BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

DEPARTMENT OF BOTANY

SYLLABUS OF UNDER GRADUATE (UG) PROGRAMME FRAMED ACCORDING TO NATIONAL EDUCATION POLICY (NEP) 2020

With effect from Academic Session 2023-2027

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, 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 outcome based 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 B.Sc. (Honors) 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.

Members of Board of Studies of NEP 2020 for Under Graduate Syllabus as per Guide lines of Binod Bihari Mahto Koyalanchal University, Dhanbad.

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

01	CHAIRMAN	Dr. Kalpana Prasad	Associate Professor, Head, University Department Of Botany, BBMK University, Dhanbad
02	External expert	Prof. R. N. Kharwar	Former Head, University Department of Botany, BHU, Vanarasi, U.P
03	MEMBERS	Dr. J. N. Singh	Associate Professor, Dean, Faculty of Science, BBMKU, Dhanbad
04		Dr. P.C. Thakur	Assistant Professor, Department of Botany, Chas College, Chas
05		Dr. Pallavi Praveen	Assistant Professor, Department of Botany, B.S. City College, Bokaro

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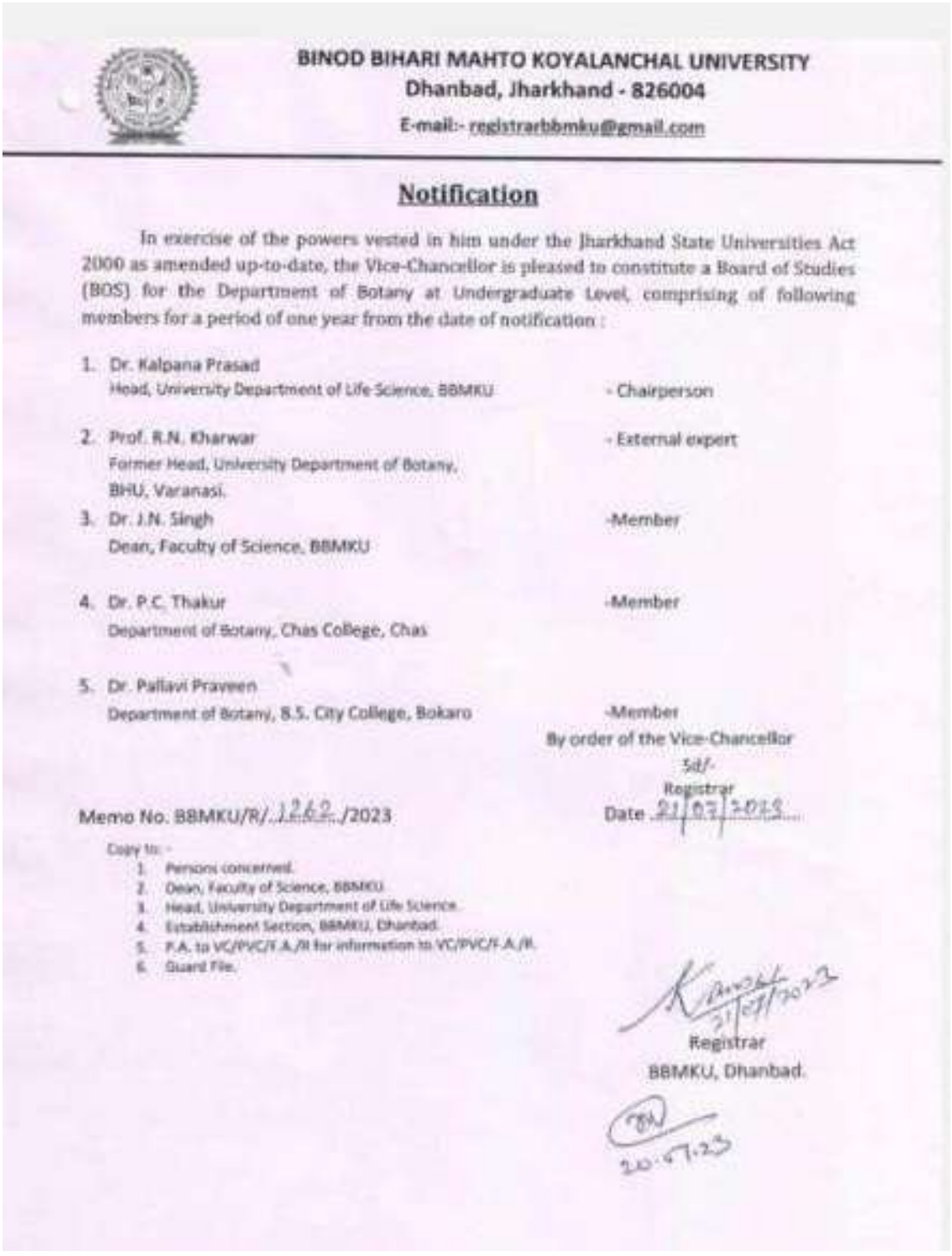

