Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Structure and Curriculum of Four Year Multidisciplinary Degree (Honors/Research) Programme with Multiple Entry and Exit option

Undergraduate Programme of Science & Technology

B.Sc. (Honors/Research) in Botany

Board of Studies

in

Botany

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

(UG I Year)

w.e.f. June, 2023

(In Accordance with NEP-2020)

Review Statement

The NEP Cell reviewed the Curriculum of **B.Sc. (Honors/Research /Degree) in Botany** Programme to be effective from the **Academic Year 2023-24.** It was found that, the structure is as per the NEP-2020guidelines of Govt. of Maharashtra.

Date: 09/08/2023

Place: Latur

NEP Cell
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the Curriculum of **B.Sc. (Honors/Research) in Botany** Programme to be effective from the **Academic Year 2023-24.**

Date: 07/07/2023

Place: Latur

(S. N. Shinde)
Chairperson
Board of Studies in Botany
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Members of Board of Studies in the Subject Botany

Under the Faculty of Science and Technology

Sr. No.	Name	Designation	In position
1	**Shri S. N. Shinde**, Head, Department of Botany, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Chairperson	HoD
2	**Dr. B. S. Survase,** Director, School of Life Sciences, S. R. T. M. U. Nanded	Member	V.C. Nominee
3	**Prof. Dr. A. S. Dhabe**, Head, Department of Botany, Dr. Babasaheb Ambedkar M. University, Aurangabad	Member	Expert from outside for Special Course
4	**Prof. Dr. A. B. Ade**, Head, Department of Botany, Savitribai Phule Pune University, Pune	Member	Academic Council Nominee
5	**Dr. V. S. Maske**, Head, Department of Botany, Bahirji Smarak Mahavidyalaya, Vasmat, Dist. Hingoli	Member	Academic Council Nominee
6	**Shri Laxman Done**, Done's Mushrooms, Kumbhari, Dist. Latur	Member	Expert from Industry
7	**Prof. Dr. N. B. Gaikwad,** Department of Botany, Shivaji University, Kolhapur	Member	P.G. Alumni
8	**Dr. S.H. Nile,** Senior Scientist, Zhejiang Chinese Medical University, HanzhouZhejans	Member	Expert from outside for Special Course
9	**Dr. K. D. Savant,** Department of Botany, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Member from same Department
10	**Shri D. R. Awad**, Department of Botany, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Member from same Department
11	**Ms. D.S. Chavan**, Department of Botany, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Member from same Department
12	**Ms. P. V. Kumbhar**, Department of Botany, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Member from same Department
13	**Ms. R.K. Mekle**, Department of Botany, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Member from same Department
14	**Ms. R.L. Shaikh,** Department of Botany,	Member	Member from same Department

Sr. No.	Name	Designation	In position
	Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)		
15	**Ms. P. S. Maskepatil**, Department of Botany, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Member from same Department
16	**Dr. D. V. Vedpathak**, Department of Microbiology, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Member from same Faculty
17	**Dr. D.G. Palke**, Head, Department of Chemistry, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Member from same Faculty

From the Desk of the Chairperson…

The Department of Botany is established in 1971. It is one of the leading departments in the field of teaching and student centric activities. After Autonomy, in keeping pace with the advances in various aspects of plant sciences, the department has introduced the courses like Molecular Biology, Cell Biology, Plant Biotechnology, Bioinformatics, Genetics, Instrumentation in Botany, Pharmacognosy, Gardening and Landscaping, Plant Breeding, Biostatistics, Forensic Botany etc. The Department has academic autonomy and has been revising its curriculum regularly. The department has successfully implemented the Choice Based Credit System (CBCS) for grading the students. The Curriculum of the B.Sc. and M.Sc. has been designed by considering NET, SET, GATE and others competitive examinations.

Institution's Motto, *Aroha Tamaso Jyoti* (The Journey from Dark to Light), the Mission, *Pursuit of Excellence*, the Vision, to evolve as a World Class Dynamic Center of Higher Education, and the Core Values have been frequently reflected in the present curriculum.

The Higher Education System in India and all over the world has undergone paradigm shift in both qualitative and quantitative aspects. Its best example is National Education Policy (NEP-2020). The National Education Policy 2020 emphasizes on developing overall personality of students by incorporating Humanitarian and Constitutional values, creativity and critical thinking, harnessing innovation, use of modern technology and interaction with various stakeholders. It recognizes that the pedagogy should evolve to make education more experiential, holistic, integrated, learner-centric, flexible and developing skill, etc. to shape the student that can face the challenges of the future, the new policy also envisages the refinement and improvement in the Learning Outcome based Curriculum Framework.

Botany is one of the most fundamental branches of Life Sciences. It is the broad subject encompassing classical and modern systemic aspects of plant diversity as well as contemporary subjects like Molecular Biology, Bioinformatics, Biotechnology, etc. to foster comprehensive understanding about various aspects of plant sciences. The present learning outcome based curriculum framework for B. Sc. (Honors/Research) in Botany is designed to provide a focused leering outcome based syllabus at the Honors level providing structured teaching-learning experiences catering to needs of the students. The honors course in Botany will prepare the students both academically and in terms of employability. This program also inculcates various attributes like Problem solving, Research skills, Critical thinking etc. These attributes encompass values related to emotional stability, social justice, creative and critical thinking, well-being and various skills required for employability, thus preparing students for continuous learning and sustainability.

