

UNIVERSITY OF NORTH BENGAL

PROPOSED COURSE STRUCTURE

FOUR YEAR UNDERGRADUATE PROGRAM (FYUGP) WITH

THREE DISCIPLINE SPECIFIC MULTIDISCIPLINARY COURSE

BOTANY

UNDER THE NEW CURRICULUM AND CREDIT FRAMEWORK, 2022

W.E.F. 2024–2025

COURSE STRUCTURE FOR 1st Year

Year	Semester	Course type	Course code	Course name	Credits	Credit distribution	
						Theory	Practical
Ι	1	DSC Subject A/ Subject B	BOTADSC101	Introduction to Life and Plant Diversity	4	3	1
		Minor	BOTAMIN101	Introduction to Life and Plant Diversity	4	3	1
	2	DSC Subject A/ Subject B	BOTADSC202	Cell Biology	4	3	1
		Minor	BOTAMIN202	Cell Biology	4	3	1

*<u>NUMBER OF TEACHING HOURS/WEEK</u>

THEORY: 1 credit = 1 Lecture/week = 1 hour/week

PRACTICAL: 1 credit = 1 Class/week = 2 hour/week

SEMESTER - I

Course Type: DSC A/B Course Code: BOTADSC101

Course Name: Introduction to Life and Plant Diversity

Credits: 4 (Theory-3, Practical-1) Full Marks: 80 (Theory-60, Practical-20)

Brief Course Description:

This course deals with the Origin and Evolution of life and imparts basic knowledge about plants and related life forms. It thoroughly establishes the relationship of plants with other kingdoms of life. Also, it emphasizes the huge diversity of known plant life, along with an idea of the fossil record and geological time scale.

Prerequisite(s) and/or Note(s):

(1) High School Biology.

(2) Note(s): Syllabus may be modified after and not during the term itself, depending on the circumstances. However, students will be evaluated only on the basis of topics covered in the course.

Course Objectives:

Knowledge acquired:

- (1) Origin and evolution of Life
- (2) Introduction to plant and other life forms
- (3) Different groups of plants.

Skills gained:

- (1) Handling microscopy, staining and mounting of plant specimens, and,
- (2) Methods of collection, identification and preservation of plant specimens.

Competency Developed:

- (1) Schematic knowledge of collection and subsequent plant specimens.
- (2) Proper arrangement of preserved plant specimens.
- (3) Choosing suitable staining and mounting protocols for study of plant specimens.

Total lectures: 45

(8 lectures)

(7 lectures)

Unit-1: Origin of life

Origin of life: Oparin's hypothesis, Haldane's hypothesis, Miller-Urey experiment, origin of cells and the first organisms: the concepts of prebiotic soup and coacervates.

Unit-2: Evolution

Geological time scale – major events in each era; Evidences of evolution; theories of evolution - Lamarck, Wallace, Charles Darwin, Hugo De Vries. Neo-Darwinism - major postulates isolation, mutation, genetic drift, and speciation.

Unit-3: Diversity and classification of life forms

Diversity of life: Prokaryotes and Eukaryotes; unicellularity and multicellularity; Two kingdom classification (Carolus Linnaeus, 1735); phylogenetic classification (August W Eichler, 1878); Three kingdom classification (Ernst Haeckel, 1866); Three domains (Carl Woese, 1990) criteria for classification, general character.

Unit-4: Plant kingdom

General features of plants; Basic knowledge of thallophytes, archegoniates and spermatophytes; Basic structure and function of plant organs: roots, stem and leaves, vascular bundle; Introduction to mesophytes, hydrophytes and xerophytes; Concept of alternation of generations; the colonization of land by plants.

Unit-5: Plant diversity

Introduction to ICN and the status of algae and fungi; Diversity of plants: study of the salient features of major plant groups - algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.

PRACTICAL

Total classes: 15

- 1. Study of Light microscope: simple and compound.
- 2. Preparation of specimens for light microscopy Collection, fixation and preservation of plant specimens; Whole mounts and sections – hand sectioning.
- 3. Study of prokaryotic and eukaryotic cells.

