SIDO KANHU MURMU UNIVERSITY, DUMKA

(A State University recognized under Section 2(f) & 12(B) of the UGC Act, 1956)

ASSOCIATED CORE & ELECTIVE COURSE SYLLABUS

OF

BOTANY

Accordance with the

Implementation of FYUGP in State Universities of Jharkhand Regulations, 2024

Implemented from
Academic Session 2025-2029 Onwards

Board of Studies Meeting Proceedings

A meeting of the Board of Studies for the revision and finalization of the **BOTANY ASSOCIATED CORE & ELECTIVE COURSE** syllabus for the Four-Year Undergraduate Programme (FYUGP), in accordance with the Implementation of FYUGP in State Universities of Jharkhand Regulations, 2024, was convened on **10.10.2025** in hybrid mode.

The following members of the Board of Studies were present in this meeting. The committee unanimously accepted and recommended the syllabi, incorporating major modifications.

Members of the Board of Studies:

S. N.	MEMBERS	SIGNATURE
1.	**Prof. (Dr.) Jyoti Kumar (External Expert)** Retd. University Professor University Department of Botany Ranchi University, Ranchi	Joined Online
2.	**Dr. Sanjay Kumar Singh (Dean, Science)** Associate Professor, University Department of Chemistry Sido Kanhu Murmu University, Dumka	10-10-25
3.	**Dr. Sanjay Kumar Sinha (Member)** Associate Professor, University Department of Botany Sido Kanhu Murmu University, Dumka	10/10/25
4.	**Dr. Baskey Neeraj (Member)** Assistant Professor, University Department of Botany Sido Kanhu Murmu University, Dumka	Neeraj Baskey 10/10/25
5.	**Dr. Anita Chakraborty (Member)** Assistant Professor, University Department of Botany Sido Kanhu Murmu Uuniversity, Dumka	10/10/25
6.	**Dr. Amar Das (Member)** Assistant Professor, Botany & Prof. In-Charge, Degree College, Nala (Fathepur) Sido Kanhu Murmu University, Dumka	10/10/25
7.	**Dr. Samuel Kisku (Member)** Assistant Professor & Head, Department of Botany S.P. College, Dumka , Sido Kanhu Murmu University, Dumka	10/10/25
8.	**Dr. Ipsita Nandi (Member)** Assistant Professor, Department of Botany Deoghar College, Deoghar, Sido Kanhu Murmu University, Dumka	10/10/25
9.	**Dr. Pallawi Upadhaya (Member)** Assistant Professor, Department of Botany S.P. College, Dumka , Sido Kanhu Murmu University, Dumka	10/10/25
10.	**Dr. Arijit Ghosh (Member)** NBAP, University Department of Botany, Sido Kanhu Murmu University, Dumka	10/10/25
11.	**Dipak Kumar Das (Invitee Member)** Assistant Professor , Department of Commerce & Coordinator, NEP-2020 Sido Kanhu Murmu University, Dumka	10/10/25

Bondya 10/10/25

Dr. S.L. Bondya
(Chairperson)

Semester wise AC & ELC Subject Combination of BOTANY

Semester	Course Category	Code	Papers	Credits
Semester I / II	Associated Core (BOTANY)	AC-BOT	Diversity of Non-Flowering Plants	4
Semester III / IV	Elective Core (BOTANY) - 1	ELC-BOT-1	Morphology and Systematic Angiosperms	4
Semester V / VI	Elective Core (BOTANY) - 2	ELC-BOT-2	Plant Anatomy and Embryology	4
Semester VII / VIII	Elective Core (BOTANY) - 3	ELC-BOT-3	Plant Physiology and Metabolism	4

INSTRUCTIONS FOR QUESTION SETTER

1. Semester Internal Examination Question Pattern (15 Marks)

The **Semester Internal Examination (SIE)** will carry a total of **15 marks**, which includes **10 marks for the internal test** and **5 marks for class attendance**. The question paper will have **two groups**.