The course is upgraded keeping in mind the aspirations of the students, changing nature of the subject as well as the learning environment. Courses of Botany have been designed to incorporate recent advancements, techniques to upgrade the skills of students. The new structure is expected to enhance the level of understanding among students and maintain the standard of Honors Degree in Botany across the country. The efforts have been made to integrate use of recent technology and use of MOOCs to assist teaching-learning process. This framework offers flexibility and innovation in syllabi designing and in methods adopted for teaching-learning process and learning assessment.

The new curriculum offers knowledge of wide areas in Botany including Diversity, Plant Systematics, Plant Biotechnology, Cell Biology, Genetics, Environmental Biology, Plant Physiology, Bioinformatics, and Medicinal Plants. Plant disease management etc. This new syllabus has been

prepared keeping in view the unique requirement of B.Sc. (Honors) Botany students. The contents of the syllabi have been drawn to accommodate the widening horizons of the Botany discipline and reflect the changing needs of the students. The semester wise course distribution and detailed syllabus for each course is appended with a list of suggested references.

The present structure comprises Discipline specific courses (DSC), Discipline Specific Electives (DSE), Discipline Specific Minor Course (DSM), Generic/Open Electives (GE/OE), Vocational Specific Course (VSC), Skill Enhancement Course (SEC), Ability Enhancement Course (AEC) etc. The discipline specific courses (DSC) are compulsory and the elective courses can be chosen from the given Basket. Except Ability Enhancement courses, all other courses, comprise theory and practicals.

The project work is specially emphasized in this structure. The project will mainly involve experimental work. The students will be asked their choice for project. The Generic Electives will be offered to the students of other departments of the college. The students will have the option to choose one generic elective from the given Basket. The generic elective comprises theory as well as practical. The students will also undertake one Vocational Specific Course (VSC) and one Skill Enhancement Course (SEC) of two credits each. The VSC and SEC also comprise theory and practicals. These courses will be chosen by the students from the concerned basket.

One generic elective is specified for Indian Knowledge Systems (IKS). Indian Knowledge Systems have a strong foundation in Indian Culture, Philosophy and Spirituality and have evolved through thousands of years. These knowledge systems include Ayurveda, Yoga etc. that are still applicable in the modern world in several ways.

These courses offer skills to pursue research and teaching in the field of Botany and thus would produce best minds to meet the demands of society. This curriculum framework for B.Sc. (Honors) in Botany is developed keeping in view of the students centric learning Pedagogy, which is entirely outcome oriented. The curriculum framework focuses on the pragmatist approach whereby practical application of theoretical concepts is covered through Laboratory and Field works.

The major objective of this curriculum is to elevate the subject knowledge of the students, making them critical thinkers and able to solve problems and issues related to Botany logically and efficiently.

(S. N. Shinde)
Chairperson
Board of Studies in Botany
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Index

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science & Technology

Structure for Four Year Multidisciplinary Undergraduate Degree Programme in Botany
Multiple Entry and Exit (In accordance with NEP-2020)

Year & Level	Sem	Major		Minor	GE/OE	VSC/ SEC (VSEC)	AEC/ VEC	OJT, FP, CEP, RP	Credit per Sem.	Cum./Cr. per exit
		DSC	DSE							
1	**2**	**3**		**4**	**5**	**6**	**7**	**8**	**9**	**10**
I 4.5	I	DSC I: 04 Cr. DSC II: 04 Cr.	NA	NA	GE-I: 04 Cr.	VSC-I: 02 Cr. SEC-I: 02 Cr.	AEC-I MIL: 02 Cr. VEC-I: 02 Cr.	CC-I: 02 Cr. (NSS, NCC, Sports, Cultural)/ CEP-I: 02 Cr. (SES-I)/ OJT: 02 Cr. / Mini Project: 02 Cr.	22	44 Cr. UG Certificate
	II	DSCIII: 04 Cr. DSC IV: 04 Cr. (IKS)	NA	NA	GE-II: 04 Cr.	VSC-II: 02 Cr. SEC-II: 02 Cr.	AEC-II MIL: 02 Cr. VEC-II: 02 Cr.	CC-II: 02 Cr. (NSS, NCC, Sports, Cultural)/ CEP-II: 02 Cr. (SES-II)/ OJT: 02 Cr. / Mini Project: 02 Cr.	22	
	Cum. Cr.	16	-	-	08	04+04= 08	04+02 +02=0 8	04	44	

Exit Option: Award of UG Certificate in Major with 44 Credits and Additional 04 Credits Core NSQF Course/Internship or continue with Major and Minor

Abbreviations:

1.	DSC	: Discipline Specific Core (Major)
2.	DSE	: Discipline Specific Elective (Major)
3.	DSM	: Discipline Specific Minor
4.	OE	: Open Elective
5.	VSEC	: Vocational Skill and Skill Enhancement Course
6.	VSC	: Vocational Skill Courses
7.	SEC	: Skill Enhancement Course
8.	AEC	: Ability Enhancement Course
9.	MIL	: Modern Indian Languages
10.	IKS	: Indian Knowledge System
11.	VEC	: Value Education Courses
12.	OJT	: On Job Training
13.	FP	: Field Projects
14.	CEP	: Fostering Social Responsibility & Community Engagement (FSRCE)
15.	CC	: Co-Curricular Courses
16.	RP	: Research Project/Dissertation
17.	SES	: Shahu Extension Services

Programme Outcomes (POs) for B.Sc. Programme	
PO 1	**Disciplinary Knowledge:** Comprehensive knowledge of science subjects which constitute the graduate programme and execution of scientific knowledge in the specific area.
PO 2	**Scientific Outlook:** The qualities of a science graduate such as observation, precision, analytical mind, logical thinking, clarity of thought and expression and systematic approach.
PO 3	**Self-Directed Life-long Learning:** Ability to appear for various competitive examinations or choose the post graduate programme or other related programme of their choice.
PO 4	**Research Skills:** Functional knowledge and applications of instrumentation and laboratory techniques to do independent experiments, interpret the results and develop research ethos.
PO 5	**Problem Solving Skills:** Analytical and logical skills and critical thinking to extract information from qualitative and quantitative data, formulate and solve problems in a systematicand rational manner.
PO 6	**Professional Competence and Ethics:** Aptitude and skills to perform the jobs in diverse fields such as science, engineering, industries, survey , education, banking, development and planning,business, public service, self-business etc. with human rationale and moralvalues.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Botany

Programme Specific Outcomes (PSOs) for B.Sc. Botany (Honors/Research)	
PSO No.	Upon completion of this programme the students will be able to
PSO 1	**Knowledge and Understanding of:** 1. The range of plant diversity in terms of structure, function and environmental Relationships. 2. The evaluation of plant diversity. 3. Plant classification and the flora of Maharashtra. 4. The role of plants in the functioning of the global ecosystem. 5. Statistics as applied to biological data.
PSO 2	**Intellectual Skills:** 1. Think logically and organize tasks into a structured form. 2. Assimilate knowledge and ideas through wide reading and the e-resources. 3. Transfer appropriate knowledge and methods within the subject. 4. Construct and test hypothesis. 5. Plan, conduct and write a report on an independent project.
PSO 3	**Practical Skills:** Students learn following skills through field and laboratory work- 1. Interpreting plant morphology and anatomy. 2. Identification of plants. 3. Vegetation analysis techniques. 4. A range of physiochemical analysis of plant materials. 5. Analyze data using appropriate statistical methods and computer programs. 6. Plant pathology to be added for sharing of fieldwork and lab analysis.
PSO 4	**Transferable Skills:** 1. Use of IT (word-processing, use of internet, statistical packages and databases). 2. Communication of scientific ideas in writing and orally. 3. Ability to work as part of a team, function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. 4. Ability to use library resources. 5. Time management. 6. Career planning.
PSO 5	**Scientific Knowledge:** Apply the knowledge of life sciences and fundamental processes of plants.
PSO 6	**Problem Analysis:** Identify the taxonomic position of plants and analyze non reported plants with substantiated conclusions
PSO 7	**Design/Development of Solutions:** Design solutions from medicinal plants for health problems, disorders and diseases of human beings and estimate the phytochemical content which meet the specified need to public health.

PSO 8	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information to provide valid conclusions.
PSO 9	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, cellular and physiological activities of plants with an understanding of the applications and limitations.
PSO 10	**The Botanist and Society:** Apply reasoning informed by the contextual knowledge to assess plant diversity, its importance for society, health, safety, ethical principles, legal and environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice and need of sustainability.
PSO 11	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science & Technology
B.Sc. (Honors/Research) Botany

Year & Level	Semester	Course Code	Course Title	Credits	No. of Hrs.
I 4.5	I	101BOT1101 (DSC-I)	Biodiversity of Cryptogams and Gymnosperms	03	45
		101BOT1103	Lab Course – I	01	30
		101BOT1102 (DSC-II)	Cell Biology and Molecular Biology	03	45
		101BOT1104	Lab Course – II	01	30
		GE-I	From Basket	04	60
		101BOT1501 (VSC-I)	Nursery and Lawn Management	02	45
		(SEC-I)	From Basket	02	30
		(AEC-I)	From Basket	02	30
		(VEC-I)	Constitution of India	02	30
		AIPC/OJT-I	Mini Project - I	02	60
	Total Credits			**22**	
	II	101BOT2101 (DSC-III)	Fundamentals of Genetics	03	45
		101BOT2103	Lab Course – III	01	30
		101BOT2102 (DSC-IV)	Histology, Anatomy and Embryology of Angiosperms	03	45
		101BOT2104	Lab Course – IV	01	30
		GE-II	From Basket	04	60
		101BOT2501 (VSC-II)	Organic Farming	02	45
		(SEC-II)	From Basket	02	30
		(AEC-II)	From Basket	02	30
		(VEC-II)	FSRCE (CBPR)	02	30
		AIPC/OJT-II	Mini Project – II (IKS)	02	60
	Total Credits			**22**	
Total Credits (Semester I & II)				**44**	