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY
Dhanbad, Jharkhand - 826004
E-mail:- registrarbbmku@gmail.com

Notification

In exercise of the powers vested in him under the Jharkhand State Universities Act 2000 as amended up-to-date, the Vice-Chancellor is pleased to constitute a Board of Studies (BOS) for the Department of Botany at Undergraduate Level, comprising of following members for a period of one year from the date of notification :

1. Dr. Kalpana Prasad
   Head, University Department of Life Science, BBMKU - Chairperson
2. Prof. R.N. Kharwar - External expert
   Former Head, University Department of Botany,
   BHU, Varanasi.
3. Dr. J.N. Singh -Member
   Dean, Faculty of Science, BBMKU
4. Dr. P.C. Thakur -Member
   Department of Botany, Chas College, Chas
5. Dr. Pallavi Praveen
   Department of Botany, B.S. City College, Bokaro -Member

By order of the Vice-Chancellor
Sd/-
Registrar

Memo No. BBMKU/R/.1262./2023 Date 21/07/2023

Copy to:-
1. Persons concerned.
2. Dean, Faculty of Science, BBMKU
3. Head, University Department of Life Science
4. Establishment Section, BBMKU, Dhanbad.
5. P.A. to VC/PVC/F.A./R for information to VC/PVC/F.A./R.
6. Guard File.

21/07/2023
Registrar
BBMKU, Dhanbad.

20.7.23

B. Sc. Botany Programme outcomes as per NEP 2020

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

Discipline Core: Botany

By the end of the program the students will be equipped with/ able to:

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

PO2: with the knowledge of structure, life cycle and life processes among plant and microbial diversity with some representative life forms.

PO3: understand various interactions that exist among different life forms and environment; to understand dynamics of nature.

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

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

PO6: the Skill for the collection, preservation and recording of information after observation and analysis.

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

PO8: understand the concept of conservation and evolution by inquiry, innovative ideas and application.

PO 9: apply skill to compete to national as well as international level competitive examinations like UGC-CSIR, UPSC, State Public Service Commission, etc.

PO10: to practice the best teaching pedagogy as a biology teacher including the latest digital modules.

PO 11: to understand and take action on aspects of global importance like climate change, SDGs, green technologies etc.

PO 12: the sufficient proficiency in the experimental techniques of biological science and to utilize the technique during research and in the professional career.

BOTANY (MAJOR)

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

S.N.	Semester	Paper	Credit	Full Marks-100			Pass Marks		
				Internal Theory (Mid Sem.)	End sem. Theory	End sem. Practical	Internal Theory (Mid Sem.)	End Sem. Theory	End sem. Practical
1.	I	MJ-1: Theory	4	25	75	-	10	30	-
2.	II	MJ-2: Theory	4	25	75	-	10	30	-
		MJ-3: Practical-I	4	-	-	100	-	-	40
3.	III	MJ-4: Theory	4	25	75	-	10	30	-
		MJ-5: Practical-II	4	-	-	100	-	-	40
4.	IV	MJ-6: Theory	4	25	75	-	10	30	-
		MJ-7: Theory	4	25	75	-	10	30	-
		MJ-8: Practical-III	4	-	-	100	-	-	40
5.	V	MJ-9: Theory	4	25	75	-	10	30	-
		MJ-10: Theory	4	25	75	-	10	30	-
		MJ-11: Practical-IV	4	-	-	100	-	-	40
6.	VI	MJ-12: Theory	4	25	75	-	10	30	-
		MJ-13: Theory	4	25	75	-	10	30	-
		MJ-14: Theory	4	25	75	-	10	30	-
		MJ-15: Practical-V	4	-	-	100	-	-	40
7.	VII	AMJ-01: Theory	4	25	75	-	10	30	-
		AMJ-02: Theory	4	25	75	-	10	30	-
		AMJ-03: Theory	4	25	75	-	10	30	-
		AMJ-04: Practical-VI	4	-	-	100	-	-	40
8.	VIII	AMJ-05: Theory	4	25	75	-	10	30	-
Total Credit -			80						

