



Hindi Vidya Prachar Samiti's
Ramniranjan Jhunjhunwala College of Arts, Science & Commerce
(Empowered Autonomous College)

Affiliated to
UNIVERSITY OF MUMBAI
Syllabus for the T.Y.B.Sc. (under NEP 2020)

Program: B.Sc. BOTANY
Program Code: RJSUBOT
Course Code: RJDSEBOT351
Discipline Specific Elective I
Theory : PALAEOBOTANY
RJDSEBOTP351
Discipline Specific Elective I
Practical : PALAEOBOTANY
Semester V

(Revised syllabus in alignment with the NEP 2020 facilitating the inter and multidisciplinary learning and multiple entry and exit of the students)

Level 5.5
(CBCS)

Revised and to be implemented from 2025-2026

Preamble

The National Education Policy 2020 aims at imparting skill-based learning and caters to the multiple entry and exit facility for the students thus empowering them to acquire knowledge at their pace. In the three-year UG program, the student has two exit options. Students also have the option of choosing the Honors program of four years of study in each discipline and later converting it to a five-year integrated PG degree program. As an undergraduate student, he/she learns the core subject (Major), a subject complementing the core subject (Minor), a course from another discipline (OEC or GEC), Vocational and Skill Education course from the Major (VSEC). The remaining verticals under NEP 2020 are IKS (Indian Knowledge System), AEC (Ability Enhancement Course), VEC (Value Education Course) and with progressive three years of UG, student also completes at different levels OJT (On Job Training), FP (Field Projects), CEP (Community Engagement Programme), RP (Research Project) which helps him/her in understanding their roots, application of the knowledge for the benefit of self and the society. Vertical CC (Co-curricular activities and activities related to yoga and human well-being) helps in preparing youth with good character and interpersonal relationships.

.

**Credit Structure for B. Sc. Semester V Major Subject: Botany as per NEP 2020
Implemented from the academic year 2025-2026 Level 5.5**

Courses	Credits	Total Credits	Course Titles
Discipline Specific Course (DSC) Theory I Biomolecules and Cell Biology	4	12	RJDSCBOT351
Discipline Specific Course (DSC) Theory II Reproductive Biology of Angiosperms	4		RJDSCBOT352
DSC Practical I: (Biomolecules and Cell Biology)	2		RJDSCBOTP351
DSC Practical II: (Reproductive Biology of Angiosperms)	2		RJDSCBOTP352
Discipline Specific Elective (DSE) I Theory Palaeobotany	2	4	RJDSEBOT351
Discipline Specific Elective (DSE) I Practical Palaeobotany	2		RJDSEBOTP351
Discipline Specific Elective (DSE) II Theory Environmental Botany	2	4	RJDSEBOT352
Discipline Specific Elective (DSE) II Practical Environmental Botany	2		RJDSEBOTP352
Vocational Skill Course (VSC) Practical Systematic Botany	4	4	RJVSCBOTP351
Field Project (FP)/CEP	2	2	RJFPBOT351/ RJCEPBOT351
Total Credits	22	22	

***As per University Grid**

COURSE OUTCOMES (COs) B. Sc. BOTANY

SEMESTER	:	V MAJOR SUBJECT ELECTIVE DSE I
TITLE OF THE SUBJECT/COURSE	:	PALAEOBOTANY
COURSE CODE	:	RJDSEBOT351
CREDITS	:	2
DURATION	:	30 HOURS

LEARNING OBJECTIVES

1	Describe the major divisions of the geological time scale and their relevance to plant evolutionary history.
2	Explain the process of petrification and its significance in preserving plant fossils. Explain the processes of cellular preservation, including coal balls, and their importance in paleopalynology and geological studies of rocks and minerals.
3	Understand the structure, habitat, and evolutionary significance.
4	Understand the unique features and evolutionary role in Gymnosperm history.

COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	Students will explain the importance of Palaeobotany and identify key fossil plants and their evolutionary significance.	1	BT Level III, IV Apply, draw conclusions
CO2	Students will accurately describe the major periods of the geological time scale and their corresponding plant evolutionary events.	1, 5	BT level III, IV and V Apply, analyse and evaluate
CO3	Students will explain cellular preservation processes, identify coal balls, and understand the significance of rocks, minerals, and paleopalynology in	1,5	BT level III, IV and V Apply, analyse and

	plant fossil studies.		evaluate
CO4	Students will accurately describe the morphology and ecological roles and explain the structural features and evolutionary importance in the fossil record.	1,5	BT level III, IV and V Apply, analyse and evaluate
CO5	Students will explain the structural characteristics and evolutionary importance in the Gymnosperm lineage.	1,5	BT level III, IV and V Apply, analyse and evaluate

Course Code	Title	Credits 2
RJDSEBOT351	PALAEOBOTANY	30 hours
Unit I: Introduction to Palaeobotany - Geological Time Scale		
Unit II: Process of Fossilisation A) Fossilisation Process 1. Petrification 2. Cast or Incrustation 3. Impression and Compression 4. Cellular preservation, Coal ball, rocks, minerals B) Paleopalynology		
Unit III: Fossil Pteridophytes 1. Psilophytopsida: <i>Rhynia</i> 2. <i>Lepidodendron</i>, <i>Lepidostrobus</i> 3. <i>Calamites</i>		
Unit IV: Fossil Gymnosperms 1. Pteridospermopsida: <i>Lyginopteris</i> 2. Mesozoic Cycadofilicales: <i>Glossopteris</i> 3. Pentoxylales: <i>Pentoxylon</i>		

Suggested References

1. Taylor, E. L., Taylor, T. N., & Krings, M. (2009). Palaeobotany: The Biology and Evolution of fossil plants. Academic Press.
2. Taylor, T. N., & Taylor, E. L. (1993). The Biology and Evolution of fossil plants.
3. Stewart, W. N., & Rothwell, G. W. (1993). Palaeobotany and the Evolution of plants. Cambridge University Press.
4. Conservation biology: Foundations, Concepts, Applications. Springer Science & Business Media (2008).