Curriculum

Major and VSC Courses

Semester - I

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: I

Course Type: DSC-I

Course Title: Biodiversity of Cryptogams and Gymnosperms

Course Code: 101BOT1101

Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To understand the Origin, evolution, and genetic diversity of microbial life.
LO 2. To analyse the linkage between microbial diversity.
LO 3. To become familiar with Cryptogamic botany.
LO 4. To evaluate different types of spore in Pteridophytes.
LO 5. To aware about the importance of Cryptogams and Gymnosperms.

Course Outcomes:

After completion of course, the student will be able to-

CO 1. Identify microorganisms and their role in various environments.
CO 2. Distinguish between reproductive stages of cryptogams.
CO 3. Examine the morphology and life cycles of certain genera of Cryptogams and Gymnosperms.
CO 4. Analyze the economic importance of Cryptogams and Gymnosperms.
CO 5. Correlate significance of bacteria, algae and fungi with human welfare.

Unit No.	Title of Unit & Contents	Hrs.
I	**Bacteria and Viruses**	**12**
	A) Bacteria: 1. General characters. 2. Size, Shape and Ultra structure. 3. Mode of Nutrition 4. Reproduction: i. Asexual ii. Genetic Recombination: a. Conjugation b. Transformation c. Transduction 5. Economic importance. **B) Viruses:** 1. General characters. 2. Classification 3. Viroids and Prions 4. Transmission of plant viruses 5. Ultra-structure of TMV. 6. Economic importance.	
	Unit Outcomes: UO 1. Classify microorganisms on the basis of host. UO 2. Identify microorganisms and their role in various environments. UO 3. Correlate significance of bacteria, algae and fungi with human	

Unit No.	Title of Unit & Contents	Hrs.
	welfare.	
II	**Fungi**	**10**
	1. General characters 2. Classification (Alexopolous and Mims, 1979). 3. Asexual reproduction 4. Study of life cycle of *Agaricus*(Developmental stages not expected) 5. Study of life cycle of *Erysiphe* (Developmental stages not expected) 6. Economic importance. 7. Mycorrhiza: i General characters ii Types iii Economic importance 8. Lichens: i General characters ii Types iii Economic importance.	
	Unit Outcome: UO 1. Correlate the economic importance of Fungi, Mycorrhiza and Lichens.	
III	**Algae and Bryophytes**	**10**
	A) Algae: 1. General characters. 2. Classification (F.E. Fritsch, 1935). 3. Pigmentation and Store food material 4. Thallus organization 5. Study of life cycle (Developmental stages not expected): i) *Nostoc* ii) *Chara* 6. Economic importance **B) Bryophytes:** 1. General characters 2. Classification (N.S. Parihar) 3. Asexual Reproduction 4. Study of life cycle (Developmental stages not expected): i) *Riccia* ii) *Funaria* 5. Economic importance	
	Unit Outcomes: UO 1. Correlate the economic importance of Algae, Bryophytes, Pteridophytes and Gymnosperm UO 2. Acquire practical skills to identify, classify and distinguish microbes and nonvascular cryptogams.	
IV	**Pteridophytes and Gymnosperms**	**13**
	A) Pteridophytes: 1. General characters. 2. Classification (N.S. Parihar) 3. Stellar Evolution 4. Study of life cycle (Developmental stages not expected): i *Lycopodium* ii *Nephrolepis*(Fern) 5. Economic importance **B) Gymnosperms:**	

Unit No.	Title of Unit & Contents	Hrs.
	1. General characters 2. Classification (Arnold, 1948) 3. Morphology of vegetative and reproductive structures and life cycle of (Developmental stages are not expected) i *Cycas* ii *Pinus* 4. Economic importance.	
	Unit Outcomes: UO 1. Examine the morphology and life-cycles of certain genera of algae, fungi and bryophytes, Pteridophytes and Gymnosperms. UO 2. Analyze the economic importance of Algae, Bryophytes, Pteridophytes and Gymnosperms.	

