University of Mumbai

वेबसाईट – mu.ac.in
ईमेल - आयडी - dr.aams@fort.mu.ac.in
aams3@mu.ac.in

विद्याविषयक प्राधिकरणे
सभा आणि सेवा विभाग(ए.ए.एम.एस)
रूम नं. १२८ एम.जी.रोड, फोर्ट,
मुंबई – ४०० ०३२
टेलिफोन नं. – ०२२ – ६८३२००३३

(नॅक पुनर्मूल्यांकनाद्वारे ३.६५ (सी.जी.पी.ए.) सह अ++ श्रेणी
विद्यापीठ अनुदान आयोगाद्वारे श्रेणी १ विद्यापीठ दर्जा)

क्र.वि.प्रा.स.से./आयसीडी/२०२५-२६/३७ दिनांक : २७ मे, २०२५

परिपत्रक:-

सर्व प्राचार्य/संचालक, संलग्नित महाविद्यालये/संस्था, विद्यापीठ शैक्षणिक विभागांचे संचालक/ विभाग प्रमुख यांना कळविण्यात येते की, राष्ट्रीय शैक्षणिक धोरण २०२० च्या अमंलबजावणीच्या अनुषंगाने **शैक्षणिक वर्ष २०२५-२६** पासून **पदवी व पदव्युत्तर अभ्यासक्रम** विद्यापरिषदेच्या दिनांक २८ मार्च २०२५ व २० मे, २०२५ च्या बैठकीमध्ये मंजूर झालेले सर्व अभ्यासक्रम मुंबई विद्यापीठाच्या www.mu.ac.in या संकेत स्थळावर NEP २०२० या टॅब वर उपलब्ध करण्यात आलेले आहेत.

मुंबई – ४०० ०३२
२७ मे, २०२५

(डॉ. प्रसाद कारंडे)
कुलसचिव

Copy forwarded for information and necessary action to :-	
1	The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Dept)(AEM), dr@eligi.mu.ac.in
2	The Deputy Registrar, Result unit, Vidyanagari drresults@exam.mu.ac.in
3	The Deputy Registrar, Marks and Certificate Unit,. Vidyanagari dr.verification@mu.ac.in
4	The Deputy Registrar, Appointment Unit, Vidyanagari dr.appointment@exam.mu.ac.in
5	The Deputy Registrar, CAP Unit, Vidyanagari cap.exam@mu.ac.in
6	The Deputy Registrar, College Affiliations & Development Department (CAD), deputyregistrar.uni@gmail.com
7	The Deputy Registrar, PRO, Fort, (Publication Section), Pro@mu.ac.in
8	The Deputy Registrar, Executive Authorities Section (EA) eau120@fort.mu.ac.in He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular.
9	The Deputy Registrar, Research Administration & Promotion Cell (RAPC), rapc@mu.ac.in
10	The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA) dy.registrar.tau.fort.mu.ac.in ar.tau@fort.mu.ac.in
11	The Deputy Registrar, College Teachers Approval Unit (CTA), concolsection@gmail.com
12	The Deputy Registrars, Finance & Accounts Section, fort draccounts@fort.mu.ac.in
13	The Deputy Registrar, Election Section, Fort drelection@election.mu.ac.in
14	The Assistant Registrar, Administrative Sub-Campus Thane, thanesubcampus@mu.ac.in
15	The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan, ar.seask@mu.ac.in
16	The Assistant Registrar, Ratnagiri Sub-centre, Ratnagiri, ratnagirisubcentar@gmail.com
17	The Director, Centre for Distance and Online Education (CDOE), Vidyanagari, director@idol.mu.ac.in
18	Director, Innovation, Incubation and Linkages, Dr. Sachin Laddha pinkumanno@gmail.com
19	Director, Department of Lifelong Learning and Extension (DLLE), dlleuniversityofmumbai@gmail.com

Copy for information :-	
1	P.A to Hon'ble Vice-Chancellor, vice-chancellor@mu.ac.in
2	P.A to Pro-Vice-Chancellor pvc@fort.mu.ac.in
3	P.A to Registrar, registrar@fort.mu.ac.in
4	P.A to all Deans of all Faculties
5	P.A to Finance & Account Officers, (F & A.O), camu@accounts.mu.ac.in

To,

1	The Chairman, Board of Deans pvc@fort.mu.ac.in
2	**Faculty of Humanities,** **Offg. Dean** 1. Prof.Anil Singh Dranilsingh129@gmail.com **Offg. Associate Dean** 2. Prof.Manisha Karne mkarne@economics.mu.ac.in 3. Dr.Suchitra Naik Naiksuchitra27@gmail.com
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	Faculty of Science & Technology **Offg. Dean** 1. Prof. Shivram Garje ssgarje@chem.mu.ac.in **Offg. Associate Dean** 2. Dr. Madhav R. Rajwade Madhavr64@gmail.com 3. Prin. Deven Shah sir.deven@gmail.com
	Faculty of Inter-Disciplinary Studies, **Offg. Dean** 1.Dr. Anil K. Singh aksingh@trcl.org.in **Offg. Associate Dean** 2.Prin.Chadrashekhar Ashok Chakradeo cachakradeo@gmail.com 3. Dr. Kunal Ingle drkunalingle@gmail.com
3	Chairman, Board of Studies,
4	The Director, Board of Examinations and Evaluation, dboee@exam.mu.ac.in
5	The Director, Board of Students Development, dsd@mu.ac.in DSW direcotr@dsw.mu.ac.in
6	The Director, Department of Information & Communication Technology, director.dict@mu.ac.in

AC – 28/03/2025
Item No.– 6.14 (N)

As Per NEP 2020

University of Mumbai

Syllabus for Major Vertical – 1 & 4 (Scheme – III)		
Name of the Programme – B.Sc. (Botany)		
Faulty of Science		
Board of Studies in Botany		
U.G. Second Year Programme	**Exit Degree**	**U.G. Diploma in Botany**
Semester		**III & IV**
From the Academic Year		**2025-26**

