BINOD BIHARI MAHTO KOLANCHAL UNIVERSITY DHANBAD

DEPARTMENT OF BOTANY NEP FYUGP SYLLABUS

ACADEMIC SESSION

W.e.f. 2022-2026

I

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY
DHANBAD

DEPARTMENT OF BOTANY

Academic Session
W. e.f. 2022-2026

SYLLABUS OF
UNDER GRADUATE (UG) PROGRAMME

FRAMED ACCORDING TO
NATIONAL EDUCATION POLICY (NEP) 2020

Members of Borard of Studies of NEP 2020 graduate syllabus as per Guide lines of Binod Bihari Mahto Koyalanchal University , Dhanbad.

01	CHAIRMAN	Dr. Kalpana Prasad	Associate Professor, Head University Department of Botany BBMK University
02	MEMBERS	Dr. J. N. Singh	Associate Professor Principal R.S. P. College. Dhanbad
03		Dr. P.C. Thakur	Assistant Professor Department of Botany Chas College, Chas
04		Dr. Pallavi Praveen	Assistant Professor Department of Botany B.S. City College, Bokaro
05		Mrs. K. R Topno	Assistant Professor Department of Botany P.K.R. M. College, Dhanbad

Preamble

The objective of a B.Sc. (Honors) programme in Higher Education system is to prepare its students for the society. The current pattern is designed to provide a focused learning outcomebased syllabus at the Honors level providing structured teaching-learning experiences catering to the needs of the students. The honors courses will prepare the students both academically and in terms of employability. The programme also inculcates various attributes at the Honors level.

These attributes encompass values related to emotional stability, social justice, creative and critical thinking, well-being and various skills required for employability, thus preparing students for continuous learning and sustainability. The new curriculum based on learning outcomes of BSc (Honours) Botany offers knowledge of areas including Plant Systematics, Plant Biotechnology, Resource Botany, Genetics, Ecology, Conservation biology, Physiology and Bioinformatics, Medicinal plants, Plant diseases management etc. The courses define clearly the objectives and the learning outcomes, enabling students to choose the elective subjects broadening their skills in the field of Botany. The course also offers skills to pursue research and teaching in the field of Botany and thus would produce best minds to meet the demands of society This curriculum framework for the bachelor-level program in Botany is developed keeping in view of the student-centric learning pedagogy, which is entirely outcome-oriented and curiosity-driven. To avoid a rote-learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts.

The curriculum framework focuses on the pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works.

B. Sc. Botany Programme outcomes as per NEP 2020

Discipline Core: Botany

By the end of the program the students will be able to:

PO1: Skill development for the proper description using botanical terms, identification, naming and classification of life forms especially plants and microbes.

PO2: Acquisition of knowledge on structure, life cycle and life processes that exist among plant and microbial diversity through certain model organism studies.

PO3: Understanding of various interactions that exist among plants and microbes; to develop the curiosity on the dynamicity of nature.

PO4: Understanding of the major elements of variation that exist in the living world through comparative morphological and anatomical study.

PO5: Ability to explain the diversity and evolution based on the empirical evidences in morphology, anatomy, embryology, physiology, biochemistry, molecular biology and life history.

PO6: Skill development for the collection, preservation and recording of information after observation and analysis- from simple illustration to molecular database development.

PO7: Making aware of the scientific and technological advancements- Information and Communication, Biotechnology and Molecular Biology for further learning and research in all branches of Botany..

PO8: Internalization of the concept of conservation and evolution through the channel of spirit of inquiry.

PO 9: To enable the graduates to prepare for national as well as international level competitive examinations like UGC-CSIR, UPSC, KPSC etc.

PO10: To enable the students for practicing the best teaching pedagogy as a biology teacher including the latest digital modules.

PO 11: The graduates should be knowledgeable and competent enough to appropriately deliver on aspects of global importance like climate change, SDGs, green technologies etc at the right opportunity.

PO 12: The graduate should be able to demonstrate sufficient proficiency in the hands-on experimental techniques for their area of specialization within biology during research and in the professional career.

