

As Per NEP 2020

University of Mumbai



**Syllabus for Minor
Vertical 2
(Scheme – II)**

Faculty of Science

Board of Studies in Botany

Second Year Programme in Minor (Botany)

Semester	III & IV	
Title of Paper	Sem.	Total Credits 4
II) Integrated approaches in plant Science I	III	2
I) Practicals in Cryptogams, Cytogenetics & Biostatistics		2
Title of Paper		Total Credits 6
I) Palaeobotany, Spermatophyta, and Aesthetics Botany	IV	2
II) Integrated approaches in plant Science II		2
I) Practicals in Palaeobotany, Spermatophyta and Biostatistics		2
From the Academic Year		2025-26

Sem. - III

Syllabus

B.Sc. (Botany) Minor

(Sem.- III)

Course- I

Title of Paper: Integrated approaches in plant Science I

Sr. No.	Heading	Particulars
1	Description of the course : Including but Not limited to :	This course explores the diversity and classification of cryptogams, covering algae, fungi, bryophytes, and pteridophytes, along with their systematic positions and life cycles. It also delves into cell biology and cytogenetics, focusing on cellular organelles, nucleic acids, meiosis, DNA replication, and protein synthesis. Hands-on activities include fungal observation, lichen identification, presentations on protein synthesis, and DNA/RNA model preparation, providing students with practical insights into plant diversity and cellular functions. Students can pursue careers in plant taxonomy, mycology, phycology, and plant pathology, as well as explore roles in biotech and research labs focused on cell biology, genetics, and molecular biology.
2	Vertical :	Minor
3	Type :	Theory
4	Credit:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	Hours Allotted :	30 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives: (List some of the course objectives) To enable the learner CO1: Identify the different types of plant forms based on structure CO2: Acquire knowledge about the life cycles of different plant forms. CO3: Gain the knowledge of cell organelles, Nucleic Acids and protein synthesis	

8	Course Outcomes: (List some of the course outcomes) The learner will be able to OC1: Recognize the different types of plant forms based on structure. OC2: Describe the life cycles of different plant forms. OC3: Elaborate the structure cell organelles, Nucleic Acids and concepts of protein synthesis
9	Modules:
	Unit 1: Cryptogamic Botany 15 L
	1. General classification of Algae up to the class. (G.M.Smith,1958) 2. Systematic position, and life cycle (excluding development stages of sex organs) of <i>Sargassum</i>. 3. General classification of fungi up to the class. (Alexopoulos and Mims,1979) 4. Systematic position, and life cycle (excluding development stages of sex organs) of <i>Aspergillus</i>. 5. General classification of bryophytes up to the class. (G. M. Smith 1955) 6. Systematic position, and life cycle (excluding development stages of sex organs) of <i>Anthoceros</i>. 7. General Classification of Pteridophytes up to the class (G. M. Smith 1955) 8. Systematic position, and life cycle (excluding development stages of sex organs) of <i>Selaginella</i> Activities: • Observe fungal growth on suitable substratum and learn about mycology in everyday life. Identify and document lichens in urban and forested areas
	Module 2: Cell Biology and Cytogenetics 15 L
	1. Ultrastructure and functions of cell organelles: Ribosomes(prokaryotic, eukaryotic, and subunits), Nucleus 2. Nucleic Acids: Types, structure, and functions of DNA and RNA 3. Meiosis in Plant Cells and its Significance 4. DNA replication (Prokaryotic &Eukaryotic) 5. Protein synthesis-Transcription (Eukaryotic) 6. RNA processing. Activities: • Presentation on protein synthesis • Preparation of DNA/RNA model