University of Mumbai

(As per NEP 2020)

Sr. No.	Heading	Particulars
1	**Title of program** **O:_____**	**B.Sc. (Botany)**
2	**Exit Degree**	**U.G. Diploma in Botany**
3	**Scheme of Examination** **R: _____**	NEP 40% Internal 60% External, Semester End Examination Individual Passing in Internal and External Examination
4	**Standards of Passing** **R: _____**	**40%**
5	**Credit Structure** **R. SU-550C (III)** **R. SU-550D (III)**	**Attached herewith**
6	**Semesters**	**Sem. III & IV**
7	**Program Academic Level**	**5.00**
8	**Pattern**	**Semester**
9	**Status**	**New**
10	**To be implemented from Academic Year**	**2025-26**

Sd/-	**Sd/-**	**Sd/-**
Sign of the BOS Chairman	**Sign of the Offg. Associate Dean**	**Sign of the Offg. Dean**
Prin.Dr Vasant Mali	**Dr. Madhav R. Rajwade**	**Prof. Shivram S. Garje**
BOS in Botany.	**Faculty of Science & Technology**	**Faculty of Science & Technology**

Under Graduate Diploma in Botany

Credit Structure (Sem. III & IV)

(B. Sc.)- Major & Minor

	R. SU-550C (III)									
Year (Level)	Semester	Subject M1	Subject M2	Subject M3	Open Electives Related to other faculty	VSC, SEC Related to core	AEC, VEC, IKS	OJT, FP, CEP, RP Related to core	Minimum credits for the year (Sem)	Cumulative minimum credits required for award of Certificate / Diploma / Degree
25	III	4+2 Course - I (2C) Plant Diversity I Course - II (2C) Functional Botany I Course- III (2C) Practical Approaches in Plant Sciences I		---	4	SEC: 2 Agriculture Biotechnology	AEC: 2	CC: 2 CEP/FP : 2	44 (22 + 22)	(88) Diploma in Faculty
	R. SU-550D (III)									
	IV	4+2 Course-I (2C) Plant Diversity II Course - II (2C) Functional Botany II Course- III (2C) Practical Approaches in		---	4	VSC:2 Phytochemical Techniques OR Plant Tissue Culture	VEC: 2	CC: 2 CEP/FP : 2		

		Plant Sciences II								
	Cum Cr.	*20*	*16*	*8*	*10*	*6+6*	*6+4+2*	*6+4*		
	Exit option: Award of UG Diploma in Major with 88 credits and additional 4 credits core NSQF course/ Internship OR continue with Major									

[Abbreviation - OE – Open Electives, VSC – Vocation Skill Course, SEC – Skill Enhancement Course, (VSEC), AEC – Ability Enhancement Course, VEC – Value Education Course, IKS – Indian Knowledge System, OJT – on Job Training, FP – Field Project, CEP – Continuing Education Program, CC – Co-Curricular, RP – Research Project]

Sem. - III

Vertical – 1
Major

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

Title of Paper **Plant Diversity I**

Sr. No.	Heading	Particulars
1	**Description of the course :** **Including but Not limited to :**	The study of plant forms, life cycles, and their importance is fundamental to understanding the diversity of the plant kingdom and its role in sustaining life on Earth. This course provides insight into various plant structures, their development, and their ecological and economic significance. By identifying different plant forms, learning about their life cycles, and exploring their applications, students will gain a deeper appreciation of the plant world and its contributions. The course equips students with critical knowledge about plant biology that can be applied in numerous scientific and practical domains. It aids in environmental conservation, improves agricultural productivity, supports medicinal research, and contributes to ecosystem restoration efforts. With hands-on learning opportunities, research prospects, and real-world applications, this course fosters curiosity and passion for plant sciences. Industries such as agriculture, pharmaceuticals, forestry, and biotechnology actively seek professionals with expertise in plant sciences.
2	**Vertical :**	Major
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**: To enable the learner **1.** Identify the different types of plant forms based on structure. **2.** Acquire knowledge about the life cycles of different plant forms. **3.** Understand the importance and utilization of various plant groups.
8	**Course Outcomes**: The learner will be able to **1.** Recognize the different types of plant forms based on structure. **2.** Describe the life cycles of different plant forms. **3.** Discuss the importance and utilization of different plant groups.
9	**Modules**
	Module 1: Algae, Fungi and Bacteria **15 Lectures**
	1. Algae: The Green Revolutionaries ● General classification of Algae up to the class. (G.M. Smith,1958) ● Interesting Facts about Algae ● General Characteristics of Chrysophyta ● Systematic position, and life cycle (excluding development stages of sex organs) of *Diatoms* **2. Fungi: Nature's recyclers** ● General classification of Fungi up to the class. (G.M. Smith,1958) ● Interesting Facts about Fungi ● General Characteristics of Ascomycetae ● Systematic position, and life cycle (excluding development stages of sex organs) of *Xylaria* **3. Bacteria: Small wonders of Nature** ● Forms and ultrastructure of Bacteria ● Interesting Facts about Bacteria **Activities:** ● Observe fungal growth on suitable substratum and learn about mycology in everyday life. ● Poster / Oral Presentation: Bacteria a friend / Bacteria an enemy
	Module 2:Bryophytes and Pteridophytes **15 Lectures**
	1. Bryophytes: The Amphibians of the Plant World ● Interesting Facts about bryophytes. ● Thallus structure of liverworts, Hornworts & Mosses. (One example of each) ● General Characteristics of Anthocerotae. ● Systematic position (G. M. Smith 1955), and life cycle (excluding development stages of sex organs) of *Anthoceros.*