*total theory papers will be 14 and practical papers will be 6.

*no internal or mid semester examination will be conducted for practical papers.

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

MAJOR PAPERS

S.N.	Semester Details	Code	Subject	Credit
1	Semester I	BOT-MJ-01T	Microbes, Algae, Fungi and Bryophytes	4
2	Semester II	BOT-MJ-02T	Pteridophytes, Gymnosperms and Angiosperms	4
		BOT-MJ-03P-1	Practical	4
3	Semester III	BOT-MJ-04T	Morphology and Anatomy	4
		BOT-MJ-05P-2	Practical	4
4	Semester IV	BOT-MJ-06T	Cell biology and Biomolecule	4
		BOT-MJ-07T	Genetics and Molecular Biology	4
		BOT-MJ-08P-3	Practical	4

BOT – Botany, MJ – Major, T – Theory, P – Practical,
MSE – Mid Semester Exam, ESE – End Semester Exam

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SEMESTER - I

PAPER- BOT-MJ -01-T **MICROBES, ALGAE, FUNGI AND BRYOPHYTES**

CREDITS:- 04 **60 LECTURES**

MARKS: 25 (MSE) + 75 (ESE) = 100 **PASS MARKS: 10 (MSE) + 30 (ESE) = 40**

INSTRUCTIONS FOR QUESTION SETTER

Mid semester exam (MSE): 1 hr.

- The mid semester exam shall have two groups of questions.Group A is compulsory which will contain two questions.Question no. 1 will be very short answer type consisting of five questions of 1 marks each. Question no. 2 will be of short answer type of 5 marks.Group B will contain descriptive type two questions of 10 marks each, out of which any one to answer.
- Class attendance score and extracurricular activities of 5 marks

End semester exam (ESE): 3hrs

There will be 2 groups of questions

GROUP-A is compulsory and will contain 3 questions. **Q. No-1 (A)** will be multiple choice 10 questions of 1 mark each. **Q. No-1 (B)** will contain 2 short answers type questions (max. 50 words) each of 2½ marks.

GROUP-B will contain descriptive type 8 questions of 15 marks each out of which any 4 are to be answered.

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Unit-1 Microbes:

Viruses- Virion, prions and viroids, DNA virus (T- phage); Lytic and lysogenic cycle, RNA virus (TMV); economic importance; Basic concept of vaccine and vaccine production

Bacteria– Basic concept of bacterial culture; reproduction– vegetative, asexual and recombination (conjugation, transformation and transduction)

Unit-2 Algae

General characteristics; Range of thallus organization and reproduction; classification of algae; morphology and life-cycles of:- Spirulina, Oedogonium, Chara, Vaucheria, Ectocarpus & Polysiphonia; Economic importance of algae.

Unit 3

Fungi:

Introduction-general characteristics, classification (G.C. Ainsworth); Phytophthora (Oomycota), Penicillium (Ascomycota), Puccinia, Agaricus (Basidiomycota); Alternaria (Deutromycota), Symbiotic associations: Lichens- General account, reproduction and significance; Mushroom-introduction, cultivation and economic importance

Unit 4 Bryophyte:

General characteristics, adaptations to land habit, classification (up to family), morphology, anatomy and reproduction of Marchantia and Anthoceros and Sphagnum

Suggested reading

- Kumar, H.D. (1999). Introductory Phycology, Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition
- Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition

Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, MacMillan Publishers Pvt. Ltd., Delhi

Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology,John Wiley and Sons (Asia), Singapore. 4th edition

Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi, India

Pandey, S.N and Trivedi, P.S. (2015). A text book of Botany Vol.I Vikas publishing House Pvt/ Ltd, New Delhi