Group A will have: **Question 1:** Five very short answer questions (1 mark each, total 5 marks)

Group B will have: Two descriptive-type questions of 5 marks each, out of which students must answer **any one** (total 5 marks) The remaining **5 marks** will be based on **class attendance**, as per the following:

- Up to 45% attendance: 1 mark
- 46% to 54%: 2 marks
- 55% to 64%: 3 marks
- 65% to 74%: 4 marks
- 75% and above: 5 marks

2. End Semester University External ExaminationQuestion Pattern(60 Marks)

The **End Semester Examination (ESE)** will be of **60 marks** and will also have **two groups**.

Group A (Compulsory) will include: **Question 1:** Five very short answer questions (1 mark each, total 5 marks) **Questions 2 and 3:** Two short answer questions (5 marks each, total 10 marks)**Group B** will contain **five descriptive-type questions** of **15 marks each**, out of which students must answer **any three** (total 45 marks)

Note: Questions may have sub-parts if needed in the theory examination.

3. End Semester University Practical ExaminationQuestion Pattern (25 Marks)

The **End Semester Practical Examination (ESE)** will be of **6 hours duration**. The total marks and evaluation should be done as per the following guidelines:

- **Experiment/Activity performed during the exam** – 15 marks
- **Practical record notebook** – 5 marks
- **Viva-voce (oral questions)** – 5 marks

Students must score **at least 10 marks** to pass the practical examination.

Question format for **20 Marks**:

Subject/ Code

F.M. =20 **Time**=1Hr. Exam Year

General Instructions:

i. **Group A** carries very short answer type compulsory questions.
ii. **Answer 1 out of 2** subjective/ descriptive questions given in **Group B**.
iii. Answer in your own words as far as practicable.
iv. Answer all sub parts of a question at one place.
v. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   i. .....
   ii. .....
   iii. .....
   iv. .....
   v. .....
2. ..... [5]

Group B

3. ..... [10]
4. ..... [10]

Note: There may be subdivisions in each question asked in Theory Examination.

Question format for **75 Marks**:

Subject/ Code

F.M. = 75 **Time**=3Hrs. Exam Year

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B**.
iii. Answer in your own words as far as practicable.
iv. Answer all sub parts of a question at one place.
v. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   i. .....
   ii. .....
   iii. .....
   iv. .....
   v. .....
2. ..... [5]
3. ..... [5]

Group B

4. ..... [15]
5. ..... [15]
6. ..... [15]
7. ..... [15]
8. ..... [15]
9. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.

PROMOTION CRITERIA

- All students will be promoted in odd Semesters (I, III, V & VII).
- To get a promotion from Semester II to Semester III, from Semester IV to Semester V, and from Semester VI to Semester VII a student has to procure a minimum of 4 CGPA.
- However, it will be necessary to obtain a minimum credit (4) to pass in each of the subjects individually before completion of the course.

CALCULATION OF MARKS FOR THE PURPOSE OF RESULT

The passing in a subject will be based on the combined marks obtained in both the internal and external examinations of the semester. However, the student must pass the and practical examinations separately.

SEMESTER –I/II

COURSE: ASSOCIATED CORE (BOTANY) **TOTAL CREDITS:** THEORY-03, PRACTICAL-01
PAPER NAME: Diversity of Non-Flowering Plants **TEACHING HOURS:** THEORY-45, PRACTICAL-30

EVALUATION			
	External Exam	**Internal Exam**	**Practical**
Full Marks	**60**	15 (10 Written + 5 Attendance/Overall Class Performance)	**25**
Duration of Exam	3 Hours	1 Hour	6 Hours
Pass Marks	30 Marks		10 marks

Course Objective:

1. This course will provide knowledge on various fields of basic botany.
2. The syllabus is prepared to enable students for competitive exams in frontier areas of plant sciences.
3. Students will be able to know about habit, habitat, morphology, anatomy and reproduction of various plant groups.

Course Outcome:

1. Students will get understand about the classification and diversity of different microbes including Bacteria, Viruses, Algae, Fungi & their economic importance.
2. Students will get understand conceptual skill about identifying microbes & pathogens.
3. Student will Gain knowledge about developing critical understanding on morphology, general characters, life cycles and economic importance of Bryophytes, Pteridophytes and Gymnosperms.