	2. Pteridophytes: The First Vascular Plants ● Habitat and Pteridophytes: Aquatic, terrestrial and xerophytic. ● General Characteristics of Pterophyta ● Systematic position (G.M. Smith 1955), and life cycle (excluding development stages of sex organs) of *Nephrolepis.* ● Stelar evolution **Activities:** Do It Yourself: ● Moss terrarium project to understand bryophyte growth. ● Ferns as ornamental plants.
10	**Text Books/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. Botany For Degree Students (1960) By B.R. Vashishta, Dr. A.K. Sinha and Dr. V. P. Singhrevised edition 2010 (Reprint 2012), S. Chand & Company LTD. 6. Text Book of Fungi (1989) by O.P.Sharma, Tata Mc.Graw 7. Morphology and Evolution of Vascular Plants (1989) by Gifford, E.M. and FosterA.S. publisher, W.H. Freeman & Co., New York. 8. An Introduction to Pteridophyte (1999)By Abdul Rashid. Reprint 2021, Vikas Publishing House Private Limited. 9. Cryptogamic Botany Volume I and II (1938,1955) by G M Smith McGraw Hill 10. Botany for Degree students-Pteridophytes by Vashishta B.R. (1996) 11. Textbook of Plant Pathology (2006) by A.V.S.S.Sambamurty. Reprint 2012) I.K. International Publishing House Pvt. Ltd. 12. College Botany Volume II(1989) reprint 2014 By Gangulee & Kar. New Central Book Agency (P)Ltd 13. College Botany Vol-III (1984) Reprint 2006 by Susil Kumar Mukherjee 14. Studies in Botany vol.1. 6th edition (Revised 2018) by J.N. Mitra, D.Mitra and Chowdhari, New Central Book Agency (P)LTD. 15. Biology of Bryophytes (1988) by Chopra, R.N., P.N.Kumar.

12	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
13	**Continuous Evaluation through: 20 marks** Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3) **(20 Marks)**	**Term end exam** Attempt any 2 questions out of 4 questions. **(30 Marks)**

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

Title of Paper: Functional Botany I

Sr. No.	Heading	Particulars
1	**Description of the course :** **Including but Not limited to :**	This course is designed to provide an in-depth understanding of the cellular and genetic mechanisms that drive plant biology. This knowledge is essential not only in academic research but also in addressing practical issues such as crop improvement, disease resistance, and sustainable agriculture. The incorporation of biostatistics further strengthens the ability to analyze and interpret complex biological data, which is increasingly vital in modern research and development. This course will build a robust theoretical foundation as well as prepare students with practical skills that are highly valued across multiple sectors, making it a stepping stone to a dynamic and impactful career in agriculture, pharmaceuticals, environmental consulting, and biotechnology.
2	**Vertical :**	Major
3	**Type :**	Theory / 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**: To enable the learner **1.** Learn the structure and function of plant cell organelles. **2.** Gain knowledge of nucleic acid. **3.** Acquire knowledge of genetic inheritance and aberrations. **4.** Understand plant hybridization **5.** Familiarize themselves with biostatistical applications.	

8	**Course Outcomes**: The learner will be able to **1.** Identify and understand the structure and functions of plant cell organelles. **2.** Describe the structure and function of DNA and RNA. **3.** Discuss the cause of variation in chromosome number and structure. **4.** Apply basic techniques in plant breeding for the production of new varieties. **5.** Use knowledge of biostatistics.

9	**Modules**
	Module 1: Cell Biology, Cytogenetics and Plant Breeding 15 Lectures
	1. Cell Biology: ● Ultrastructure and functions of cell organelles: Glyoxsomes, Ribosomes. (prokaryotic and eukaryotic) ● Meiosis in Plant Cells and its Significance. ● Nucleic Acids: Types, structure, and functions of DNA and RNA. **2. Cytogenetics and Plant Breeding:** ● Variation in Chromosome structure (Chromosomal Aberrations). ● Definition, Types and Genetic Effects of the following: Deletions, Duplications, Inversions and Translocations. ● Variation in Chromosome number: Aneuploidy, Euploidy and its types ● Plant breeding - Definition and Concept, Techniques **Activity:** ● Poster / Oral presentation/ Model of any topic of Cell biology. ● Collection of different varieties of Wheat, rice etc.
	Module 2: Molecular Biology and Biostatistics 15 Lectures
	1. Molecular Biology ● DNA replication: Models of DNA Replication, Meselson -Stahl. Experiment, Mechanism of DNA replication (Prokaryotes and Eukaryotes) ● Transcription in Eukaryotes. ● RNA Processing. ● Biostatistics: Introduction, concept and problems based on Standard error, Chi Square **2. Biostatistics:** ● Introduction and concept - Standard error, Chi Square ● Problems based on Standard error, Chi Square **Activities:** ● Biostatistics: Designing and solving problems based on Standard error, Chi Square using Excel

10	**Text Books/Reference Books:** 1. R. C. Dube (2008). A Text Book of Biotechnology, S. Chand. 2. P.K. Gupta (2019). Elements of Biotechnology. 3. U. Satyanarayana (2017). Biotechnology. 4. Pal J.K. and Ghaskadabi S.S. (2008). Fundamentals of Molecular Biology. 5. Verma and Agrawal (2010). Molecular Biology 6. Devi P (2008). Principle and Methods of Plant Molecular Biology,Biochemistry and Genetics Agrobios, Jodhpur, India 7. Russel, P.J. 1998. Genetics (5th edn) The Benjamin/ Cummins Pub. Co., Inc. USA. 8. Griffiths, A.J.F and Gilbert, W.M (2nd edn). Modern genetic analysis. W.H. Freeman and Company, New York, USA. 9. Lewin, B. Genes VIII. Oxford, University Press. New York, USA. 10. Strickberger, M.W: Genetics (4th edn). McMillan Publishing Company, New York, USA. 11. Singh B. D. (2007). Plant Breeding. Kalyani Publishers. Ludhiana. 12. Chopra, V.L. (2000). Plant Breeding: Theory and Practice 2nd Ed. Oxford & IBH, New Delhi. 13. Das H. K. Ed. (2007) Textbook of Biotechnology. 3rd Edition. Wiley India (P) Ltd. 14. Genes X– Benjamin Lewin, Jones and Bartlett, 2011.	
12	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
13	**Continuous Evaluation through:** Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3) **(20 Marks)**	**Term end exam for 30 marks:** Attempt any 2 questions out of 4 questions. **(30 Marks)**