10 Reference Books:

1. Text Book of Algae (1986) by O.P.Sharma. Tata McGraw Hill.
2. Text Book of Botany-Algae (1994) By B. P. Pandey. S. Chand.
3. Text Book of Botany 3rd Edition (2004) Prof. V. Singh, DR. P.C. Pandey & Dr. D.K Jain. Rastogi Publication.
4. Plant Pathology (1982) Dr. B. P. Pandey. S. Chand & Company LTD.
5. Text Book of Fungi (1989) by O.P.Sharma, Tata Mc.Graw
6. Morphology and Evolution of Vascular Plants (1989) by Gifford, E.M. and Foster A.S. publisher, W.H. Freeman & Co., New York.
7. An Introduction to Pteridophyte (1999) By Abdul Rashid. Reprint 2021, Vikas Publishing House Private Limited.
8. Cryptogamic Botany Volume I and II (1938,1955) by G M Smith McGraw Hill
9. Botany for Degree students-Pteridophytes by Vashishta B.R. (1996)
10. Textbook of Plant Pathology (2006) by A.V.S.S.Sambamurty. Reprint 2012) I.K. International Publishing House Pvt. Ltd.
11. College Botany Volume II(1989) reprint 2014 By Gangulee & Kar. New Central Book Agency (P)Ltd
12. College Botany Vol-III (1984) Reprint 2006 by Susil Kumar Mukherjee
13. Studies in Botany vol.1. 6th edition (Revised 2018) by J.N. Mitra, D.Mitra and Chowdhari, New Central Book Agency (P)LTD.
14. Biology of Bryophytes (1988) by Chopra, R.N., P.N.Kumar.
15. R. C. Dube (2008). A Text Book of Biotechnology, S. Chand.
16. P.K. Gupta (2019). Elements of Biotechnology.
17. Pal J.K. and Ghaskadabi S.S. (2008). Fundamentals of Molecular Biology.
18. Verma and Agrawal (2010). Molecular Biology
19. Devi P (2008). Principle and Methods of Plant Molecular Biology, Biochemistry and Genetics Agrobios, Jodhpur, India
20. Russel, P.J. 1998. Genetics (5th edn) The Benjamin/ Cummins Pub. Co., Inc. USA.
21. Lewin, B. Genes VIII. Oxford, University Press. New York, USA. .
22. Chopra, V.L. (2000). Plant Breeding: Theory and Practice 2nd Ed. Oxford & IBH, New Delhi.
23. Genes X– Benjamin Lewin, Jones and Bartlett, 2011

11 Internal Continuous Assessment: 40%

External, Semester End Examination 60% Individual Passing in Internal and External Examination

12 Continuous Evaluation: 20 Marks

Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3)
(20 Marks)

Term End Theory Examinations
(30 Marks)

Syllabus
B.Sc. (Botany) Minor
(Sem.- III)

Course -II

Title of Paper: Practicals in Cryptogams, Cytogenetics & Biostatistics

Sr. No.	Heading	Particulars
1	Description of the course : Including but Not limited to :	This course provides a comprehensive study of fungal diseases, lichens, bryophytes, and pteridophytes, emphasizing their life cycles and structural adaptations. It also covers key aspects of cell biology, including organelle ultrastructure, chromosomal aberrations, and nucleic acid estimation. Statistical methods such as standard error and chi-square tests are introduced to enhance data analysis skills. Practical sessions include microscopic observations, biochemical estimations, and a field study. This practical training equips students for careers in plant pathology, molecular biology, cytogenetics, biotechnology, and academic or industrial research, as well as roles in agriculture, quality control, and statistical data analysis in life sciences.
2	Vertical :	Minor
3	Type :	Practical
4	Credit:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	Hours Allotted :	30 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives: (List some of the course objectives) To enable the learner CO1: understand the classification, structure, and life cycles of cryptogams. CO2: study fungal diseases and their impact on plants. CO3: explore the structural and functional aspects of cell organelles.	

	CO4: analyze chromosomal aberrations and their consequences.
	CO5: gain hands-on experience in nucleic acid estimation.
	CO6: apply statistical methods for biological data interpretation
8	Course Outcomes: (List some of the course outcomes) The learner will be able to OC1: Identify, describe differentiate lichen thalli fungal diseases such as late blight of potato. OC2: Explain the life cycles of Anthoceros, Selaginella, Sargassum, and Aspergillus. OC3: Demonstrate understanding of ribosome and nucleus ultrastructure. OC4: Analyze chromosomal aberrations from slides/photomicrographs. OC5: Estimate DNA and RNA from plant material. OC5: Apply statistical techniques like standard error and chi-square tests in biological studies.