Learning Resources:

1. An introduction to Paleobotany- Arnold, C.A - McGraw Hill Book Company Inc. 1972
2. An Introduction to Pteridophyta- Parihar, N.S. - Central Book Depot, 1962
3. An introduction to Pteridophytes. - Rashid, A. (1978) Vikas Publishing House (P) Ltd., 1999
4. Biology and Morphology of Pteridophytes- Parihar N.S. Central Book Depot, Allahabad.1996
5. Botany for Degree Students – Pteridophytes- Vashishta, B.R. S. Chand Publishing, 2006
6. Comparative morphology of vascular plants- Eames, A. J. and E. M. Giffard- Madroño; a West American Journal of Botany (1960)
7. Gymnosperms- Vashishta P.C., A.R. Sinha, Anil Kumar, S.Chand-Publishing House-2006
8. Indian Fossil Pteridophytes- Surange, K.R. - Alexander Doweld, 1966
9. Morphology of Gymnosperms- J.M. & Chamberlain C.J. Central Book Depot, Allahabad. 1978
10. Morphology of Pteridophytes-Sporne, K.R. , Hutchinson University Library, 1962
11. Morphology of Vascular plants- Bierhorst, D.W. MacMillan Co.; First Edition (January 1, 1971)
12. Principles of Paleobotany- Darroh, W.C. -Chronica Botanica Company, 1939
13. Pteridophytes and Gymnosperms-K.U.Kramer, P.S.Green, Springer Verlag, New York 2003
14. Pteridophytes- Vashishta P.C, S. Chand- Publishing House-2006
15. The Gymnosperms (Fossils& Living)- Kakkar, R.K.andKakkar, B.R. Central Publishing House, Allahabad. 1995
16. The Gymnosperms- Biswas, C &Johri, B.N., NarosaPublishing House, New Delhi.Coulter. 2004
17. The Phylogeny and Classification of ferns Jermy- A. G. - Academic Press Inc (1 December 1973)
18. https://cbaj.in/index.php/index
19. https://www.mygreatlearning.com/blog/what-is artificialintelligence/#WhatisArtificialIntelligence
20. https://i0.wp.com/innspub.net/wp-content/uploads/2022/05/JBES-2021-V19.webp?resize=224%2C300&ssl=1

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: I

Course Type: Lab Course
Course Title: Lab Course –I (Based on DSC-I)
Course Code: 101BOT1103
Credits: 01 Max. Marks: 50 Hours: 30

Leaning Objectives

LO 1. To classify the different microbes.

LO 2. To compare the different types of plant groups.

LO 3. To understand that the role of bryophytes and lichens in pollution indicators.

LO 4. To describe the medicinal role of Fungi, lichens, Algae, etc.

LO 5. To illustrate internal structure of thallus/stem of cryptogams and Gymnosperms.

Course outcomes:

After completion of course, the student will be able to-

CO 1. Classify the different microbes.

CO 2. Categorize the different types of algae, bryophytes, Pteridophytes, Gymnosperms etc.

CO 3. Explain the diversity of Microbes, Cryptogams and Gymnosperms.

CO 4. Analyse the distinguishing characters of Microbes, Cryptogams and Gymnosperms

Sr. No.	Practicals
1	Study compound Microscope
2	Study forms of Bacteria.
3	Study external features and classification of *Agaricus*.
4	Study external features and classification of *Erysiphe*.
5	Study types of Lichens (Crustose, Foliose and Fructicose).
6	Study external features and classification of *Nostoc.*
7	Study external features and classification of *Chara.*
8	Study external, internal features and classification of *Riccia.*
9	Study external, internal features and classification of *Funaria.*
10	Study external, internal features and classification of *Lycopodium.*
11	Study external, internal features and classification of *Nephrolepis.*
12	Study external, internal, reproductive features and classification of *Cycas.*
13	Study external, internal, reproductive features and classification of *Pinus.*

14	Botanical excursions (one short, one long excursion and visit to Research laboratory, Field etc is compulsory)

N.B.: Any Ten Practicals from above.

Learning Resources:

1. A text book of Practical Botany-I, Bendre and Kumar, Rastogi Publication, 2019
2. A text book of Practical Botany-I, S. N. Pandey and B. P. Pandey, S.Chand Publication
3. A text book of Practical Botany-II, Bendre and Kumar, Rastogi Publication, 2019
4. A text book of Practical Botany-II, S. N. Pandey and B. P. Pandey, S.Chand Publication

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: I

Course Type: DSC-II

Course Title: Cell and Molecular Biology

Course Code: 101BOT1102

Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives

LO 1. To understand cell and cell organelles.

LO 2. To describe biomolecules.

LO 3. To identify the different stages of cell division.

LO 4. To describe the process of different Biomolecules.

Course outcomes

After completion of course, the student will be able to-

CO 1. Identify organism using karyotype and ideograms.

CO 2. Identify and differentiates various cell organelles.

CO 3. Differentiate different stages of mitotic and meiosis.

CO 4. Explain the process of cell division in both somatic and germ cells.

CO 5. Examine Morphology, chemical composition, structure and function of typical Chromosome.

CO 6. Correlate the structural aspect of DNA and RNA.