THEORY

(10 lectures)

(10 lectures)

(10 lectures)

- 4. Demonstration of basic staining techniques of plant tissues.
- 5. Study and demonstration of mounting techniques.
- 6. Morphological variations in roots, stem and leaves (or equivalent organs) across different plant groups.
- 7. Study of reproductive structures in different plant groups through photographs / permanent slides.

- 1. Brian K. Hall and Benedikt Hallgrímsson, 2013. Strickberger's Evolution (Fifth Edition). Jones and Bartlett Publishers.
- Eldon D Enger, Frederick C Ross, David B Bailey, 2011. Concepts in Biology (Fourteenth Edition). Tata McGraw Hill.
- 3. Gerald Audesirk, Teresa Audesirk, Bruce E Byers, 2019. Biology: Life on earth. (Twelfth Edition). Pearson.
- 4. James D Mauseth, 2019. Botany: An Introduction to Plant Biology. Jones & Bartlett.
- Kenneth A Mason, Jonathan B Losos, Tod Duncan, 2017. Biology (Twelfth Edition). McGraw Hill.
- Lisa A Urry, Michael L Cain, Steven A Wasserman, Peter V Minorsky, Rebecca B Orr, 2021. Campbell Biology (Twelfth Edition). Pearson.
- 7. Michael G Simpson, 2019. Plant Systematics (Third Edition). Academic Press.
- Peter Raven, George Johnson, Kenneth Mason, Jonathan Losos and Tod Duncan, 2023. Biology (Thirteenth Edition). McGraw Hill.
- Prasad M K, Krishna Prasad M, 2000. Outlines of Microtechnique. Emkay Publishers, New Delhi.
- Scott Freeman, Kim Quillin, Lizabeth Allison, Michael Black, Greg Podgorski, Emily Taylor, and Jeff Carmichael, 2019. Biological Science. Pearson.
- Sylvia S Mader and Michael Windelspecht, 2022. Biology (Fourteenth Edition). McGraw Hill.
- 12. Timothy Walker, 2012. Plants: A Very Short Introduction. Oxford.

SEMESTER - I

Course Type: MINOR Course Code: BOTAMIN101

Course Name: Introduction to Life and Plant Diversity

Credits: 4 (Theory-3, Practical-1) Full Marks: 80 (Theory-60, Practical-20)

Brief Course Description:

This course deals with the Origin and Evolution of life and imparts basic knowledge about plants and related life forms. It thoroughly establishes the relationship of plants with other kingdoms of life. Also, it emphasizes the huge diversity of known plant life, along with an idea of the fossil record and geological time scale.

Prerequisite(s) and/or Note(s):

(1) High School Biology.

(2) Note(s): Syllabus may be modified after and not during the term itself, depending on the circumstances. However, students will be evaluated only on the basis of topics covered in the course.

Course Objectives:

Knowledge acquired:

- (1) Origin and evolution of Life
- (2) Introduction to plant and other life forms
- (3) Different groups of plants.

Skills gained:

- (1) Handling microscopy, staining and mounting of plant specimens, and,
- (2) Methods of collection, identification and preservation of plant specimens.

Competency Developed:

- (1) Schematic knowledge of collection and subsequent plant specimens.
- (2) Proper arrangement of preserved plant specimens.
- (3) Choosing suitable staining and mounting protocols for study of plant specimens.

Total lectures: 45

(8 lectures)

(7 lectures)

Unit-1: Origin of life

Origin of life: Oparin's hypothesis, Haldane's hypothesis, Miller-Urey experiment, origin of cells and the first organisms: the concepts of prebiotic soup and coacervates.

Unit-2: Evolution

Geological time scale – major events in each era; Evidences of evolution; theories of evolution - Lamarck, Wallace, Charles Darwin, Hugo De Vries. Neo-Darwinism - major postulates isolation, mutation, genetic drift, and speciation.