PART 'A'

Theory Course Contents:

Unit 1: Viruses: General account of Viruses; TMV & Bacteriophage. **Bacteria:** General characters and economic importance. **(10 Lectures)**

Unit 2: Algae: General characters, economic importance and life history of *Nostoc, Oedogonium*, and *Polysiphonia.* **Fungi:** General characters, economic importance and life history of *Phytophthora, Agaricus & Puccinia.* **(10 Lectures)**

Unit 3: Bryophytes: General account, economic importance and life history of *Marchantia & Anthoceros.* **(10 Lectures)**

Unit 4: Pteridophytes: General account and life history of *Selaginella, Equisetum & Marsilia*. **(10 Lectures)**

Unit 5: Gymnosperm: General account and life history of *Cycas and Pinus*. **(05 Lectures)**

PART 'B'

Practical Course Contents:

Unit 1: Microbiology: Staining and identification of bacteria. **(05 Lectures)**

Unit 2: Algae: Preparation of temporary slides/permanent slides, enumeration of salient features and identification of *Nostoc, Oedogonium* and *Polysiphonia.* **Fungi:** Preparation of temporary slides/permanent slides, enumeration of salient features and identification of *Phytophthora, Agaricus* and *Puccinia.* **(10 Lectures)**

Unit 3: Bryophytes: Preparation of temporary slides/permanent slides, enumeration of salient features and identification of *Marchantia*, & *Anthoceros.* **Pteridophytes:** Preparation of temporary slides/permanent slides, enumeration of salient features and identification of *Selaginella, Equisetum & Marsilia*. **(10 Lectures)**

Unit 4: Gymnosperm: Preparation of temporary slides/permanent slides, enumeration of salient features and identification of *Cycas* & *Pinus*. **(05 Lectures)**

Distribution of marks (Practical):

Experiments	:	10 marks
Spotting	:	05 marks
Class records/Charts/Model/Herbarium etc.	:	05 marks
Viva voce	:	05 marks

Suggested Readings:

1. Roy, S.C. and De, K.K. Cell Biology, 1997, New Central Book Agency.
2. Ganguli,H.C. Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency.
3. Ganguli, H.C. and Kar, A.K. College Botany, Vol. II, latest Ed., New Central Book Agency.
4. Sen, S. 1992. Economic Botany, New Central Book Agency, Kolkata.
5. Verma, V. 1974. A Textbook of Economic Botany, Emcay Publication, New Delhi.
6. Bendre, A., Kumar, A. Economic Botany, Rastogi Publication, New Delhi. India.
7. Pandey, B.P. Plant Anatomy, Latest Ed., S. Chand & Company.

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SEMESTER –III/IV

COURSE: ELECTIVE COURSE (BOTANY)-1 **TOTAL CREDITS:** THEORY-03, PRACTICAL-01
PAPER NAME: Morphology and Systematic Angiosperms **TEACHING HOURS:** THEORY-45, PRACTICAL-30

EVALUATION			
	External Exam	**Internal Exam**	**Practical**
Full Marks	**60**	15 (10 Written + 5 Attendance/Overall Class Performance)	**25**
Duration of Exam	3 Hours	1 Hour	6 Hours
Pass Marks	30 Marks		10 marks

Course Objective:

- To learn the morphology and structure and modification of Angiospermic Plants.
- To learn various field of plant systematics.

Course Outcome:

1. The unit will enable the students to learn about the morphology and structure and modification of Angiospermic Plants.
2. The unit will enable the students to learn about plant systematics.

PART 'A'

Theory Course Contents:

Unit-1: Morphology of Angiosperms (20 Lectures)

1. **The Root:** Definition, type, modification and function.
2. **The Stem:** Definition, type, modification and function.
3. **The Leaf:** Definition, parts, venation, types, phyllotaxy, modification and function.
4. **The Inflorescence:** Definition, different types.
5. **The Flower:** Definition, position, parts, aestivation floral diagram and floral formula.