Vashishta, P.C., Sinha, A.K., Kumar, A. (2010). Bryophyta, S. Chand. Delhi, India

Parihar, N.S. (1991). An Introduction to Embryophyta Vol. I Bryophyta. Central Book Depot, Allahabad. Central Book Agency

Parihar, N.S. (1976). Biology and Morphology of Pteridophytes, Central Book Depot Allahabad

Sharma, O.P. (1990). Textbook of Pteridophyta, MacMillan India Ltd. Delhi

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SEMESTER - II

PAPER- BOT-MJ -02-T PTERIDOPHYTES, GYMNOSPERMS AND ANGIOSPERMS

CREDITS:- O4 **60 LECTURES**

MARKS: 25 (MSE) + 75 (ESE) = 100 **PASS MARKS: 10 (MSE) + 30 (ESE) = 40**

INSTRUCTIONS FOR QUESTION SETTER

Mid semester exam (MSE): 1 hr.

- The mid semester exam shall have two groups of questions. Group A is compulsory which will contain two questions. Question no. 1 will be very short answer type consisting of five questions of 1 marks each. Question no. 2 will be of short answer type of 5 marks. Group B will contain descriptive type two questions of 10 marks each, out of which any one to answer.
- Class attendance score and extracurricular activities of 5 marks

End semester exam (ESE): 3hrs

There will be 2 groups of questions

GROUP-A is compulsory and will contain 3 questions. Q. No-1 (A) will be multiple choice10 questions of 1 mark each. Q. No-1 (B) will contain 2 short answers type questions (max. 50 words) each of 2½ marks

BOT – Botany, MJ – Major, T – Theory, P – Practical,
MSE – Mid Semester Exam, ESE – End Semester Exam

GROUP-B will contain descriptive type 8 questions of 15 marks each out of which any 4 areto be answered

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1. Pteridophytes

General characteristics, classification, early land plants (Rhynia); classification (upto family), morphology, anatomy and reproduction of Selaginella and Equisetum, heterospory and seed habit, stelar evolution.

2 Gymnosperms

General characteristics, classification (up to family), morphology, anatomy and reproduction of Pinus, Ginkgo and Gnetum

3. Introduction to plant taxonomy

Identification, classification, herbarium preparation,
Botanical nomenclature (principles and rules (ICBN); Ranks and names; Binomial system.

Classification: Types of classification - Artificial, Natural and Phylogenetic, Bentham and Hooker (up to series) and Takhtajan system of classification

4 Taxonomy of plant families

Apocynaceae, Asclepiadaceae, Labiatae, Solanaceae, and Poaceae.

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 Chandand 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

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Practical/ Lab course (BOT-MJ-3 P-I) **Credit: 04**

60 LECTURES/CONTACT HRS

MARKS: ESE = 100 **PASS MARKS: ESE = 40**

1. Study of microbes (included in the syllabus) with permanent slide and temporary slide prepared in the laboratory. Study of structure of TMV by photographs. Study of Bacteria by slides/photographs. Gram staining technique.
2. Study of vegetative and reproductive structures (Slide preparation) of algae included in the syllabus by temporary and permanent slides.
3. Study of vegetative and reproductive structures (Slide preparation) of fungi included in the syllabus by temporary and permanent slides.
4. Study of different forms of lichen by photographs.
5. Study of vegetative and reproductive structures (Slide preparation) of bryophytes included in the syllabus by temporary and permanent slides.
6. **Selaginella:** Morphology, whole mount leaf with ligule, strobilus, microsporophyll and megasporophyll (temporary slides), T.S. stem, L.S. strobilus (permanent slide).
7. **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).
8. **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).
9. **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).
10. **Taxonomic Identification:** Description of an angiospermic plant, study of vegetative and floral characters (description, V.S. flower, section of ovary, floral

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diagram/s, floral formula/e) and systematic position of the following families according to Bentham system of classification: Apocyanaceae, Aschelpiadaceae,

Labiatee, Solanaceae ,Poaceae.(Plants can be chosen as per availability of local flora)

11. 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.