Assessment: (Teaching, Learning and Evaluation)

Weightage for assessments (in percentage)

Type of Course	Formative Assessment / IA	Summative Assessment
Theory	15	60
Practical	5	20
Projects		
Experiential Learning (Internships etc.)		

MAJOR PAPERS

S.N.	Semester Details	Code	Subject	Credit
1.	Semester I	BOT101T	Microbes, Algae, Fungi and Bryophytes	4
2.		BOT102P	Practical	2
3.	Semester II	BOT201T	Pteridophytes, Gymnosperms and Angiosperms	4
4.		BOT202P	Practical	2
5.	Semester III	BOT301T	Morphology and Anatomy	4
6.		BOT302P	Practical	2
7.	Semester IV	BOT401T	Embryology and Cytogenetics	4
8.		BOT402P	Practical	2
9.	Semester V	BOT501T	Molecular Biology and Plant Biotechnology	4
10.		BOT502T	Economic Botany and Plant Breeding	4
11.		BOT503P	Practical	2
12.	Semester VI	BOT601T	Plant Physiology and Biochemistry	4
13.		BOT602T	Ecology and Biostatistics	4
14.		BOT603P	Practical	2
15.		BOT504R	Project -Local Plant Diversity	4
16.	Semester VII	BOT701T		4
17.		BOT702T		4
18.		BOT703T		4
19.		BOT704P	Practical	2
20.	Semester VIII	BOT801T		4
21.		BOT802T		4
22.		BOT803T	Research Methodology	4
23.		BOT804P	Practical	2

CORE SPECIFIC ELECTIVE PAPERS (DSE)

S.N	Semester Details	Subject: Botany	Code	Credits
1.	Semester V	Algal and Fungal Biotechnology	**DSE 1**	3
2.	Semester VI	Herbal Technology	**DSE 2**	3
3.	Semester VII	Plant Propagation and Tissue Culture	**DSE 3**	3
4.	Semester VIII	Landscaping, Gardening and Green House Technology	**DSE 4**	3

Microbes, Algae, Fungi and Bryophytes (Course code: BOT101T)
Credit: 4

Unit 1.

Microbes :

Viruses-discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); economic importance; bacteria–discovery, general characteristics and cell structure; reproduction vegetative, asexual and recombination (conjugation, transformation and transduction); economic importance.

Unit 2

Algae:

General characteristics; Range of thallus organization and reproduction; classification of algae; morphology and life-cycles of: Nostoc, Chlamydomonas, Oedogonium, Vaucheria, Fucus, Sargassum; economic importance of algae.

Unit 3

Fungi :

Introduction-general characteristics, ecology and significance, range of somatic thallus organization, cell wall composition, nutrition, reproduction and classification (G.C. Ainsworth); life cycle of Stemonitis (Myxomycota) Rhizopus (Zygomycota) Penicillium (Ascomycota), Puccinia, Agaricus (Basidiomycota); Alternaria (Deutromycota), Symbiotic associations: Lichens- General account, reproduction and significance; Mycorrhiza: ectomycorrhiza, endomycorrhiza and their significance

Unit 4

Bryophytes:

General characteristics, adaptations to land habit, classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia and Funaria; ecology and economic importance of bryophytes.

Practical/ Lab course (Course code: BOT102P) **Credit: 2**

1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
Types of Bacteria from temporary/permanent slides/photographs; EM of bacterium; Binary Fission; Conjugation; Structure of root nodule; Gram staining technique
2 Study of vegetative and reproductive structures of Nostoc, Chlamydomonas (electron micrographs), Oedogonium, Vaucheria, Fucus and Sargassum through temporary preparations and permanent slides/specimens
3 Rhizopus and Penicillium: Asexual stages from temporary mounts.
Alternaria: Specimens/photographs and tease mounts.
Puccinia: Herbarium specimens of Black Rust of Wheat and infected Barberry leaves; section/tease mounts of spores on wheat and permanent slides of both the hosts.
Agaricus: Specimens of button stage and full grown mushroom.
Lichens: Study of growth forms of lichens (crustose, foliose and fruticose).
Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs).
4 Marchantia and Riccia: Morphology of thallus, rhizoids and scales, V.S. thallus through gemma cup, gemmae whole mount (all temporary slides), V.S antheridiophore, archegoniophore, L.S. sporophyte (all permanent slides).
Funaria- Morphology, whole mount leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, L.S capsule and protonema.

