus* and *Polysiphonia*, through electron micrographs, temporary preparations and permanent slides.

Suggested Readings

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

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CC-2: Biomolecules and Cell Biology

(Credits: Theory-4, Practical-2)

THEORY

Lectures: 40

Unit 1: Biomolecules

(10 lectures)

Types and significance of chemical bonds; pH and buffers.

Carbohydrates: Nomenclature and classification; Monosaccharides; Disaccharides; Oligosaccharides and polysaccharides.

Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions

Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quaternary.

Nucleic acids: Structure of nitrogenous bases; Types of nucleic acids.

Unit 2: Bioenergenetics

(1 lectures)

Introduction

Unit 3: Enzymes

(6 lectures)

Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory).

Unit4: The cell

(2 Lecture)

Introduction

Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).

Unit 5: Cell wall and plasma membrane

(5 lectures)

Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport.

Unit 6: Cell organelles

(12 lectures)

Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus.

Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast.

Endomembrane system: Endoplasmic Reticulum, Golgi Apparatus and Lysosomes: General account

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Unit 7: Cell division

(4 lectures)

Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.

Practical

1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins.
2. Study of plant cell structure with the help of epidermal peel mount of Onion/*Rhoeo*.
3. Measurement of cell size by the technique of micrometry.
4. Study of cell and its organelles with the help of electron micrographs.
5. Study the phenomenon of plasmolysis and deplasmolysis.
6. Study different stages of mitosis and meiosis.

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Suggested Readings

1. Campbell, MK (2012). Biochemistry, 7th ed., Published by Cengage Learning.
2. Campbell, PN and Smith AD (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone.
3. Tymoczko JL, Berg JM and Stryer L (2012). Biochemistry: A short course, 2nd ed., W.H. Freeman.
4. Berg JM, Tymoczko JL and Stryer L (2011). Biochemistry, W.H.Freeman and Company
5. Nelson DL and Cox MM (2008). Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco

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GE-1: Biodiversity (Microbes, Algae, Fungi and Archegoniate)

(Credits: Theory-4, Practical-2)

THEORY

Lectures: 40

Unit 1: Microbes (6 lectures)

Viruses – Discovery, general structure, replication (general account), Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

Unit 2: Algae (9 lectures)

General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: *Nostoc*, *Chlamydomonas*, *Polysiphonia*. Economic importance of algae.

Unit 3: Fungi (9 lectures)

Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; life cycle of *Rhizopus* (Zygomycota) *Penicillium* (Ascomycota), *Puccinia*, *Agaricus* (Basidiomycota); Symbiotic Associations-Lichen: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.

Unit 4: Introduction to Archegoniate (1 lectures)

Unifying features of archegoniates, Transition to land habit, Alternation of generations.

Unit 5: Bryophytes (6 lectures)

General characteristics, Classification (up to family), morphology, anatomy and reproduction of *Marchantia* and *Funaria*. Ecology and economic importance of bryophytes with special mention of *Sphagnum*.

Unit 6: Pteridophytes (5 lectures)

General characteristics, classification, Early land plants (*Rhynia*). Classification (up to family), morphology, anatomy and reproduction of *Selaginella*, *Equisetum*. Heterospory and seed habit. Ecological and economical importance of Pteridophytes.

Unit 7: Gymnosperms (4 lectures)

General characteristics; Classification (up to family), morphology, anatomy and reproduction of *Cycas* and *Pinus*. Ecological and economical importance.

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Practical

1. EMs/Models of viruses – T-Phage and TMV.
2. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium.
3. Gram staining
4. Study of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas* (electron micrographs), *Polysiphonia* through temporary preparations and permanent slides. (* *Fucus* - Specimen and permanent slides)
5. *Rhizopus and Penicillium*: Asexual stage from temporary mounts and sexual structures through permanent slides.
6. *Puccinia*: Herbarium specimens and permanent slides
7. *Agaricus*: Specimens of button stage and full grown mushroom; Sectioning of gills of *Agaricus*.
8. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
9. *Marchantia*- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).
10. *Selaginella*- morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide).
11. *Cycas*- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).
12. *Pinus*- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).

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Suggested Readings

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