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

Title of Paper: Practical Approaches in Plant Sciences I

60 Hours **Credits:02**

List of Practicals (External)
1. Study of Stages in the Life Cycle of *Diatoms.* 2. Study of stages in the life cycle of *Nephrolepis* 3. Study of the Ultrastructure of Cell Organelles: Glyoxysomes, Ribosome 4. Study of chromosomal abnormalities from treated root tips (Colchicine/pDB) 5. Isolation and estimation of DNA from plant Material 6. Estimation of RNA from plant material 7. Standard error 8. Chi square test

List of Practicals (Internal)
1. Study of stages in the life cycle of *Xylaria.* 2. Study of stages in the life cycle of *Anthoceros.* 3. Study of types of stele. 4. Study of Meiosis from suitable plant material. 5. Submission of any one probiotic. 6. Collection and submission of different varieties of Wheat, rice etc.

SEC

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

Title of Paper: Agriculture Biotechnology

Sr. No.	Heading	Particulars
1	**Description of the course :** **Including but Not limited to :**	This course focuses on the cultivation and mass multiplication of beneficial microorganisms, soil health analysis, preservation techniques for produce, microbial growth studies, and plant disease management. This course complements studies in plant pathology, agronomy, microbiology, and food science, providing a practical edge to theoretical knowledge. Growing emphasis on sustainable practices and food safety drives demand for experts in soil health, microbial applications, and plant disease management. Students can pursue careers as agricultural microbiologists, soil scientists, plant pathologists, food technologists, and environmental consultants.
2	**Vertical :**	SEC
3	**Type :**	Practical
4	**Credit**:	2 credits / 4 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**: To enable the learner **1.** Learn the cultivation, mass multiplication and application of agriculturally important microorganisms. **2.** Develop skills in soil health analysis, including pH, organic carbon, electrical conductivity, soil types, and nutrient assessment for effective soil management. **3.** Understand techniques for preserving fruits and vegetables to enhance shelf life and analyze antioxidant properties. **4.** Gain practical experience in microbial growth studies, mushroom spawn production, and composting techniques using starter cultures.	

	5. Identify and study plant diseases such as White Rust, Smut, and Powdery Mildew, and explore methods for their management.
8	**Course Outcomes**: The learner will be able to **1.** Demonstrate the cultivation and mass multiplication of agriculturally beneficial microorganisms and its application in sustainable agriculture. **2.** Analyze soil health through pH, organic carbon, electrical conductivity, soil types, and nutrient analysis for effective soil management. **3.** Apply methods to enhance the shelf life of fruits and vegetables and assess their antioxidant properties. **4.** Investigate microbial growth patterns, develop mushroom spawn production techniques, and design compost bins using starter cultures. **5.** Identify and evaluate common plant diseases such as White Rust, Smut, and Powdery Mildew for effective disease management.

9	**LIST OF PRACTICALS**	**15 Lectures**
	EXTERNAL	
	1. Cultivation and mass multiplication of Trichoderma and formulation of bio-product for sustainable agriculture. 2. Cultivation and mass multiplication of Pseudomonas and formulation of Liquid fertilizer. 3. Cultivation of Azolla and its practical application in Agriculture. 4. Testing of soil health and soil health management – Making Soil Health Card (SHC). a. Soil pH b. Soil organic Carbon c. Soil electrical conductivity (EC) d. Soil types 5. Soil Nutrients analysis- Nitrogen, Phosphorus and Potassium. 6. Testing of seed viability by TTC method. 7. Study of preservation methods for locally available fruits and vegetables. 8. Estimate the antioxidant activity in locally available fruits and vegetables by DPPH method.	

	Activity: 1. Submission of preserved fruit/vegetable product. 2. Preparation of a soil health card of locally available soil sample.	
	INTERNAL	
	1. Study of Growth Curve of *E. coli*. 2. Isolation of Rhizobia from root nodules. 3. Production and Maintenance of Mushroom Spawn. 4. Formulation of starter culture for home-scale composting. 5. Designing a composter. 6. Study of plant diseases- White Rust, Smut disease and Powdery mildew. 7. Case study: Genetically Modified Crop - Bt Cotton. **Activity:** 1. Submission of composter. 2. Poster or oral presentation on the above case study.	
10	**Text Books/Reference Books:** ● Handbook of Organic farming and Biofertilizers by A.C. Gaur - Ambika Book Agency (2006). ● Agricultural Microbiology Based Entrepreneurship - Edited by Natarajan Amaresan, Dhanasekaran Dharumadurai, Olubukola Oluranti Babalola – Springer ● Microbial- Based Biopesticides: Methods and Protocols - Edited by Travis R. Glare, Maria E. Moran-Diez – Humana Press ● Mushrooms Cultivation, Marketing and Consumption -Directorate of Mushroom Research (Indian Council of Agricultural Research) - Chambaghat Solan-173213 ● Methods Manual: Soul Testing in India - Department of Agriculture & Cooperation, Ministry of Agriculture, Gov. Of India.	
12	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
13	**Continuous Evaluation: 20 marks** Practical exam,Activities.	**Term end exam for 30 marks:** Practical exam,Activities.

Sem. - IV

Syllabus
B.Sc. (Botany)
(Sem.- IV)

Title of Paper: Plant Diversity II

Sr. No.	Heading	Particulars
1	**Description of the course :** **Including but Not limited to :**	This course explores the evolution and practical aspects of plant science—from gymnosperms and palaeobotany to leaf structure, inflorescences, and garden design, providing a well-rounded view of botanical diversity. Students will gain essential knowledge to identify plant groups, analyze structural modifications, and design effective green spaces, blending theoretical insights with practical skills. Students can pursue careers as botanists, horticulturists, environmental consultants, landscape designers, or academic researchers, with diverse opportunities in both public and private sectors.
2	**Vertical :**	Major
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**: To enable the learner **1.** Comprehend the characteristics and importance of the Gymnosperms. **2.** Acquire knowledge and importance of palaeobotany. **3.** Gain insight into structure, modification, and the importance of leaves. **4.** Learn about the structure and function of inflorescences in various plant species. **5.** Explore the characteristics features that distinguish various plant families.	