Unit No.	Title of Unit & Contents	Hrs.
I	**Cell Biology**	**13**
	1. Ultra-structure of Prokaryotic cell 2. Ultra-structure of Eukaryotic cell. 3. Structure and functions of Cell wall 4. Structure and functions of Plasma membrane 5. Structure and functions of cell organelles: i Nucleus ii Golgi apparatus iii Endoplasmic reticulum iv Ribosome v Lysosome vi Mitochondria	

Unit No.	Title of Unit & Contents	Hrs.
	vii Chloroplast 6. Structure of Flagella.	
	Unit Outcome: UO 1. Identify and differentiate various cell organelles. UO 2. Evaluate the functions of different cell organelles.	
II	**Chromosome**	**10**
	1. Organization of Chromosome (Nucleosome Solenoid Model). 2. Morphology, chemical composition, structure and function of typical chromosome 3. Types of chromosome. 4. Giant chromosomes: i. Polytene ii. Lambrush 5. Chromosomal Aberrations i. Structural ii. Numerical	
	Unit Outcome: UO 1. Examine Morphology, chemical composition, structure and function of typical chromosome. UO 2. Describe the Chromosomal abrerrations	
III	**Cell Division**	**10**
	1. Cell Cycle: Inter phase G1 - S - G2 –M phase and G0 phase 2. Mitosis: Phages and significance 3. Meiosis: Phages and significance 4. Difference between Mitosis and Meiosis 5.Cell senescence and Cell death (Apoptosis): i. Programmed cell death, ii. Mechanism of cell death iii. Significance.	
	Unit Outcomes: UO 1. Distinguish between mitotic and meiosis. UO 2. Explain the process of cell division in both somatic and germ cells.	
IV	**Molecular Biology**	**12**
	1. Structure of DNA (Watson and Crick's model) 2. Types of DNA	

Unit No.	Title of Unit & Contents	Hrs.
	3. Replication of DNA (Semi-conservative) 4. Structure, function and types of RNA. (r –RNA, t-RNA, m-RNA) 5. Genetic code: Properties and importance 6. Protein synthesis	
	Unit Outcome: UO 1. Correlate the structural aspect of DNA and RNA. UO 2.	

Learning Resources:

1. Biochemistry and Molecular Biology of Plants- Buchanan, Grissem and Jones, American Soc. Plant Biologists, Waldorf 2000
2. Cell and Molecular Biology (VIII)- De Robertis and De Robertis –B.I. Waverly Pvt. Ltd., New Delhi 1997
3. Cell and Molecular Biology- De Robertis and De Robertis, , 8 edition, Info-Med, Hongkong. 1988
4. Cell and Molecular Biology- E.J. Dupraw –Academic Press, London 1970
5. Cell and Molecular Biology: Concepts & Experiments- Karp, G. John Wiley and Sons, Inc., USA. 1999.
6. Cell Biology- C. B. Powar –: Himalaya Publishing House 1992.
7. Cell Biology- Johnson Lewys, Sarup and sons, New Delhi 2004
8. Cytogenetics - C. P. Swanson, T. Merz, and W.J. Young –; Prentice – Hall of India Pvt. Ltd., New Delhi India 1982
9. Molecular biology of the cell (4th Ed.) - Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter P., New York: Garland Science 2002
10. Molecular Cell Biology- Lodish S, Baltimore B, Berk, C and Lawrence K, ,3rd editions, Scientific American Books, N.Y. 1995
11. The Cell: Molecular Approach- Lewin, B. GENE VII. Oxford University Press, New York, USA Cooper G M and Hausman R E, 4thEdn, Sinauer Associates, USA. 2007
12. https://onlinelibrary.wiley.com/journal/15824934
13. https://juniperpublishers.com/ijcsmb/images/fraction-slider/IJCSMB_.jpg
14. https://www.sciencedirect.com/journal/journal-of-molecular-biology
15. https://www.springer.com/journal/18/
16. https://www.mdpi.com/journal/cimb
17. https://www.peerreviewcentral.com/ads/image/AJBGMB.png

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: I

Course Type: Lab Course

Course Title: Lab Course –II (Based on DSC-II)

Course Code: 101BOT1104

Credits: 01 **Max. Marks: 50** **Hours: 30**

Learning Objectives:

LO 1. To differentiate the cell and cell organelles.

LO 2. To determine the mega-biomolecules.

LO 3. To identify the different stages of cell division.

LO 4. To summaries the different types of Chromosome.

Course outcomes:

After completion of course, the student will be able to-

CO 1. Identify the different Cell organelles.

CO 2. Identify the different stages of cell division etc.

CO 3. Prepare the ideogram on the basis of Karyotype.

CO 4. Correlate the prokaryotic and eukaryotic cell.

Sr. No.	Practical
1	Study of Prokaryotic cell
2	Study of Eukaryotic cell
3	Study of cell organelles with the help of photocopies / slides
4	Study of structure and function of typical chromosome
5	Study of Giant chromosomes: i. Polytene ii. Lambrush
6-7	Study of mitosis (Onion/Garlic Root tips).
8	Study of Mitotic index (Onion/Garlic Root tips).
9-10	Study of Meiosis from onion floral buds or any other available material.
11-12	Study of karyotype and ideogram from photocopies of Onion / Aloe plant
13	Estimation of plant DNA
14	Botanical excursions (one short, one long excursion and visit to Research laboratory, Field etc. is compulsory)

N.B.: Any Ten Practicals from above.