Suggested reading

Pandey, B.P. (2014). Modern Practical Botany Vol. I. S. Chand and Company Ltd. Ramnagar, New Delhi.

Purohit, S.D., Kundra, G. K. and Singhvi, A. (2013). Practical Botany (part I). Apex
Publishing House Durga Nursery Road Udaipur, Rajasthan.

Sambamurty, A.V.S.S. (2006). A text book of algae. I.K International Publishing House, Pvt. Ltd.

Pteridophytes, Gymnosperms and Angiosperms (BOT201T) **Credit: 4**

1. Pteridophytes

General characteristics, classification, early land plants (Rhynia); classification (up to family), morphology, anatomy and reproduction of Selaginella, Equisetum and Pteris; heterospory and seed habit, stelar evolution; ecological and economic importance of Pteridophytes.

2 Gymnosperms

General characteristics, classification (up to family), morphology, anatomy and reproduction of Cycas, Pinus and Ephedra; ecological and economic importance.

3 Introduction to plant taxonomy

Identification, classification, nomenclature, functions of herbarium, important herbaria and botanical gardens of the world and India

Important flora, botanical nomenclature (principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations).

Classification: Types of classification-artificial, natural and phylogenetic Bentham and Hooker (upto series) and Hutchinson classification.

4 Taxonomy of plant families

Ranunculaceae, Malvaceae, Rutaceae, Fabaceae, Apiaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Asteraceae, Poaceae and Orchidaceae

Suggested readings

- Vashishta, P.C., Sinha, A.K. and Kumar, A. (2010). Pteridophyta, S Chand and Company Ltd., Ramnagar, New Delhi, India.
- Vashishta, P.C., Sinha, A.K. and Kumar, A. (2010). Gymnosperms, S Chand and Company Ltd., Ramnagar, New Delhi, India.
- Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) LtdPublishers, New Delhi, India.
- Parihar, N.S. (1991). An Introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
- Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
- Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford and IBH Pvt. Ltd.,New Delhi. 3rd edition.
- Gangulee H.C., Kar, A.K. and Santra S.C. (2011). College Botany Vol II. 4th Edition New Central Book Agency.
- Parihar, N.S. (1976). Biology and Morphology of Pteridophytes. Central Book Depot.
- Sharma, O.P. (1990). Textbook of Pteridophyta. MacMillan India Ltd. Delhi.

Practical/ Lab course (BOT202P) **Credit: 2**

1 Selaginella: Morphology, whole mount leaf with ligule, strobilus, microsporophyll and megasporophyll (temporary slides), T.S. stem, L.S. strobilus (permanent slide).
Equisetum: Morphology, T.S. internode, L.S. strobilus, T.S and L.S. strobilus, whole mount sporangiophore,. spores (wet and dry) (temporary slides); T.S. rhizome (permanent slide).
Pteris: Morphology, T.S rachis, V.S. sporophyll, whole mount sporangium and spores (temporary slides), T.S. rhizome, whole mount prothallus with sex organs and young sporophyte (permanent slide).
2 Cycas: Morphology (coralloid roots, bulbil, leaf), T.S. coralloid root and rachis, V.S. leaflet and microsporophyll, whole mount spores (temporary slides), L.S. ovule, T.S. root (permanent slide).
Pinus: Morphology (long and dwarf shoots, male and female cones), T.S. needle and stem, L.S./T.S. male cone, whole mount microsporophyll and microspores (temporary slides), L.S. female cone, TLS and RLS stem (permanent slide).
3 Taxonomic Identification: Description of an angiospermic plant, study of vegetative and floral characters (description, V.S. flower, section of ovary, floral diagram/s, floral formula/e) and systematic position of the following families according to Bentham and Hooker's system of classification: Brassicaceae, Asteraceae, Solanaceae, Lamiaceae, and Liliaceae.(Plants can be chosen as per availability of local flora)
4 Herbarium techniques: Plant collection, preservation and mounting of two properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book), digital/virtual herbarium.