9	Modules:	
	External Practical	
	1. Study of Fungal disease- late blight of potato. 2. Study of Lichen Thallus- Crustose, Foliose, Fruticose 3. Study of stages in the life cycle of <i>Anthoceros</i>. 4. Study of stages in the life cycle of <i>Selaginella</i>. 5. Study of the Ultra-Structure of Cell Organelles: Ribosome and Nucleus 6. Study of Cytological Consequences of Chromosomal Aberrations from permanent slides/photomicrograph 7. Estimation of DNA from plant Material 8. Estimation of RNA from plant Material 9. Standard Error Chi square test	
	Internal Practical	
	1 Study of Stages in the Life Cycle of Sargassum (As per theory) 2 Study of stages in the life cycle of Aspergillus. 3 Study of Meiosis from suitable plant material 4 Preparation of field report	

10	Reference Books: 1. Pandey, B.P. (2012). <i>College Botany Vol. II</i>. S. Chand Publishing. 2. Sharma, O.P. (1993). <i>Paleobotany and Fossil Plants</i>. McGraw Hill Education. 3. Vashishta, P.C., Sinha, A.K., & Kumar, A. (2010). <i>Gymnosperms</i>. S. Chand Publishing. 4. Johri, B.M., Lakhani, K., & Vats, S.K. (2008). <i>A Textbook of Angiosperms</i>. Macmillan Publishers. 5. Gupte, S.R. (2014). <i>Cytology, Genetics and Evolution</i>. S. Chand Publishing. 6. Gupta, S.C. (2013). <i>Fundamentals of Statistics</i>. Himalaya Publishing House. 7. Randhawa, G.S. & Mukherjee, S.P. (1986). <i>Floriculture in India</i>. Allied Publishers. 8. MLA. Rosner, Bernard (Bernard A.). <i>Fundamentals of Biostatistics</i>. Boston Brooks/Cole, Cengage Learning, 2011. 9. Pranab Kumar Banerjee. <i>Introduction to Biostatistics (A Textbook of Biometry)</i>. Publisher, S. Chand Publishing, 2007	
11	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination
12	Continuous Evaluation through: Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3) (30 marks)	Term End Practical Examination (30 marks)

Sem. - IV

Syllabus

B.Sc. (Botany) Minor

(Sem.-IV)

Course -I

Title of Paper: Spermatophyta, Palaeobotany and Aesthetics Botany

Sr. No.	Heading	Particulars
1	Description of the course : Including but Not limited to :	This course explores the fascinating world of Gymnosperms and their evolutionary significance, including their classification, life cycles, and economic importance. Palaeobotany introduces students to the geological time scale, fossil formation, and key contributions in the field. The study of Angiosperms focuses on leaf morphology, inflorescence types, and aesthetic botany, including garden design principles. Students can pursue careers in botany, forestry, palaeobotany, horticulture, environmental conservation, and landscape design.
2	Vertical :	Minor
3	Type :	Theory
4	Credit:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	Hours Allotted :	30 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives: (List some of the course objectives) To enable the learner CO1: Comprehend the characteristics and importance of the Gymnosperms. CO2. Acquire knowledge and importance of paleobotany. CO 3. Gain insight into structure, modification, and the importance of leaves. CO 4. Learn about the structure and function of inflorescences in various plant species. CO 5. Explore the characteristics and features that distinguish various plant families.	

	CO 6. Get information about plants suitable for garden designing, types of gardens, And botanical gardens.
8	Course Outcomes: (List some of the course outcomes) The learner will be able to CO1: Identify and compare vegetative and reproductive characteristics and applications of Diverse plant groups. OC2. Describe the significance of paleobotany. OC 3. Explain the structure, modifications, and importance of leaves. OC 4. Discuss the structure and function of inflorescences. OC 5. Identify the plant according to families using morphometry. OC6. Suggest plants suitable for garden designing, types of gardens, and botanical gardens.