Learning Resources:

1. A text book of Practical Botany-I, Bendre and Kumar, Rastogi Publication, 2019
2. A text book of Practical Botany-I, S. N. Pandey and B. P. Pandey, S.Chand Publication
3. A text book of Practical Botany-II, Bendre and Kumar, Rastogi Publication, 2019
4. A text book of Practical Botany-II, S. N. Pandey and B. P. Pandey, S.Chand Publication
5. Cell and Molecular biology: A lab Manual, K.V.Chaitanya,
6. Cell biology and Cytogenetics lab and physiological Hematologycal Lab –I, Sudha Garg, A Pragati prakashan 2023
7. Practical manual on cytology and Cytogenetics, Dr. B.Ramesh

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: I

Course Type: VSC-I

Course Title: Nursery, Lawn Management and Entrepreneurship Development

Course Code: 101BOT1501

Credits: 02 Max. Marks: 50 Lectures: 45 Hrs.

Learning Objectives:

LO 1. To demonstrate the techniques of Nursery.

LO 2. To understand the techniques of Lawn management.

LO 3. To discuss the methods of Poly House.

LO 4. To describe the methods of protection of Ornamental plants.

Course Outcomes:

After completion of course, the student will be able to-

CO 1. Describe the techniques of Nursery.

CO 2. Explain the techniques of Lawn management.

CO 3. Create the techniques of floral decoration and poly house.

CO 4. Compare the methods of Lawn development and farmhouse management.

Unit No.	Title of Unit & Contents	Hrs.
I	**Nursery Management**	**04**
	1. Nursery Management. 2. Production Nursery Management. 3. Plant protection in Ornamental crops. 4. Nutrient deficiency in plants	
	Unit Outcome: UO 1. Explain the protection of Ornamental plant. UO 2. Develops the skills of Nursery Management.	
II	**Lawn Development and Farmhouse Management**	**04**
	1. Lawn development 2. Making of lawn 3. Making of artificial lawn 4. Farm house management	
	Unit Outcomes: UO 1. Describe the techniques of Lawn management. UO 2. Explain the Lawn development and farmhouse management.	
III	**Grafting Technique**	**04**
	1. Grafting Types 2. Grafting Methods 3. Technique of sampling from mother plant	
	Unit Outcome: UO 1. Understand the techniques and methods of Grafting. UO 2. Discuss the	

IV	**Entrepreneurship Development**	**03**
	1. Entrepreneurship Development 2. Poly House Technology 3. Bonsai and its types sampling mother plant.	
	Unit Outcomes: UO 1. Explain the techniques of poly house. UO 2. Learn the techniques of Bonsai preparation.	
V	**Practicals (Included in above 04 units)**	**30**
	1. Seed Germination techniques for tree species 2. Tools, implements and containers used for propagation and nursery techniques. 3. Seed propagation- preparation of portable trays, seed treatments, sowing and seedling 4. Planning and designing of gardens, functional uses of plants in the landscape 5. Use of chemicals and other compounds for prolonging the vase life of cut flowers. 6. Grading, packing and marketing of cut flowers. 7. Identification of common garden weeds and their control methods 8. Identification of insect, fungal, bacterial and viral pest of ornamental plants and their control methods 9. Determination of Soil texture properties (temp, pH and texture) 10. Technique of potting and repotting 11. Types of Bonsai and technique 12. Preparation of Hanging basket 13. Propagation of plants by cutting: Soft stem, semi hard and hard wood, Layering, Grafting and Budding 14. Demonstration of Verme-composting and Bio-composting 15. Visit to nursery.	

Learning Resources:

1. A handbook of Landscape: CPWD Directorate general, New Delhi Feb. 2013
2. Complete gardening in India- Gopala swamiengar K.S. Revised edition. Hosali Press, Bangalore. (1935)
3. Ecology: A Practical Manual by A. C. Grubb and P. J. Edwards (1987)
4. Field and Laboratory Methods for General Ecology by J. E. Brower, J. H. Zar, and C. N. von Ende (1998)
5. Floriculture in India-G. S. Randhawa, Allied Publishers, 1986
6. Handbook of Agriculture-ICAR, New Delhi,1 January 2006
7. Home gardening: P. P. Trivedi, Indian Council of Agricultural Research 2010
8. Horticulture in India: P. C. Bansil CBS Publishers & Distributors. 2008
9. Horticulture Nursery Management: Dr. Surya Gunjal, Director, School of Agricultural Sciences, YCMOU, Nashik 2010
10. Management-John Mason Landlinks Press,2004
11. Ornamental gardening in India: Mishra K. K.Biotech Books. 2003
12. Plant Nursery Development and Management-PriyaLokare, Dr. Keshamma E.18 December 2021
13. Plant Nursery Management –P.K. Ray Scientific Publisher India New Delhi 2012

14. Plant Propagation: Principles and practices (8th Edition) Hartmann, H.T., Kester D.E., Davis, F.T and R.L Geneve (2010)
15. Ralph Snodsmiths Fundamentals of Gardening: Questions and Answers from the Garden Hotline – Ralph Snodsmith. The University of Virginia 15 Apr 2010

Suggested Activities:

Raising a nursery, managing it, studying and drawing various land scaping designs, practicing layering methods, using shade nets to protect horticultural crops, practicing indoor gardening, techniques, visiting florists and recording their methods of prolonging vase life of commercial cut flowers.