	6. Get information about plants suitable for garden designing, types of gardens.
8	**Course Outcomes**: The learner will be able to **1.** Identify and compare vegetative and reproductive characteristics and applications of diverse plant groups. **2.** Describe the significance of paleobotany. **3.** Explain the structure, modifications, and importance of leaves. **4.** Discuss the structure and function of inflorescences. **5.** Identify the plant according to families using morphometry. **6.** Suggest plants suitable for garden designing, types of gardens, and botanical gardens.

9	**Modules**
	Module 1: Gymnosperms and Paleobotany **15 Lectures**
	1. Gymnosperms: The Giants of Plant World ● General classification of Gymnosperms up to the order per (Chamberlain1934). ● Interesting facts about gymnosperms. ● General characters of Coniferophyta. ● Systematic position (Chamberlain,1934) and life cycle (excluding developmental stages of sex organs) of *Pinus.* **2. Palaeobotany** ● Geological Time Scale -Era, period, Evolutionary changes in plants, the importance of Palaeobotany. ● Formation and types of Fossils, Interesting facts about fossils. ● Birbal Sahni Institute of Palaeobotany, Lucknow. **Activities:** ● Explore the world's largest and oldest conifers via online resources. ● Preparation of fossil imprints using plants.
	Module 2: Plant morphology and Gardening **15 Lectures**
	1. Leaf: The Powerhouse ● Parts of typical leaves, ● Types of leaves- Simple and Compound, ● Venation: Introduction, Types ● Phyllotaxy: Introduction, Types

	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, Lawn, Arch and Pergola, Avenue, Flower Beds, Rock Garden and Water Garden). ● Gardens in India -Jijamata Udyan, Byculla; Maharashtra Nature Park, Mahim; Government Botanical Garden, Ooty. **Activities:** ● Leaf impression art – Identifying different venation patterns through leaf prints. ● Explore a local botanical garden to document plant diversity.
10	**Text Books/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 Swami Iyengar 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.

12	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
13	**Continuous Evaluation through: 20 marks** Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3)	**Term end exam for 30 marks:** Attempt any 2 questions out of 4 questions.

Syllabus
B.Sc. (Botany)
(Sem.- IV)

Title of Paper: Functional Botany II

Sr. No.	Heading	Particulars
1	**Description of the course :** **Including but Not limited to :**	This course covers plant photoperiodism, vernalization, stress mechanisms, internal morphology, and enzyme biochemistry, along with the practical applications of plant anatomy. Students will gain insights into plant adaptation and metabolism, enhancing their ability to address real-world challenges in crop management and biotechnology. There is growing demand for experts in plant stress physiology and biochemistry to develop resilient crops and sustainable agricultural practices. Students can pursue careers as plant physiologists, agronomists, biotechnologists, research scientists, and environmental consultants.
2	**Vertical :**	Major
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**: To enable the learner **1.** Gain knowledge of Photoperiodism and Vernalization. **2.** To learn about the stress mechanism in plants. **3.** Acquire knowledge of the internal morphology of plants. **4.** Understand the enzyme classification, types, structure, and function. **5.** To know the application of anatomy in various fields.	

8	**Course Outcomes**: The learner will be able to **1.** Describe the process of Photoperiodism and Vernalization. **2.** Analyze the stress mechanism in plants. **3.** Discuss the internal morphology of plants. **4.** Explain the enzyme classification, types, structure, and function. **5.** Understand the application of anatomy in various fields.
9	**Modules**
	Module 1: Plant Anatomy **15 Lectures**
	Anatomy: ● Meristem- Characteristics, types, and functions. ● Types of tissues in plants: Parenchyma, Collenchyma, Sclerenchyma and conducting tissues. ● Normal Secondary growth in dicot root and stem. ● Growth rings, Periderm, Tylosis, Heartwood, and Sapwood. ● I-girder in plants and Inflexibility, Incompressibility, Inextensibility. ● Anatomy in relation to taxonomy. **Activity:** ● Poster Presentation / Oral Presentation / Model of Anatomical structures (as per theory)
	Module 2: Plant Physiology and Plant Biochemistry **15 Lectures**
	1. Plant Physiology ● Phytochrome, Physico-chemical properties of phytochrome, Pr-Pfr interconversion. ● Photoperiodism: Definition, Introduction, Response of plant to day length (SDP, LDP, DNP), Significance of photoperiodism. ● Vernalization. **2. Plant Biochemistry** ● Carbohydrates: Definition, classification, structure ● Proteins: Definition and classification **Activity:** ● Documentation of flowering in plants during different seasons in the vicinity. ● Survey and collection of dietary pulses.

10	**Text Books/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. Jain, V.K. (2000): Fundamentals of Plant Physiology, S.Chand & Co, New Delhi. 4. Verma, V. (2007): Text Book of Plant Physiology, Ane Books India, New Delhi. 5. Richard Crang , Sheila Lyons-Sobaski and Robert Wise (2018) Plant Anatomy A Concept-Based Approach to the Structure of Seed Plants 6. B. P. Pandey, Plant Anatomy, 1987, S. Chand and Co. Ltd, New Delhi 7. Eams and Mc Daniel, An Introduction to Plant Anatomy, 1990, McGraw –Hill Book Co. Ltd and Kogakusha Co, Tokyo, Japan 8. P. Saxena and S. M. Das (2012) A Textbook of Plant Anatomy 9. P. J. Chandurkar, Plant Anatomy, 1971, Oxford and IBH publication Co. New Delhi 10. Adriance S Foster, Practical Plant Anatomy, 2000, D Van Nostrand Co. INC, New York 11. Esau, Plant Anatomy, 2000, Wiley Toppan Co. California, USA 12. Pijush Roy, Plant Anatomy, 2004, New Central Book Agency Ltd, Kolkata	
12	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
13	**Continuous Evaluation for 20 marks through:** Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3)	**Term end exam for 30 marks:** Attempt any 2 questions out of 4 questions.