Examination F.M.100 Time- 04 hrs

1. Study of TMV/bacteria by slide/photographs/Gram staining technique of bacteria. 15
2. Preparation of temporary slides of any one genus of Algae **OR** any one genus of fungi included in the syllabus 15
3. Preparation of temporary slide of any one genus of Bryophyte/Pteridophyte/Gymnosperm (included in syllabus) 15
4. Study of vegetative and floral characters (V.S. flower, section of ovary, Floral diagram/s, floral formula/e) and systematic position of any one family included in the syllabus. 15
5. Submission of two physical/digital Herbarium 2x5 - 10
6. Spotting 2x5 - 10
7. Viva - 10
8. Class record & Collection 10

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.

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

SEMESTER-III

PAPER- BOT-MJ-T-04 **MORPHOLOGY AND ANATOMY**

CREDITS:- 04 **60 LECTURES**

MARKS: 25 (MSE) + 75 (ESE) = 100 **PASS MARKS: 10 (MSE) + 30 (ESE) = 40**

INSTRUCTIONS FOR QUESTION SETTER

Mid semester exam (MSE): 1 hr.

- The mid semester exam shall have two groups of questions. Group A is compulsory which will contain two questions. Question no. 1 will be very short answer type consisting of five questions of 1 marks each. Question no. 2 will be of short answer type of 5 marks. Group B will contain descriptive type two questions of 10 marks each, out of which any one to answer.
- Class attendance score and extracurricular activities of 5 marks

End semester exam (ESE): 3hrs

There will be 2 groups of questions

GROUP-A is compulsory and will contain 3 questions. Q. No-[1] (A) will be multiple choice 10 questions of 1 mark each. Q. No-1 (B) will contain 2 short answers type questions (max. 50 words) each of 2½ marks.

[1] Meristematic and permanent tissues: Types of tissues, Root and shoot apical meristems, Theories related to apical meristem,(Apical cell theory, Histogen theory, & Tunica Corpus theory), simple, complex and secretary tissues .

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GROUP-B will contain descriptive type 8 questions of 15 marks each out of which any 4 are to be answered.

2 Organs: Structure of dicot and monocot root, stem and leaf.

3 Adaptive and protective systems: Epidermis, cuticle and stomata.

4 Secondary growth: Structure and function of Vascular cambium, secondary growth in stem and roots, anomalous secondary growth (Boerhaavia & Dracaena).

5 Periderm: Development and composition , lenticel and rhytidome, sapwood , heartwood, early and late wood.

6 Anatomical adaptation of hydrophytes and xerophytes.

Suggested readings

Mauseth, J.D. (1988). Plant Anatomy, The Benjamin/Cummings Publisher, USA Pandey, B.P. (2001). Plant Anatomy. S. Chand and Company Ltd., New Delhi.

Sharma, P.C. (2017). Text Book of Plant Anatomy. Arjun Publishing House.

Menan, A.B. (2008). Introduction to Plant Anatomy, Neha Publishers and Distributors

Sharma, M.K. (2013). Plant Structures (An Introduction to Plant Anatomy), Vayu Education of India

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Practical/Lab Course (Course code: BOT-MJ-5-P-II)

Credit: 04 **60 LECTURES/CONTACT HRS**

MARKS: ESE = 100 **PASS MARKS: ESE = 40**

1. Study of Meristematic and Permanent tissues by temporary and permanent slide preparation and photograph.
2. Study of Root and Shoot apical meristems by photograph.
3. Study of simple, complex and secretory tissues by photograph.
4. Study of anatomical details of monocot root, stems and leaf by preparing temporary slide and also by permanent slide or by photographs.
5. Study of anatomical details of dicot root, stems and leaf by preparing temporary slide and also by permanent slide or by photographs.
6. Study of anatomical structure of cambium by slides.
7. Study of normal secondary growth in stem and roots by photograph.
8. Study of anomalous structure of *Boerhaavia* stem and *Dracaena* stem by preparing temporary slide and by permanent slide or by photographs.
9. Study of anatomical details of Epidermis, Cuticle and Stomata by preparing temporary slide/photograph.
10. Study of parenchyma, c17ollenchymas, sclerenchyma and different components of Xylem and Phloem by preparing temporary slide/photographs.
11. Study of anatomical adaptations in xerophytes and hydrophytes by preparing temporary slides.