9	Modules:	
	Module 1: Gymnosperms and Palaeobotany	15 L
	1. Gymnosperms: The Giants of the Past and Present - General classification of Gymnosperms up to the classes per Chamberlain (1934) - Interesting facts about gymnosperms - General characters of Coniferophyta - Systematic position and life cycle (excluding developmental stages of sex organs) of <i>Pinus</i> - Economic importance of Coniferophyta: Wood, resins, food and medicinal value 2. Palaeobotany - Geological Time Scale -Era, period, Evolutionary changes in plants, the importance of Palaeobotany - Formation and types of Fossils Contribution of Birbal Sahani in Palaeobotany Activities: - Explore the world's largest and oldest conifers via online resources. - Preparation of fossil imprints using plant	
	Module 2: Angiosperms plant morphology and Aesthetic botany	15 L

1. Leaf: The Powerhouse

- Parts of typical leaves, types of leaves- Simple and Compound, Venation, Phyllotaxy

2. Inflorescence: The Art of Floral Cluster in Nature

- Types of inflorescences- Racemose, Cymose and Special Inflorescence

3. Garden designing: Merging Science and Aesthetics

- Types of garden-Formal and Informal -Features
- Garden Locations (Hedges, Edges, Fence, Lawn, Arch and pergola, Avenue, Flower Beds and Water Garden)
- Plants for garden designing - Foliage plants, flowering plants
- Botanical garden-Acharya Jagdish Chandra Bose Indian Botanic Garden, Royal Botanic Garden Kew, London

Activities:

- Leaf impression art – Identifying different venation patterns through leaf prints.
- Explore a local botanical garden to document plant diversity.

10 Reference Books:

1. College Botany Vol I by Gangulee Das and Datta (1959),2011
2. College Botany Vol II by Gangulee and Kar Rev Edition (1989), 2011
3. College Botany, Volume III 3 by Sushil Kumar Mukherjee, 2006
4. Botany for Degree Students, Vahishta, Sinha and Kumar, S. Chand and Company Ltd, (1976), 2011
5. A Textbook of Botany by Prof.V. Singh, Dr. R.C. Pande, Dr. D. K. Jain, Rastogi Publication, 3rd Edition, 2004-2005.
6. A Text Book of Botany: Angiosperms by B.P. Pandey, S Chand Publication, 2001
7. College Botany by S. Sundar Rajan, Himalaya Publication, Edition 2021
8. Taxonomy of Angiosperms– Taxonomy, Systematic Botany, Economic Botany, Ethnobotany, by Annie Ragland, V. Kumaresan, Saras Publication., 2013
9. Complete Gardening in India – Gopal Swamiengar Edition, 4. Publisher, Gopalaswamy Parthasarathy, 'Srinivasa', 1991.
10. Floriculture and Landscaping by Bose 1999 PRINT
11. Landscape Gardening and Design with Plants; author Supriya Kumar Bhattacharjee; publisher Pointer Publishers, 2004; ISBN 8179100855, 9788179100851.
12. Floriculture in India by G.S. Randhawa, A. Mukhopadhyay, Allied Publishers · Edition: 1st Edition,2017

11 Internal Continuous Assessment: 40%

External, Semester End Examination 60%
Individual Passing in Internal and External Examination

12 Continuous Evaluation: 20 Marks

Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3)
(20 Marks)

Term End Theory Examinations
(30 Marks)

Syllabus

B.Sc. (Botany) Minor

(Sem.- IV)

Course – II

Title of Paper: Integrated approaches in plant Science II

Sr. No.	Heading	Particulars
1	Description of the course : Including but Not limited to :	This course explores key concepts in plant physiology, including phytochrome, photoperiodism, vernalization, and plant responses to abiotic and biotic stress. It also covers enzyme kinetics and their role in biochemical processes. In cytogenetics and plant breeding, students learn about chromosomal aberrations, hybridization techniques, and the impact of the Green Revolution. Students can pursue careers in plant research, genetics, biotechnology, agriculture, horticulture, and environmental science.
2	Vertical :	Minor
3	Type :	Theory
4	Credit:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	Hours Allotted :	30 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives: (List some of the course objectives) To enable the learner CO1. Gain knowledge of Photoperiodism and Vernalization CO2. To learn about the stress mechanism in plants. CO3. Acquire knowledge of the internal morphology of plants. CO4. Understand the enzyme classification, types, structure, and function CO 5. know the application of anatomy in various fields.	