Unit 2: Systematic of Angiosperms (10 Lectures)

1. **Botanical nomenclature:** Binomial nomenclature; principles and rules.
2. **System of classification:** Bentham and Hooker's system and Hutchinson system.

Unit 3: Study of diagnostic features of the families (15 Lectures)

1. Study of diagnostic features of the families: *Apocynaceae, Verbenaceae, Lamiaceae, and Poaceae.*

PART 'B'

Practical Course Contents:

Unit 1: Study of diagnostic features of the families: Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): *Apocynaceae, Verbenaceae, Lamiaceae, &, Poaceae.* **(20 Lecture)**

Unit 2: Morphological study of: Root, Stem, Leaf, Inflorescence and Flower. **(10 Lecture)**

Distribution of marks (Practical):

Experiments	:	10 marks
Spotting	:	05 marks
Class records/Charts/Model/Herbarium etc.	:	05 marks
Viva voce	:	05 marks

Suggested Readings:

1. Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency.
2. Ganguli,H.C. and Kar, A.K. College Botany, Vol. II, latest Ed., New Central Book Agency.
3. Mukherjee, S. College Botany, Vol. III, latest Ed., New Central Book Agency.
4. Ananta Rao T. Morphology of Angiosperms.
5. Chopra G.L. (1977). Angiosperms (Systematic and Life cycle), Nagin and Company, Delhi.
6. Flowering Plants Angiosperms, Lalit M. Tewari & Jeewan S. Jalal (2011) Jagdamba Publishing Company, New Delhi.

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SEMESTER –V/VI

COURSE: ELECTIVE COURSE (BOTANY)-2 **TOTAL CREDITS:** THEORY-03, PRACTICAL-01
PAPER: Plant Anatomy and Embryology **TEACHING HOURS:** THEORY-45, PRACTICAL-30

EVALUATION			
	External Exam	**Internal Exam**	**Practical**
Full Marks	**60**	15 (10 Written + 5 Attendance/Overall Class Performance)	**25**
Duration of Exam	3 Hours	1 Hour	6 Hours
Pass Marks	30 Marks		10 marks

Course Objective:

- The Objective of this paper is to provide basic knowledge of plant internal architecture, cellular composition and reproduction.
- This helps them to understand how different plant tissue structure evolve and modify their functions with respect to their environment. Also, to make them aware about identification, nomenclature and classification.

Course Outcome:

- Knowledge regarding anatomy equipped the students to identify different types of tissues and make them able to correlate their physiology in a better away.
- This will also help them to understand how different plant tissue evolve and modify their structure and functions with respect to their environment.
- Knowledge regarding embryology make them understand how reproduction play significant role in defining population structure and natural diversity.

PART 'A'

Theory Course Contents:

Unit 1: Meristematic and permanent tissues; Simple and complex tissues. Secondary Growth & Vascular cambium – structure and function. Secondary growth in dicot stem, (heartwood and sapwood). (**15 Lectures**)

Unit 2: General account of adaptations in xerophytes and hydrophytes. **(05 Lectures)**

Unit 3: Structure and types of ovules; Megasporogenesis; Types of embryo sacs, organization and ultrastructure of mature embryo sac, Microsporogenesis and male gametophytes. **(15 Lectures)**

Unit 4: Pollination and fertilization Pollination mechanisms and adaptations; Double fertilization; Seed structure dicot and monocot. Embryo and endosperm: types, structure and functions.**(10 Lectures)**

PART 'B'

Practical Course Contents:

Unit 1: Anatomy (20 Lectures)

1. Study of meristems through permanent slides and photographs.
2. Stem: Monocot: *Zea mays*; Dicot: *Helianthus*; Secondary: *Helianthus* (only Permanent slides).
3. Root: Monocot: *Zea mays*; Dicot: *Helianthus*; Secondary: *Helianthus* (only Permanent slides).
4. Leaf: Dicot and Monocot leaf (only Permanent slides).
5. Adaptive anatomy: Xerophyte (*Nerium* leaf); Hydrophyte (*Hydrilla* stem).
6. Pollen grain and Placentation: Types.