Syllabus
B.Sc. (Botany)
(Sem.- IV)

Title of Paper: Practical Approaches in Plant Sciences II

60 Hours **Credits:02**

List of Practicals - External

1. To study the life cycle of *Pinus*. (Vegetative /reproductive structures)
2. Types of Inflorescences (any one example of each type)
3. Study of Families: Malvaceae, Rubiaceae, Amaryllidaceae - Classification, Morphological peculiarities, Floral Formula, and Economic importance.
4. Estimation of Protein by Lowry's method.
5. Separation of photosynthetic pigments by Paper Chromatography.
6. Study of Normal Secondary Growth in dicot stem and root.
7. Coefficient of correlation.
8. Regression analysis.

List of Practicals - Internal

1. Study of different types of fossils- (with the help of photo)
2. Study of Leaf morphology. (As per theory)
3. Garden Locations (Hedges, Edges, Lawn, Arch and pergola, Avenue, Flower Beds Rock Garden and Water Garden).
4. Preparation of Garden Plans: Formal and Informal Gardens.
5. Estimation of reducing sugars.
6. Growth Rings, Periderm, Lenticels, Tyloses, Heart Wood and Sap wood.
7. Study of tissues in plants (Sunflower stem, Nerium leaf, etc.).

VSC

Syllabus
B. Sc. (Botany)
Sem.- IV
VSC (Any One)

Title of Paper: Phytochemical Techniques (VSC - 1)

Sr. No.	Heading	Particulars
1	**Description of the course :** **Including but Not limited to :**	This course teaches the microscopic and morphological evaluation of crude drugs, including techniques for assessing herbal drugs and understanding their uses and chemical properties. It provides essential skills for quality control in herbal medicine and natural product research. It complements studies in pharmacology, botany, natural product chemistry, and herbal medicine. The growing popularity of herbal products and natural remedies drives demand for professionals skilled in crude drug evaluation and quality assurance. Students can work as quality control analysts, research scientists, herbal pharmacists, and professionals in the natural products industry.
2	**Vertical :**	VSC
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**: To enable the learner 1. Carry out the microscopic and morphological evaluation of crude drugs. 2. Know the evaluation techniques for the herbal drugs 3. Know the crude drugs, their uses, and chemical nature.
8	**Course Outcomes**: The learner will be able to 1. Conduct Macroscopic and Microscopic Evaluation 2. Evaluate Physicochemical Properties and Perform Chromatographic Techniques 3. Analyze Phytochemical Constituents.
9	**List of Practicals: External**
	1. Determination of palisade ratio. 2. Determination of stomatal index. 3. Macroscopic and microscopic study of Coriander (Fruit). 4. Determination of loss on drying. (Any herbal plant material) 5. Fluorescence study of given drug powder. (Adulsa leaf powder, Ginger powder etc.) 6. Test for carbohydrates /proteins. (Any herbal plant material) 7. Test for Alkaloids (Coffee) / Tannins (Tea) 8. Industrial /Institute Visit
	List of Practicals: Internal Practicals
	1. Determination of Total ash value. (Any herbal powder) 2. TLC for volatile oil. (Clove oil) 3. Determination of water-soluble extractive value. (Any herbal powder) 4. Test for glycoside (Aloe vera) and saponin (Ritha powder) **Activity-** ● Presentation of review paper on phytochemical analysis of medicinal plants. ● Preparation of Gel / Churna / Ark etc. from medicinal plants (Entrepreneurial Practice)
10	**Text Books/Reference Books:** 1. Practical Pharmacognosy- Khandelwal K.R. (2008) - Techniques & Experiments, Nirali Prakashan, 19th edition. 2. A Text Book of Pharmacognosy -S. B. Gokhale, Dr. C. K. Kokate, A. P. Purohit, 37th edition, Nirali Prakashan, New Delhi. 3. Pharmacognosy, 16th edition,W.C.Evans, Trease and Evans, W.B. Sounders & Co., London, 2009

11	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
12	**Continuous Evaluation through: 20 marks** Practical exam, Activities	**Term End Practical Exam: 30 marks** Practical exam, Activities

Syllabus
B. Sc. (Botany)
(Sem.- IV)

Title of Paper: Plant Tissue Culture (VSC - 2)

Sr. No.	Heading	Particulars
1	**Description of the course :** **Including but Not limited to :**	This course introduces the infrastructure and essentials of a plant tissue culture laboratory, covering nutrient media, plant growth regulators, and aseptic techniques for culturing plants. Understanding plant tissue culture is key to advancing plant biotechnology and sustainable crop production. It equips students with hands-on skills in plant propagation, manipulation, and research methodologies essential for modern agriculture. It complements studies in plant biology, biotechnology, genetics, and horticulture, providing a practical extension to theoretical knowledge. Students can pursue careers as biotechnologists, research scientists, lab technicians, plant breeders, and conservation specialists.
2	**Vertical :**	VSC
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**: To enable the learner 1. Understand the infrastructure, key components and requirements of Plant Tissue Culture laboratory 2. Understand the basic principles in plant tissue culture involving the role of nutrient media and plant growth regulators 3. Learn aseptic techniques inoculation methods and steps in Culturing plants through plant tissue culture	