8	Course Outcomes: (List some of the course outcomes) The learner will be able to OC1. Describe the process of Photoperiodism and Vernalization. OC2. Analyze the stress mechanism in plants OC3. Discuss the internal morphology of plants. OC4. Explain the enzyme classification, types, structure, and function OC5. Understand the application of anatomy in various fields.
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9	Modules	
	Module 1: Plant Physiology and Plant Biochemistry	15 L
	1. Photoperiodism: Definition, Introduction, Response of plant Day length (SDP, LDP,DNP), Significance of photoperiodism Vernalization. 2. Stress: Definition, Types Abiotic stress - Drought, Salinity, Temperature, Biotic stress caused by pathogens, and plant responses and tolerance mechanism. 3. Enzymes: Nomenclature, classification, mode of action, enzyme kinetics, Michaelis-Menten equation. Activities: • Documentation of flowering in plants during different seasons in the vicinity. • Study of enzyme structures by Bioinformatic tools	
	Module 2: Cytogenetics and plant Breeding	15 L
1. Variation in Chromosome structure (Chromosomal Aberrations) 2. Definition, Types and Genetic Effects of the following: Deletions, Duplications, Inversions and Translocations 3. Plant breeding - Definition and Concept, Green Revolution in India 4. Hybridization technique in plants: Objectives, types, procedure, raising F1 generation, difficulties in hybridization Activities: • Study the chromosomal abnormalities in cri-du-chat, down syndrome, DG translocation, etc. • Survey and collection of dietary pulses.		

10	Reference Books: 1. Lincoln Taiz and Eduardo Zeiger (2010) Plant Physiology, 5th edition. Sinauer Associates, Inc. Publishers. Sunderland, USA. 2. David L. Nelson, Michael M. Cox Lehninger Principles of Biochemistry; W. H. Freeman 6th edition 2013. 3. Singh B. D. (2007). Plant Breeding. Kalyani Publishers. Ludhiana. 4. Jain, V.K. (2000): Fundamentals of Plant Physiology, S.Chand&Co, New Delhi. 5. Verma, V. (2007): Text Book of Plant Physiology, Ane Books India, New Delhi. 6. <u>Richard Crang</u> , <u>Sheila Lyons-Sobaski</u> and <u>Robert Wise</u> (2018) Plant Anatomy A Concept-Based Approach to the Structure of Seed Plants 7. B. P. Pandey, Plant Anatomy, 1987, S. Chand and Co. Ltd, New Delhi 8. Eams and Mc Daniel, An Introduction to Plant Anatomy, 1990, McGraw –Hill Book Co. Ltd and Kogakusha Co, Tokyo, Japan 9. P. Saxena and S. M. Das (2012) A Textbook of Plant Anatomy 10. P. J. Chandurkar, Plant Anatomy, 1971, Oxford and IBH publication Co. New Delhi 11. Adriance S Foster, Practical Plant Anatomy, 2000, D Van Nostrand Co. INC, New York 12. Esau, Plant Anatomy, 2000, Wiley Toppan Co. California, USA 13. Pijush Roy, Plant Anatomy, 2004, New Central Book Agency Ltd, Kolkata		
11	<table border="1"> <tr> <td>Internal Continuous Assessment: 40%</td><td>External, Semester End Examination 60% Individual Passing in Internal and External Examination</td></tr> </table>	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination
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12	<table border="1"> <tr> <td> Continuous Evaluation: 20 Marks Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3) (20 Marks) </td><td> Term End Theory Examinations (30 Marks) </td></tr> </table>	Continuous Evaluation: 20 Marks Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3) (20 Marks)	Term End Theory Examinations (30 Marks)
Continuous Evaluation: 20 Marks Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3) (20 Marks)	Term End Theory Examinations (30 Marks)		

Syllabus

B.Sc. (Botany) Minor

(Sem.- IV)