Suggested readings

Pandey, B.P. (2014). Modern Practical Botany Vol. II. S. Chand and Company Ltd., New Delhi.

Bendre, A.M. and Kumar A. (2003). Manual of Practical Botany Vol. II. Rastogi Publications, Meerut.

Santra S.C. and Chatterjee (2005). College Botany Practical Vol. II New Central Book Agency Pvt. Ltd.

INTRODUCTORY REGULATORY COURSE- BOTANY

There will be two group of questions. **Group A** is compulsory which will contain three questions. Question number one will be very short answer type consisting of ten questions of 1 Mark each. Two (2) Questions will be short answer type 5 Marks each. **Group B** will contain descriptive types 6 questions of **20** Marks each, out of which any four questions have to be answered.

Credit: Theory – 4 **Lecture 60** **Full Marks -100**

1. **Scope of Botany and five kingdom classification with special emphasis on Plantae**. **(4)**
   General characteristic features of Thallophyta, Bryophyta, Pteridophyta, Gymnosperm and Angiosperm.
2. **Biodiversity and its conservation**. **(4)**
   Definition, levels of biodiversity, importance and methods of biodiversity conservation.
3. **Botanical name family and uses of medicinal plants.** **(4)**
   i. Sarpgandha, ii. Ashvgandha, iii. Brahmi, iv. Aloe vera, v. Amla, vi. Tulsi, vii. Turmeric, viii. Garlic, ix. Giloy.
4. **Ecosystem** **(5)**
   -Basic concept, component of ecosystem, Types, structural and functional components of ecosystem, food chain and food Web, ecological pyramid.
   -Environmental issues:- Green house effect, global warming, eutrophication, algal bloom, photochemical smog.
5. **Basic idea of plant tissue culture and its application.** **(6)**
   - Basic requirement of tissue culture, technic protoplast and application.
6. **Plant water relationship:** Osmosis, Diffusion, Imbibition, Water popotential, Plasmolysis **(5)**
7. **Transpiration:** **(5)**
   - Brief idea about transpiration and Guttation.
   - Stomatal opening and closing.
8. **Photosynthesis:** **(4)**
   Brief idea about Photosynthesis- Light reaction.
9. **Brief idea about respiration-** Glycolysis. **(7)**
10. **Cell biology** **(6)**
    - Prokaryotes and Eukaryotes, Cell division- Mitosis and Meiosis.
11. **Biomolecules** **(5)**
    - Nucleic acid (DNA and RNA) , Protein (Chemistry and structure)
12. **Genetics** **(5)**
    - Mendel's law of inheritance, co-dominance, Incomplete dominance.

Suggested Readings

1. Singh V , Pande, P C and Jain, D K ,(2018) A textbook of Botany, Rastogi Publications
2. Sharma, P D (2017) Ecology and Environment, 13th Edition, Rastogi Publications, Meerut
3. Hosetti, B B and Ramkrishna, S (2016) Biodiversity- Concepts and Conservation, Aavishkar Publishers, Distributors,Jaipur
4. Patro, I (2016) Biodiversity Conservation and Management, Discovery Publishing Pvt Ltd
5. Singh V , Pande, P C and Jain, D K ,(2018), Economic Botany, 3rd Edition, Rastogi Publications
6. Kochhar, S L ,(2016) Economic Botany- A Comprehensive Study,5th Edition, Cambridge University Press India Pvt Ltd
7. Odum, E P and Barrett, G W ,(2017) Fundamentals of Ecology, 5th Edition, Cengage Learning, New Delhi
8. Shukla, R S and Chandel, P S (2016) A text book of Plant Ecology, S Chand & Company Pvt Limited
9. Bhojwani, S S and Razdan, M K , (1996) Plant Tissue Culture Theory andPractice Elsevier Science Amsterdam The Netherlands
10. Dubey, R C – 2015, A Text book of Biotechnology, S Chand & Co Pvt Ltd- New Delhi.
11. Hopkins, W G and Huner, A,(2008) Introduction to Plant Physiology JohnWiley and Sons, U S A 4th edition
12. Taiz, L , Zeiger, E , Muller, I M and Murphy, A (2015) Plant Physiology and development Sinauer Associates Inc USA 6th edition