Examination **F.M.100** **Time- 04 hrs**

1. Study of anatomical details (TS) of monocot/dicot root OR stem OR leaf by preparing temporary slide. 15
2. Study of anomalous structure of *Boerhaavia* OR *Dracaena* stem by preparing temporary slide. 15

3. Study of anatomical adaptations in xerophytes OR hydrophytes by preparing temporary slide. 15
4. Study of anatomical details of Epidermis OR Stomata by preparing temporary slide. 15
5. Study of parenchyma/c18ollenchymas/sclerenchyma/xylem/phloem by preparing temporary slide/photographs. 10
6. Spotting 2x5 - 10
7. Viva 10
8. Class record & Collection 10

Suggested readings

1. Dickison, W.C. (2000). Integrative plant Anatomy, Harcourt Academic Press, USA
2. Fahn. A. (1974). Plant Anatomy, Pergmon Press. USA
3. Mauseth, J.D. (1998), Plant Anatomy, The Berjammin/ Cummings Publishers, USA
4. Esau. K. (1977). Anatomy of seed plants, John Wiley & Sons Inc., Delhi

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SEMESTER – IV

PAPER- BOT-MJ -06-T **CELL BIOLOGY AND BIOMOLECULES**

CREDITS:- 04 **60 LECTURES**

MARKS: 25 (MSE) + 75 (ESE) = 100 **PASS MARKS: 10 (MSE) + 30 (ESE) = 40**

INSTRUCTIONS FOR QUESTION SETTER

INSTRUCTIONS FOR QUESTION SETTER

Mid semester exam (MSE): 1 hr.

- The mid semester exam shall have two groups of questions. Group A is compulsory which will contain two questions. Question no. 1 will be very short answer type consisting of five questions of 1 marks each. Question no. 2 will be of short answer type of 5 marks. Group B will contain descriptive type two questions of 10 marks each, out of which any one to answer.
- Class attendance score and extracurricular activities of 5 marks

End semester exam (ESE): 3hrs

There will be 2 groups of questions

GROUP-A is compulsory and will contain 3 questions. Q. No-1 (A) will be multiple choice 10 questions of 1 mark each. Q. No-1 (B) will contain 2 short answers type questions (max. 50 words) each of 2½ marks.

GROUP-B will contain descriptive type 8 questions of 15 marks each out of which any 4 are to be answered.

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CELL BIOLOGY

1. Differences between prokaryotic and eukaryotic cell.
2. Chemistry, Structure and Function of plant cell wall, Plasma Membrane and Nucleus.
3. Structure & Functions of: Chloroplast, Mitochondria, Ribosomes, Endoplasmic reticulum, Golgi apparatus, Lysosomes.
4. Cell division: Mitosis and Meiosis.

BIOMOLECULES

1. **Carbohydrates:** Nomenclature and classification, Role of monosaccharides, disaccharides, oligosaccharides and polysaccharides.
2. **Proteins:** Structures of amino acids; Structure of Protein – primary, secondary, tertiary and quaternary structure; biological roles of proteins.
3. **Lipids**: Types and function.
4. **Enzyme**: Definition, discovery, Structure of: holoenzyme, apoenzyme. Prosthetic group, Cofactors; mechanism of enzyme action. Factors affecting enzyme activity.

SUGGESTED READINGS

1. Campbell, MK (2012) Biochemistry, 7th ed., published by Cengage Learning.
2. Camphell, PN and Smith AD (2011) Biochemistry illustrated, 4th ed., Published by Churchill Livingstone.
3. Tymoezko JL, Berg JM and Stryer L (2012) Biochemistry; A short course, 2nd ed. W.H.Freeman.
4. Berg JM, Tymoezko JL, and Stryer L (2011) Biochemistry, W.H.Freeman and Company.

5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5thed. 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.

SEMESTER - IV

PAPER- BOT-MJ -07-T GENETICS AND MOLECULAR BIOLOGY

CREDITS:- 04 **60 LECTURES**

MARKS: 25 (MSE) + 75 (ESE) = 100 **PASS MARKS: 10 (MSE) + 30 (ESE) = 40**

INSTRUCTIONS FOR QUESTION SETTER

Mid semester exam (MSE): 1 hr.