Course - III

Title of Paper: Practicals in Palaeobotany, Spermatophyta and Biostatistics

Sr. No.	Heading	Particulars
1	Description of the course : Including but Not limited to :	This course provides an in-depth study of Gymnosperms, fossils, and angiosperm morphology, including leaf structures, inflorescences, and economically important plant families. It also introduces students to statistical tools like correlation and regression analysis for botanical research. Practical applications include anatomical and reproductive studies of Pinus, fossil identification, chromosomal aberration analysis, and garden design planning. S tudents can pursue careers in botany, forestry, palaeobotany, environmental conservation, horticulture, landscape design, and agricultural research.
2	Vertical :	Minor
3	Type :	Practical
4	Credit:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	Hours Allotted :	60 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives: (List some of the course objectives) To enable the learner CO1: understand the vegetative, anatomical, and reproductive structures of Pinus. CO2: explore fossil types and their evolutionary significance in plant history. CO3: analyze leaf morphology, inflorescence types, and plant family characteristics. CO4: study chromosomal aberrations and their cytological consequences.	

	CO5: apply statistical methods like correlation and regression in botanical research. CO6: develop skills in garden planning and landscape design.
8	Course Outcomes: (List some of the course outcomes) The learner will be able to OC1: Identify and describe the key features of Pinus and various fossil forms. OC2: Classify and differentiate plant families based on morphological and economic traits. OC3: Demonstrate knowledge of leaf morphology and inflorescence types. OC4: Analyze chromosomal aberrations using photomicrographs. OC5: Apply statistical techniques like correlation and regression in plant studies. OC6: Design formal and informal gardens with appropriate plant selection.

9	Modules	
	External Practical	
	1. Study of vegetative, anatomical, and reproductive structures of <i>Pinus</i> 2. To study different types of fossils- (with the help of photo) 3. Study of Fossil form - Genera <i>Pentoxylon</i> (with the help of photo/ specimen) 4. Study of Leaf morphology. (As per theory) 5. Types of Inflorescences (any one example of each type) 6. Study of Families: Malvaceae, Solanaceae Palmae: Classification, Morphological peculiarities, Floral Formula, and Economic importance. 7. Coefficient of correlation 8. Regression analysis	
	Internal Practical	
	1. Garden Locations (Hedges, Edges, Fence, Lawn, Arch and pergola, Avenue, Flower Beds and Water Garden) 2. Preparation of Garden Plans: Formal and Informal Garden 3. Study of cytological consequences of chromosomal Aberrations from permanent slides / photomicrographs 4. Field visit and report submission	

10	Reference Books: 1. Pandey, B.P. (2012). <i>College Botany Vol. II</i> . S. Chand Publishing. 2. Sharma, O.P. (1993). <i>Paleobotany and Fossil Plants</i> . McGraw Hill Education. 3. Vashishta, P.C., Sinha, A.K., & Kumar, A. (2010). <i>Gymnosperms</i> . S. Chand Publishing. 4. Johri, B.M., Lakhani, K., & Vats, S.K. (2008). <i>A Textbook of Angiosperms</i> . Macmillan Publishers. 5. Gupte, S.R. (2014). <i>Cytology, Genetics and Evolution</i> . S. Chand Publishing. 6. Gupta, S.C. (2013). <i>Fundamentals of Statistics</i> . Himalaya Publishing House. 7. Randhawa, G.S. & Mukherjee, S.P. (1986). <i>Floriculture in India</i> . Allied Publishers. 8. MLA. Rosner, Bernard (Bernard A.). Fundamentals of Biostatistics. Boston Brooks/Cole, Cengage Learning, 2011. 9. Pranab Kumar Banerjee. Introduction to Biostatistics (A Textbook of Biometry). Publisher, S. Chand Publishing, 2007	
11	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination
12	Continuous Evaluation: 20 Marks Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3) (20 Marks)	Term End Practical Examinations (30 Marks)

Note:

- A minimum of Two field excursions (with at least one beyond the limits of Mumbai / Local Area) for habitat studies are compulsory.
- Field work of not less than eight hours duration is equivalent to one period per week.
- Industrial visit/Institutional visits at least One per Semester are compulsory.
- A Certified Journal is essential and must be submitted during the examination for evaluation purposes.