	4. Gain knowledge about the importance of plant tissue culture
8	**Course Outcomes**: The learner will be able to 1. Design a Plant Tissue Culture laboratory. 2. Analyze the role of various nutrients affecting the growth of plants. 3. Develop skills for handling explants, inoculation and establishment of plant cultures. 4. Apply the knowledge and skills of plant tissue culture techniques for economic growth in agriculture and industry.
9	**List of Practicals: External**
	1. Sterilization techniques in plant tissue culture: 2. Wet Sterilization - Autoclave 3. Dry Sterilization - Hot air oven, Flame Sterilization 4. Laminar airflow chamber 5. Chemical Sterilization 6. Ultrafiltration 7. Surface sterilization of Explant. 8. Preparation of Murashige & Skoog's (MS) media of given concentration from stock solutions. 9. Inoculation of explant and regeneration. 10. Callus induction from regenerated explant. 11. Visit to a Plant Tissue Culture laboratory and submission of report.
	List of Practicals: Internal Practicals
	1. Designing of Plant Tissue Culture Laboratory 2. Preparation of Synthetic seeds. 3. Hardening and acclimatization of regenerated Plantlets. **Activity:** ● Hardened and acclimatized Plants to be submitted.

10	**Text Books/Reference Books:** 1. An introduction to plant tissue culture by Kalyan Kumar Dey, New Central Book Agency 2. Plant Tissue Culture- Techniques and Experiments by Roberta H Smith, Academic Press Inc; 3rd edition (30 August 2012) 3. Experiments in Plant Tissue culture -3rd Edition by John H Dodds, Michigan State University and Lorin W Roberts, University of Idaho, Cambridge University Press 4. Introduction to Plant Tissue Culture by M.K. Razdan, science Publishers 5. Plant Tissue culture- Theory and Practice, A revised edition by S.S. Bhojwani and M. K. Razdan.	
11	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
12	**Continuous Evaluation through: 20 marks** Practical exam, Activities	**Term End Practical Exam: 30 marks** Practical exam, Activities

Note: (Major, Minor, VSC and SEC)

- 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 visit at least **One** per Semester is compulsory.

- **Certified Journal** to be submitted during practical examination.

QUESTION PAPER PATTERN
(External and Internal)

Time:-01hr	Paper: External Theory (Major)	30 marks

NB:
1. Attempt any 2 questions out of 4 questions
2. All Questions carry equal marks.
3. Draw neat and labelled diagrams wherever necessary.

Q.No.	Descriptor	Module	Marks
Q1	Answer the following:		
A		1	08 M
B		2	07 M
Q2	Answer the following:		
A		1	08 M
B		2	07 M
Q3	Answer the following:		
A		2	08 M
B		1	07 M
Q4	Answer the following:		
A		2	08 M
B		1	07 M

Internal Theory 20 marks

Continuous Evaluation through:	Quizzes, Class Tests, Presentation, Project, Role play, Creative writing, Assignment etc. (at least 3)

University of Mumbai

S. Y. B.Sc. Semester – III (NEP 2020) Practical Examination

BOTANY-PRACTICAL

External Practical Exam Skeleton Question Paper

Course - III (Major)

Name of the Course: Practical Approaches in Plant Sciences I

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Time 2 hrs **Total Marks - 30**

Q 1	Identify, and describe the specimen **A** and **B**	08M
Q.2	Prepare squash from the material **'C'**. Draw and comment on the abnormality observed. **/** Perform _____ from the data **'C'.**	07M
Q. 3	Estimate _____from the material **'D'.**	07M
Q.4	Identify and describe the specimen/ photograph/ Slide – **'E'**.	03M
Q.5	Field Visit	05M

Key-

A *Diatoms* (vegetative /reproductive structures)

B *Nephrolepis* (vegetative /reproductive structures)

C Treated root tips (Colchicine / pDB) / Standard Error/ Chi-square test

D DNA / RNA

E Glyoxysomes / Ribosomes

University of Mumbai

S. Y. B.Sc. Semester – III (NEP 2020) Practical Examination

BOTANY-PRACTICAL

Internal Practical Exam Skeleton Question Paper

Course - III (Major)

Name of the Course: Practical Approaches in Plant Sciences II

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Time: 2 hours **Marks: 20 Marks**

Q 1	Identify, and describe the specimen **A** and **B**	08M
Q.2	Prepare a smear from the material **'C'**. Draw, and comment on any one stage seen.	05M
Q. 3	Identify and describe the specimen/ photograph/ Slide – **'D'**.	03M
Q.4	Submission - any one probiotic / different varieties of Wheat, rice etc.	04M

Key-

A *Xylaria* (vegetative /reproductive structures)

B *Anthoceros* (vegetative /reproductive structures)

C Flower Bud

D Types of Stele

University of Mumbai

S. Y. B.Sc. Semester – IV (NEP 2020) Practical Examination

BOTANY-PRACTICAL

External Practical Exam Skeleton Question Paper

Course - III (Major)

Name of the Course: Practical Approaches in Plant Sciences II

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Time 2 hrs **Total Marks- 30**

Q 1	Identify, classify and describe the specimen '**A'**./ Make a temporary stained preparation of T.S. of specimen '**A'** and comment on the secondary growth.	6M
Q.2	Classify specimen **'B'** upto its family. Draw L. S. Flower and T. S. of Ovary. Give floral formula.	6M
Q.3	Perform the experiment '**C**' allotted to you.	6M
Q.4	Perform _____ from the given data '**D**'.	5M
Q.5	Identify and describe the specimen/ photograph/ Slide – '**E'** and '**F'.**	4M
Q.6	Field visit and report submission	3M

Key

A	*Pinus* (vegetative /reproductive structures) / Dicot Stem / Dicot Root
B	Plant Families: Malvaceae/ Rubiaceae /Amaryllidaceae
C	Protein estimation / Paper Chromatography
D	Coefficient of correlation/Regression Analysis
E	Inflorescence types

University of Mumbai

S. Y. B.Sc. Semester – IV (NEP 2020) Practical Examination

BOTANY-PRACTICAL

Internal Practical Exam Skeleton Question Paper

Course - III (Major)