- The mid semester exam shall have two groups of questions. Group A is compulsory which will contain two questions. Question no. 1 will be very short answer type consisting of five questions of 1 marks each. Question no. 2 will be of short answer type of 5 marks. Group B will contain descriptive type two questions of 10 marks each, out of which any one to answer.

- Class attendance score and extracurricular activities of 5 marks

End semester exam (ESE): 3hrs

There will be 2 groups of questions

GROUP-A is compulsory and will contain 3 questions. Q. No-1 (A) will be multiple choice 10 questions of 1 mark each. Q. No-1 (B) will contain 2 short answers type questions (max. 50 words) each of 2½ marks.

GROUP-B will contain descriptive type 8 questions of 15 marks each out of which any 4 are to be answered.

GENETICS

1. MENDELIAN GENETICS & ITS EXTENSION

Mendel's laws of inheritance, Incomplete dominance and co-dominance, Epistatis, Complementary and Duplicate genes.

2. EXTRACHROMOSOMAL INHERITANCE

Cytoplasmic inheritance: Variation in four O'clock plant & infective heredity Kappa particles in *Paramecium*.

3. LINKAGE AND CROSSING OVER

Mechanism and significance of Linkage and crossing over

4. VARIATION IN CHROMOSOME NUMBER & STRUCTURE

Euploidy, Aneuploidy, Deletion, Duplication, Inversion, Translocation, origin of *Rhaphobrassica* & Triticale.

5. GENE MUTATION

Types of mutations, Molecular basis of mutations, Mutagens – Physical and chemical, Role of mutation in crop improvement.

MOLECULAR BIOLOGY

1. Nucleic Acids:

Historical perspective: DNA as the carrier of genetic information (Griffith's & Hershey & Chase experiment)

2. **Nucleic acids:** Structure of nitrogenous bases; Structure and function of nucleotide; types of nucleic acids; DNA structure and function: Watson and Crick Model of DNA, structure of BDNA, A-DNA and Z- DNA; Structure and function of RNA; tRNA, rRNA and mRNA.

3. **Chromosome:**

Structure and function, nucleosome model, Chromatin structure – Euchromatine, heterochromatin – Constitutive & Facultative heterochromatin. Polytene and Lampbrush chromosome.

4. **Replication of DNA:** Mechanism of DNA replication, Enzymes involved in DNA replication
5. **Central Dogma and Genetic Code:** General account of Central dogma and genetic code.
6. **Mechanism of Transcription:-**Transcription in prokaryotes and eukaryotes
7. **Translation:** Process of translation in Prokaryotes and eukaryotes, Proteins involved in translation.
8. **Regulation of Gene expression:** Regulation of gene expression in Prokaryotes, Operon – inducible system – Lac operon, Repressible system, Tryptophan operon.

SUGGESTED READINGS

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics. John Wiley & sons. India 8th edition.
2. Snustad, D.P. and Simmons, M.J. (2010) Principles of Genetics, John Wiley & Sons, Inc., India. 5th edition.
3. Klug, W.S., Cummings, M.R., Speneer. C.A. (2012). Concepts of Genetics. Benjamin Cummings, USA. 10th edition.
4. Griffiths, A.J.F, Wessler, S.R., Carroll, S.B., Doebley. I. (2010). Introduction to Genetic Analysis. W.H. Freeman and Co., U.S.A., 10th edition.

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

Practical/Lab Course (Course code: BOT-MJ-8-P-III)

Credit: 04 **60 LECTURES/Contact Hrs**

MARKS: ESE = 100 **PASS MARKS: ESE = 40**

1. Study prokaryotic and eukaryotic cell by photograph.
2. Perform qualitative tests for carbohydrates.
3. Perform qualitative tests for proteins.
4. Study of different stages of mitosis by preparing temporary slide.
5. Study of different stages of meiosis by preparing temporary slide.
6. Study plant cell wall, Plasma Membrane and Nucleus by photograph.
7. Study Chloroplast, Mitochondria and Ribosomes by slide/photograph.
8. Study mechanism of enzyme action by photograph.
9. Study incomplete dominance, co-dominance, Epistatis, Complementary and Duplicate genes by photograph.
10. Study mechanism of crossing over by slide/photograph.
11. Study structure of nitrogenous bases, nucleotide, DNA, B-DNA, A-DNA and Z- DNA by photograph.
12. Study structure of RNA by photograph.
13. Study replication of DNA by photograph.