Unit-3: Diversity and classification of life forms

Diversity of life: Prokaryotes and Eukaryotes; unicellularity and multicellularity; Two kingdom classification (Carolus Linnaeus, 1735); phylogenetic classification (August W Eichler, 1878); Three kingdom classification (Ernst Haeckel, 1866); Three domains (Carl Woese, 1990) criteria for classification, general character.

Unit-4: Plant kingdom

General features of plants; Basic knowledge of thallophytes, archegoniates and spermatophytes; Basic structure and function of plant organs: roots, stem and leaves, vascular bundle; Introduction to mesophytes, hydrophytes and xerophytes; Concept of alternation of generations; the colonization of land by plants.

Unit-5: Plant diversity

Introduction to ICN and the status of algae and fungi; Diversity of plants: study of the salient features of major plant groups - algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.

PRACTICAL

Total classes: 15

- 8. Study of Light microscope: simple and compound.
- 9. Preparation of specimens for light microscopy Collection, fixation and preservation of plant specimens; Whole mounts and sections – hand sectioning.
- 10. Study of prokaryotic and eukaryotic cells.

THEORY

(10 lectures)

(10 lectures)

(10 lectures)

- 11. Demonstration of basic staining techniques of plant tissues.
- 12. Study and demonstration of mounting techniques.
- 13. Morphological variations in roots, stem and leaves (or equivalent organs) across different plant groups.
- 14. Study of reproductive structures in different plant groups through photographs / permanent slides.

- 13. Brian K. Hall and Benedikt Hallgrímsson, 2013. Strickberger's Evolution (Fifth Edition). Jones and Bartlett Publishers.
- 14. Eldon D Enger, Frederick C Ross, David B Bailey, 2011. Concepts in Biology (Fourteenth Edition). Tata McGraw Hill.
- 15. Gerald Audesirk, Teresa Audesirk, Bruce E Byers, 2019. Biology: Life on earth. (Twelfth Edition). Pearson.
- 16. James D Mauseth, 2019. Botany: An Introduction to Plant Biology. Jones & Bartlett.
- Kenneth A Mason, Jonathan B Losos, Tod Duncan, 2017. Biology (Twelfth Edition). McGraw Hill.
- Lisa A Urry, Michael L Cain, Steven A Wasserman, Peter V Minorsky, Rebecca B Orr, 2021. Campbell Biology (Twelfth Edition). Pearson.
- 19. Michael G Simpson, 2019. Plant Systematics (Third Edition). Academic Press.
- Peter Raven, George Johnson, Kenneth Mason, Jonathan Losos and Tod Duncan, 2023. Biology (Thirteenth Edition). McGraw Hill.
- Prasad M K, Krishna Prasad M, 2000. Outlines of Microtechnique. Emkay Publishers, New Delhi.
- 22. Scott Freeman, Kim Quillin, Lizabeth Allison, Michael Black, Greg Podgorski, Emily Taylor, and Jeff Carmichael, 2019. Biological Science. Pearson.
- Sylvia S Mader and Michael Windelspecht, 2022. Biology (Fourteenth Edition). McGraw Hill.
- 24. Timothy Walker, 2012. Plants: A Very Short Introduction. Oxford.

SEMESTER - II

Course Type: DSC A/B Course Code: BOTADSC202 Course Name: Cell Biology

Credits: 4 (Theory-3, Practical-1) Full Marks: 80 (Theory-60, Practical-20)

Brief Course Description:

This course deals with topics in Cell Biology. In particular, the course will cover the structural organization and functions of prokaryotic and eukaryotic cell, cellular organelles and cytoskeleton. It also gives an idea of cell division.

Prerequisite(s) and/or Note(s):

(1) High School Biology.

(2) Note(s): Syllabus changes yearly and may be modified during the term itself, depending on the circumstances. However, students will be evaluated only on the basis of topics covered in the course.

Course Objectives:

Knowledge acquired:

1) Clear idea about the structures and functions of basic components of prokaryotic and eukaryotic cells, especially cytoskeletons, membranes, and organelles.

(2) Detailed knowledge of cell cycle and cell division.

Skills gained:

(1) Measurement of cell size.