Name of the Course: Practical Approaches in Plant Sciences II

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Time: 2 hours **Marks: 20M**

Q1	Prepare Garden Plan **'A'**. Show any two garden locations and mention any two plants used for the same.	05M
Q2	Make temporary stained preparation of specimen '**B'**, and comment on the Tissue observed.	05M
Q3	Estimate _____ from the specimen '**C**'.	05M
Q4	Identify and describe the specimen/ slides/photomicrographs '**D'.**	02M
Q5	Journal	03M

Key

A	Formal / Informal Garden
B	Parenchyma, Collenchyma, Sclerenchyma, Conducting tissues.
C	Reducing Sugars
D	Growth Ring / Periderm / Lenticel / Tyloses / Heartwood / Sapwood / Leaf morphology. (Any One)

University of Mumbai

S. Y. B.Sc. Semester – III (NEP 2020) Practical Examination
BOTANY-PRACTICAL- SEC
External Skeleton Question Paper

[**Agriculture Biotechnology]**

Time: 2 Hours **Marks: 30**

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed**.

Q.1	Determine _____ from sample **A**	10 Marks
Q.2	Perform _____ for given sample **B**	10 Marks
	OR	
Q.2	Estimate _____ in sample **B**.	10 Marks
Q.3	Identify and describe slide/ specimen/ photomicrograph **C** and **D.**	06 Marks
Q.4	Journal	04 Marks

Key

A. pH/organic carbon/soil type/EC/phosphorus /potassium

B. Seed viability test by TTC method)/ antioxidant activity

C. *Trichoderma /Pseudomonas /Azolla*

D. Preservation methods for fruits and vegetables/ Kjeldahl apparatus

University of Mumbai

S. Y. B.Sc. Semester – III (NEP 2020) Practical Examination

BOTANY-PRACTICAL- SEC

Internal Skeleton Question Paper

[**Agriculture Biotechnology]**

Time: 2 Hours **Marks: 20**

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Q.1	Perform the experiment **A** allotted to you.	06 Marks
Q.2	Isolate _____ from material **B**.	06 Marks
	OR	
Q.2	Prepare _____ from material **B**.	06 Marks
Q.3	Identify and describe slide/ specimen/ photomicrograph **C** and **D**.	04 Marks
Q.4	Submission	04 Marks

Key

A. Growth pattern of Bacteria

B. *Rhizobia* / Spawns for mushroom cultivation

C. Plant diseases - White Rust /Smut disease / Powdery mildew

D. *Bt* cotton

University of Mumbai

S. Y. B.Sc. Semester – IV (NEP 2020) Practical Examination

BOTANY-PRACTICAL- VSC - 1

External Practical Exam Skeleton Question Paper

Name of the Course: Phytochemical Techniques

Time: 2 Hours **Marks: 30**

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Q1	Determine _____ specimen **A**.	6M
Q2	Perform macroscopic and microscopic study of specimen **B**.	6M
	Determine _____ of material **C**.	6M
Q3	OR	
	Conduct _____ of material **C**.	
Q4	Perform test for materials **D** and **E**.	5M
Q5	Journal	3M
Q6	Industrial /Institute Visit Report	4M

Key

A	Palisade ratio / Stomatal index
B	Coriander fruit
C	Loss on drying / Fluorescence analysis
D	Carbohydrates / Proteins
E	Alkaloids (Coffee) / Tannins (Tea) Extract

University of Mumbai

S. Y. B.Sc. Semester – IV (NEP 2020) Practical Examination

BOTANY-PRACTICAL- VSC - 1

Internal Practical Exam Skeleton Question Paper

Name of the Course: Phytochemical Techniques

Time: 2 Hours **Marks: 20**

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Q1 Determine _____ of material **A**. 08 M

Q2 Perform _____ for material **B**. 07M

Q3 Submission of report / product - (Any One) 05 M

- Presentation of review paper on phytochemical analysis of medicinal plants
- Preparation of Gel / Churna / Ark etc. from medicinal plants)

Key:

A Total ash value / Water-soluble extractive value

B TLC for volatile oil / Test for glycosides and saponins

University of Mumbai

S. Y. B.Sc. Semester – IV (NEP 2020) Practical Examination

BOTANY-PRACTICAL- VSC - 2

External Exam Skeleton Question Paper

Name of the Course: Plant Tissue Culture

Time: 2 Hours **Marks: 30**

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Q1	Perform Sterilization of Explant **A.**	6M
	OR	
	Inoculate the given material **A.**	6M
Q2	Prepare _____ml of MS media from the given solutions **B.**	8M
Q3	Identify and describe the specimen/ photograph/ Instrument **C and D.**	6M
Q4	Plant Tissue Culture laboratory visit report.	5M
Q5	Journal	5M

Key

A	Any one suitable explant (Leaf / Node / Seed etc.)
B	Provide concentration of MS media for calculation and preparation
C	Any one sterilization technique
D	Any stage of Callus / regenerated plant

University of Mumbai

S. Y. B.Sc. Semester – IV (NEP 2020) Practical Examination

BOTANY-PRACTICAL- VSC - 2

Internal Exam Skeleton Question Paper

Name of the Course: Plant Tissue Culture

Time: 2 Hours **Marks: 20**

N.B.

1. **Candidates should show their slides/ preparations/ results for all questions to the examiner.**
2. **Use of logarithm tables / simple calculator is allowed.**

Q1	Design Plan **A**.	05M
Q2	Prepare _____ from material **B.**	05M
Q3	Identify and describe the slide/specimen/microphotograph **C**.	03M
Q4	Journal	02M
Q5	Submission of Hardened plants	05M

Key:

A	Plant Tissue Culture Laboratory
B	Synthetic seeds
C	Hardening / acclimatization of regenerated Plantlets

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.Dr Vasant Mali
BOS in Botany.

Sd/-
Sign of the Offg. Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science & Technology

Sd/-
Sign of the Offg. Dean
Prof. Shivram S. Garje
Faculty of Science & Technology