S.Y. B. Sc BOTANY (NEP 2020)
SEMESTER III and IV
QUESTIONPAPERPATTERN
 (External and Internal)

Format of Question Paper: External Theory (Mandatory)			
30marks		Time:-01hr	
Q.No.	Descriptor	Module	Marks
Q1	Answer the following:(any1)	1	10
A			
B			
Q2	Answer the following:(any1)	2	10
A			
B			
Q3	Write Short Notes on:(any 2)	1 and2	10
A			
B			
C			
D			

Internal Theory (Mandatory) 20 marks

Continuous Evaluation through:	Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3)
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University of Mumbai
SY. B.Sc. Semester – III (NEP 2020) Practical Examination 2025-26
BOTANY-PRACTICAL- II (Minor)

Name of the Course: Practicals in Cryptogams, Cytogenetics and Biostatistics

PRACTICAL SKELETON PAPER

EXTERNAL		
TIME - 2 hours		Total Marks – 30
Q.1	Identify, and describe the specimen A and B	08 M
Q.2	Estimate _____ from the given plant material 'C'	06 M
Q.3	Perform _____ from the given data D	06M
Q.4	Identify and describe the given specimens/Photomicrographs/ slides 'E' and 'F'	06M
Q.5	Journal	04M
	Key	
A	Sargassum (Vegetative/Reproductive structure)	
B	Anthoceros (Vegetative/Reproductive structure)	
C	DNA/RNA	
D	Standard Error/ Chi-square test	
E	Fungal disease/Lichen thallus	
F	Chromosomal Aberrations/cell organelles	

	INTERNAL	20 M
1	Identify, and describe the specimen A and B	08M
2	Make a smear preparation from the given plant material 'C'. Draw, comment, and show the slide to the examiner	06M
3	Field visit and report Submission	6M
	Key	
A	Aspergillus (Vegetative/reproductive structure)	
B	Selaginella (Vegetative/reproductive structure)	
C	Flower buds	

University of Mumbai
SY. B.Sc. Semester – IV (NEP 2020) Practical Examination 2025-26

BOTANY-PRACTICAL- Course – III

Name of the Course: Practicals in Palaeobotany, Spermatophyta and Biostatistics

Skeleton Question Paper

External		
Time 2 hrs		Total Marks- 30
Q 1	Identify and describe the specimen 'A'.	6M
Q.2	Classify specimen 'B' upto its family. Draw L. S. Flower and T. S. of Ovary. Give floral formula.	8M
Q.3.	Perform _____ from the given data 'C'	6M
Q. 4.	Identify and describe the specimen/ photograph/ Slide – 'D','E'and'F'.	6M
Q.5.	Journal	4M
	Key	
A	<i>Pinus</i> (vegetative /reproductive structures)	
B	Plant Families: Malvaceae/ Solanaceae /Palmae	
C	Coefficient of correlation/Regression Analysis	
D	Fossil form - Genera <i>Pentoxylon</i>	
E	Leaf morphology	
F	Inflorescence types	

	Internal	20
1	Prepare Garden Plan 'A'. Show any three garden locations and mention any two plants used for the same.	06
2	Make temporary stained preparation of specimen 'B', Comment on Secondary Growth/ Mechanical Tissue system observed.	05
3	Identify and describe the specimen/ slides/photomicrographs'C' and 'D'	04
4	Field visit and report submission	05
	Key	

A	Formal/Informal Garden	
B	dicot stem/dicot root, coleus stem / Maize root	
C and D	Growth Ring/ Periderm/ lenticel/tyloses/heartwood/sapwood	

Letter Grades and Grade Points:

Semester GPA/ Programme CGPA Semester/ Programme	% of Marks	Alpha-Sign/ Letter Grade Result	Grading Point
9.00 - 10.00	90.0 - 100	O (Outstanding)	10
8.00 - < 9.00	80.0 - < 90.0	A+ (Excellent)	9
7.00 - < 8.00	70.0 - < 80.0	A (Very Good)	8
6.00 - < 7.00	60.0 - < 70.0	B+ (Good)	7
5.50 - < 6.00	55.0 - < 60.0	B (Above Average)	6
5.00 - < 5.50	50.0 - < 55.0	C (Average)	5
4.00 - < 5.00	40.0 - < 50.0	P (Pass)	4
Below 4.00	Below 40.0	F (Fail)	0
Ab (Absent)	-	Ab (Absent)	0

Sd/-

**Sign of the BOS
Chairman
Prin. Vasant Mali
BOS in Botany**

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Faculty of Science &
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