- (2) Technique of Chromosome study.
- (3) Characterize plasmolysis and deplasmolysis.

Competency Developed:

(1) Student learn the structure and function of different parts of cell and its importance.

(2) Distinguish between the stages of cell division.

THEORY

Total lectures: 45

Unit 1: The cell

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

Unit 2: Cell wall and plasma membrane

Chemistry, structure and function of plant cell wall; Plasma membrane - Chemical composition and function, Fluid mosaic model; Membrane transport - Diffusion, Osmosis, Passive, active and Facilitated diffusion.

Unit 3: Cell organelles

Nucleus – Structure of nuclear envelope, nuclear pore complex, nuclear lamina, structure of chromatin, nucleolus; Chloroplast, mitochondria and peroxisomes - Structural organization and functions; Endoplasmic reticulum – Structure and function; Golgi apparatus – Organization and function; Lysosomes - Structure and function.

Unit 4: Cell division

Mitosis and meiosis: Different stages and significance; Phases of eukaryotic cell cycle.

Unit 5: Cellular macromolecules

Carbohydrates - Nomenclature and classification with examples; Lipids – classification with examples; Fatty acids - structure and functions; Amino acids – Classification and examples; Proteins - peptide bond, properties and biological role of proteins, levels of protein structure; Properties and function of enzymes; Nucleic acids - Structure and types.

PRACTICAL

Total classes: 15

- 1. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.
- 2. Measurement of cell size by the technique of micrometry.
- 3. Study of cell and its organelles with the help of electron micrographs.
- 4. Study the phenomenon of plasmolysis and deplasmolysis.
- 5. Study of different stages of mitosis by squash technique.
- 6. Qualitative tests for reducing sugars, non-reducing sugars, lipids and proteins.

(14 lectures)

(7 lectures)

(12 lectures)

(6 lectures)

(6 lectures)

- 1. Campbell MK (2012) Biochemistry, 7th edition, Published by Cengage Learning.
- 2. Campbell PN and Smith AD (2011) Biochemistry Illustrated, 4th
- edition, Published by Churchill Livingstone.
- Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd edition,
 W.H.Freeman.
- 4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company.
- Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th edition, W.H.
 Freeman and Company.
- 6. Karp G (2010). Cell Biology, 6th edition, John Wiley & Sons, U.S.A.
- 7. Hardin J, Becker G, Skliensmith LJ (2012) 8th edition Becker's World of the Cell, Pearson Education Inc. U.S.A.

SEMESTER - II

Course Type: MINOR Course Code: BOTAMIN202 Course Name: Cell Biology

Credits: 4 (Theory-3, Practical-1) Full Marks: 80 (Theory-60, Practical-20)

Brief Course Description:

This course deals with topics in Cell Biology. In particular, the course will cover the structural organization and functions of prokaryotic and eukaryotic cell, cellular organelles and cytoskeleton. It also gives an idea of cell division.

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Course Objectives:

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(2) Detailed knowledge of cell cycle and cell division.

Skills gained:

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(1) Student learn the structure and function of different parts of cell and its importance.

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Unit 2: Cell wall and plasma membrane

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Unit 4: Cell division

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Unit 5: Cellular macromolecules

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- 7. Hardin J, Becker G, Skliensmith LJ (2012) 8th edition Becker's World of the Cell, Pearson Education Inc. U.S.A.

QUESTION PATTERN & TOTAL MARKS DISTRIBUTION FOR DSC Subject A/Subject B, & MINOR PAPERS

Theoretical Papers (Full Marks = 60)

SI No.	Questions to be answered	Out of	Marks for each Question	Total Marks
1.	5	8	2	$5 \times 2 = 10$
2.	5	8	6	5 × 6 =30
3.	2	4	10	$2 \times 10 = 20$

DURATION OF EXAMINATION FOR DSC Subject A/Subject B, & MINOR PAPERS

Semester End Examination	Full Marks	Duration of Exams
Theoretical	60	2.5 Hours
Practical	20	3 Hours

Practical guidelines and question pattern will be communicated before the semester end examination as per the decision of UGBOS Botany.