Examination **F.M.100** **Time- 04 hrs**

1. Preparation of temporary slides of any stage of mitosis OR meiosis. 15

2. Biochemical test of carbohydrates or protein 15
3. Testing of goodness of fit by chi-square method. 15
4. Study of Watson and Crick model of DNA/nucleosome model/ polytene/ Lambrush chromosome by photographs 15
5. Study of DNA replication mechanism by photographs 10
6. Spotting 2x5 - 10
7. Viva 10
8. Class record & Collection 10

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

Multi Disciplinary Course

(Course code: BOT- MDC) **Credit: 3** **45 LECTURES**
FM-75 **Pass Marks-30**

1. **Plant diversity and Human welfare:** Genetic, species and ecosystem level, importance of plants and their uses, conservation of plants diversity.
2. **Nursery and Gardening:** Nursery raising, gardening practices, plant propagation.
3. **Organic Farming:** Methods and types.
4. **Pollution:** Air, Water, Soil, Noise Pollution- causes, effect, and remedial measures.
5. **Biofertilizers:** General account of microbes used as Biofertilizer, Vermicompost
6. **Herbal medicine:** History and scope.
7. **Biofuels:** Definition types, and uses.
8. **Mushroom cultivation:** Process and nutraceuticals value of edible mushrooms.

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

Semester:-I Paper: - MN-IA

(Credit: Theory-3)

Lectures: 45

Full marks: 60 Time: 3 hrs

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

PLANT DIVERSITY-I AND CYTOGENETICS

UNIT-01- Plant Diversity-I

ALGAE:-General characteristics, Morphology and life-cycles of the following: Nostoc, Chlamydomonas, Batrachospermum.

FUNGI: - General characteristics, morphology and life cycle of Albugo, Puccinia, Alternaria , Lichens -general account.

BRYOPHYTA:- General characteristics , morphology , anatomy and reproduction of Marchantia.

UNIT-02- Cytology and Genetics

Cytology:- Structure of cytoplasm cell organelles – Mitochondria, Chloroplast, Ribosome ;
Cell Division – Mitosis, Meiosis.

Genetics:- Principles of inheritance , Mendel's Law ; complimentary gene & Epistasis
Gene – mutation and polyploidy

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

BOT-MN-1A- PRACTICAL (PLANT DIVERSITY-I AND CYTOGENETICS)

(Credit: Practical-1)

F.M. – 25 **Examination Time- 03 hrs**

1. Study of vegetative and reproductive structures by preparation of temporary slides from unit-1(algae , fungi , & bryophyte) - 10

2. Cytological slide preparation -05

3. Spotting - 05

4. Record -03

5. Viva -02

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

Semester:-II Paper: - MN-IB

(Credit: Theory: 3)

Lectures: 45

Full marks: 60 Time: 3 hrs

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

PLANT DIVERSITY-II AND PLANT PHYSIOLOGY

UNIT-01- PLANT DIVERSITY-II

Pteridophytes:-General characteristics, morphology, anatomy and reproduction of Selaginella, and Pteris.

Gymnosperms General characteristics; morphology, anatomy and reproduction of Pinus. Ecological and economical importance.

UNIT-02 – PLANT PHYSIOLOGY

Transpiration - Mechanism and Significance.

Ascent of sap – Root pressure theory and transpiration pull theory.

Photosynthesis – Photophosphorylation , C3 , C4 - cycle

Respiration – Glycolysis, TCA- cycle.

Growth hormone- Auxin , Gibberellin

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

BOT-MN-1B- PRACTICAL (PLANT DIVERSITY-II AND PLANT PHYSIOLOGY)

(Credit: Practical-1)

F.M. – 25 Examination Time- 03 hrs

1. Study of vegetative and reproductive structures by preparation of temporary slides from unit-1 (Ptredophytes & Gymnosperm) - 10
2. To perform physiological experiment from the syllabus -05
3. Spotting - 05
4. Record -03
5. Viva -02