COURSE OUTCOMES (COs) B. Sc. BOTANY

SEMESTER	:	V MAJOR SUBJECT DSE I PRACTICAL
TITLE OF THE SUBJECT/COURSE	:	PALAEOBOTANY
COURSE CODE	:	RJDSEBOTP351
CREDITS	:	2
DURATION	:	30 HOURS/ 60 HOURS

LEARNING OBJECTIVES

1	To learn about the different process of fossilisation
2	To learn and identify fossilised plants from different Taxonomic groups by studying the casts, impressions, slides.

COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	Identify various fossilized plant parts and assign them to their respective genus.	1	BT Level III, IV Apply, draw conclusions

B Sc. BOTANY SEMESTER V Syllabus

Discipline Specific Elective I

Course Code	Practical Title	Credits
RJDSEBOTP351	PALAEOBOTANY	2
Study of fossils using fossilized material/impression/slides		
1. <i>Rhynia</i>		
2. <i>Lepidodendron</i>		
3. <i>Lepidostrobus</i>		
4. <i>Calamites</i>		
5. <i>Zygopteris</i>		
6. <i>Botryopteris</i>		
7. <i>Lyginopteris</i>		
8. <i>Glossopteris</i>		
9. <i>Pentoxylon</i>		
10. <i>Cordaite</i>		

Scheme of Examinations

1. Internal examination 20 marks by MCQ/ Assignment / Project / Survey / Presentation / Seminar.
2. One External (Semester End Examination) of 30 marks. Duration: 1 hour.
3. One combined Practical Examination at the end of Semester consisting of 50 marks with minimum 20 marks for passing.
4. Minimum marks for passing Semester End Theory and Practical Exam are 40%.
5. Students must appear for the Semester End Examination to be able to complete total credits for a given Semester.
6. For any KT examinations, there shall be Examination on Demand and students must register for the same.
7. A candidate will be allowed to appear for the practical examinations if he/she submits a certified Journal of T.Y.B.Sc. DSE Botany or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of T.Y. B.Sc. DSE Botany as per the minimum requirements.
8. In case of loss of journal, a candidate must produce a certificate from the Head of the Department /Institute that the practical for the academic year were completed by the student. However, such a candidate will be allowed to appear for the practical examination, but the marks allotted for the journal (if any) will not be granted.
9. HOD's decision, in consultation with the Principal, shall remain final and abiding to all.

Evaluation and Assessment

(Based on the centralised guidelines given by EC under NEP 2020)

Evaluation (Theory): Total marks per course - 50.

Internals- 20 marks

External- Semester End Examination – 30 marks

Question paper covering all units and topics.

Practical Examination - 50 marks

Continuous evaluation for practicals - 20 marks

Semester end examination - 30 marks

Question	Knowledge	Understanding	Application And Analysis	Total Marks- Per Unit
Unit 1 & 2	05	03	02	10
Unit 3 & 4	05	03	02	10
Short notes from topics covering all the units	05	03	02	10
-TOTAL- Per objective	15	09	06	30
% WEIGHTAGE	50	30	20	100%

Mapping of the course to Local/ Regional/National/International relevance

The diversity existing in the Plant kingdom is unparalleled ranging from single cell to the tallest tree living on this planet. Plants represent the unique organism which fulfils the energy needs of all other organisms. With their unique metabolic capacity they can carry out biosynthesis of complex biomolecules at ambient temperature and pressure without polluting the surroundings, in fact help in obviating climate change. All courses contribute towards SDG 4 i.e. Quality Education.

Class	Course Name	Course Code	Local relevance	Regional relevance	National relevance	International relevance
T.Y.B.Sc. Botany Major DSE I	Palaeobotany Theory	RJDSEBOT351	✓	✓	✓	✓
T.Y.B.Sc. Botany Major DSE I	Palaeobotany Practical	RJDSEBOTP351	✓	✓	✓	✓

Mapping of the course to Employability/ Entrepreneurship/Skill development

The courses in Botany have been designed to impart one or more skills to make students employable.

Class	Course Name	Course Code	Topic focusing on Employability/ Entrepreneurship/ Skill development	Employability/ Entrepreneurship/ Skill development	Specific activity
T.Y.B.Sc. Botany Major DSE I	Theory	RJDSEBOT351	All topics	Teaching, research, Palaeobotanist	
T.Y.B.Sc. Botany Major DSE I	Practical	RJDSEBOTP351	All Practicals	Teaching, research, Palaeobotanist	

Integration of Cross cutting Issues

Class	Course Code	Cross Cutting Issues
T.Y.B.Sc. Botany Major DSE I	RJDSEBOT351 RJDSEBOTP351 Palaeobotany	Ethics, Environment UNSDG 4, 13 NEP 2020 Interdisciplinary