Unit 2: Embryology (10 Lectures)

1. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous.
2. Female gametophyte: Polygonum (monosporic) type of Embryo sac Development (Permanent slides/photographs).
3. Dissection of embryo/endosperm from developing seeds.

Distribution of marks (Practical):

Experiments	:	10 marks
Spotting	:	05 marks
Class records/Charts/Model/Herbarium etc.	:	05 marks
Viva voce	:	05 marks

Suggested readings:

1. Bhojwani, S.S. & Bhatnagar, S.P. (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Ltd New Delhi. 5th edition. 2. Mauseth, J.D. (1988).
2. Plant Anatomy. The Benjamin/Cummings Publisher, USA.
3. Plant Anatomy. The Benjamin/Cummings Publisher, USA.
4. Roy, P. Plant Anatomy, Latest Ed., New Central Book Agency.
5. Pandey, B.P. Plant Anatomy, Latest Ed., S. Chand & Company.
6. Singh, G. Plant Systematics: An Integrated Approach (3rd ed.), 2016, CRC Press
7. Tayal, M.S. Plant Anatomy, Latest Ed., Rastogi Publications.

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SEMESTER –VII/VIII

COURSE: ELECTIVE COURSE (BOTANY)-3 **TOTAL CREDITS:** THEORY-03, PRACTICAL-01
PAPER: Plant Physiology and Metabolism **TEACHING HOURS:** THEORY-45, PRACTICAL-30

EVALUATION			
	External Exam	**Internal Exam**	**Practical**
Full Marks	**60**	15 (10 Written + 5 Attendance/Overall Class Performance)	**25**
Duration of Exam	3 Hours	1 Hour	6 Hours
Pass Marks	30 Marks		10 marks

Course Objective:

- The course aims at making students realize how plants function, namely the importance of water, minerals, hormones, and light in plant growth and development.
- Understand transport mechanisms and translocation in the phloem, and appreciate the commercial applications of plant physiology.

Course Outcome:

- The students are able to correlate morphology, anatomy, cell structure and biochemistry with plant functioning
- The link between theory and practical syllabus is established, and the employability of youth would be enhanced.

PART 'A'

Theory Course Contents:

Unit 1: Plant-water relations Importance of water, water potential and its components; Transpiration types and its mechanism, significance. Mineral nutrition, Essential elements, macro- and micro-nutrients. Ascent of sap and translocation of organic solutes. **(15 lectures)**

Unit 2: Photosynthesis: light reaction and dark reaction; Respiration: Glycolysis and TCA cycle. **(15 lectures)**

Unit 3: Enzymes: properties, mechanism and mode of enzyme action. **(03 lectures)**

Unit 4: Biological nitrogen fixation. **(02 lectures)**

Unit 5: Plant growth regulators: Auxins, Gibberellins & Cytokinins; Photoperiodism (SDP, LDP, Day neutral plants); Vernalization. **(10 lectures)**

PART 'B'

Practical Course Contents:

Unit 1: Measurement of rate of transpiration; Farmer's photometer/Ganogs photometer. (05 Lectures)

Unit 2: Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.

(10 Lectures)

Unit 3: Separation of pigments by paper chromatography. (05 Lectures)

Unit 4: To determine the absorption of water by Oily and starchy seed. Biochemical test: Carbohydrate, Protein and Fat. (10 Lectures)

Distribution of marks (Practical):

Experiments	:	10 marks
Spotting	:	05 marks
Class records/Charts/Model/Herbarium etc.	:	05 marks
Viva voce	:	05 marks

Suggested Readings:

1. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th ed.
2. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
3. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
4. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
5. Mohit Verma & S K Verma.A Textbook of Plant Physiology, Biochemistry and Biotechnology: S Chand.
6. VK Jain (2018). Fundamentals of Plant Physiology, S. Chand Publishing.
7. Taiz, L., Zeiger, E., Moller, I.M. and Murphy, A. (2017) Plant Physiology and Development. 6th Edition, Artmed, Porto Alegre.

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