Semester - II

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: II

Course Type: DSC-III

Course Title: Fundamentals of Genetics

Course Code: 101BOT2101

Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To awaken the students about genetic terms.
LO 2. To understand the principles of genetics and laws of inheritance.
LO 3. To correlate the relationships between epistatic and non-epistatic genes.
LO 4. To develop the awareness about genetic disorders
LO 5. To criticize the mechanisms that generates variation in traits.

Course outcomes:

After completion of course, the student will be able to-

CO 1. Justify about Syndromes.
CO 2. Explain the process of inheritance.
CO 3. Correlates the between epistatic and non-epistatic genes.
CO 4. Explain sex determination and extra-nuclear inheritance.
CO 5. Evaluate Pedigree analysis and its control.

Unit No.	Title of Unit & Contents	Hrs.
I	**Mendelism**	**13**
	1. Introduction of Genetics 2. Mendel's experiments (biography of Mendel). 3. Punnett Checker Board 4. Rediscovery of Mendel's Work 5. Genetic terminologies 6. Monohybrid crosses with examples. 7. Dihybrid cross with examples 8. Back cross and Test cross with examples. 9. Mendelian Genetics: a) Law of Dominance b) Law of Segregation c) Law of Independence	
	Unit Outcome: **UO-1.** Explain the process of inheritance. UO-2. Describe the Laws of Mendelian Genetics.	
II	**Gene Interactions**	**10**
	Interaction of Genes: **A. Allelic interactions:** 1. Incomplete dominance with examples of 4 '0'clock plant. 2. Co- dominance with examples of coat color in cattle **B. Non-Allelic interactions** **I. Epistatic:** Explanation and examples of i) Dominant epistasis - 12:3:1 (Fruit colour in summer squash)	

Unit No.	Title of Unit & Contents	Hrs.
	ii) Recessive epistasis - 9:3:4 (Supplementary genes)(Grain colour in maize/coat colour in mice) iii) Duplicate dominant epistasis - 15:1 (Seed capsule of Shepherds purse) iv) Duplicate recessive epistasis (Complementary genes) - 9:7 (Sweet pea flower color) **II. Non-epistatic:** Explanation and examples of Collaborator gene - 9:3:3:1 (Comb shape in fowl)	
	Unit Outcome: UO-1. Solve the problems related to Genetics. UO-2. Describe the Allelic interactions and Non-Allelic interactions	
III	**Sex Determination**	**10**
	1. Introduction 2. Sex determination: Discovery of sex chromosomes, 3. Chromosomal theory of sex determination. 4. Sex determination in Animals/ Drosophila (XX, XY method) 5. Sex determination in insects (XO-XX method), 6. Sex determination in Birds (ZW-ZZ method), 7. Sex determination in Plants (*Asparagus*). 8. Linkage: i) Introduction and Definition ii) Complete Linkage iii) Incomplete Linkage Coupling repulsion Hypothesis iv) Significance	
	Unit Outcomes: UO-1. Explain sex determination and extranuclear inheritance. UO-2. Evaluate Pedigree analysis and its control.	
IV	**Sex Linked Inheritance**	**12**
	1. Introduction: Definition 2. Types of Sex linked inheritance: i. X-linked with example ii.Y-linked with example iii. XY-linked with example 3. Sex linked inheritance in Drosophila (White eye colour) 4. Sex linked inheritance in Man: Hemophilia 5. Sex linked inheritance in Man: Colour blindness 6. Sex linked inheritance in Man: Hypertrochosis 7. Inheritance of bobbed bristles in Drosophila 8. Gene related diseases: i. Phenylketonuria (PKU) ii. Alkaptonuria (AKU) iii. Albinism. iv. Sickle Cell Anemia 9. Syndromes in Man: i) Down's syndrome ii) Klinfelter's Syndrome. iii) Patau syndrome iv) Edwards syndrome v) Turner syndrome	

Unit No.	Title of Unit & Contents	Hrs.
	Unit Outcome: **UO-1.** Describe the Sex linked inheritance**.** UO-2. Identify the gene related diseases and Syndromes.	

Learning Resources:

1. Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D.. Molecular Biology (Ed.) Garland Publishing Inc. New York. I989
2. Atherl, A. G., Girton, J. R. and McDonald, J. F.. The Science of Genetics. Saunders College USA. 1999
3. Burnham, C. R.. Discussions in Cytogenetics, Burgess Publishing Co., Minnesota. 1962
4. Busch. H. and Rothblum, L. Volume X. The cell nucleus: DNA part A, Academic Press. 1982
5. Gupta, P.K.. Genetics. Rastogi Publications, Meerut 2007
6. Hartl, D. L. and Jones E. W.. Genetics: Principles and Analysis (4ih Ed.) 1998
7. Jones and Barew Publishers, Massachusetts, USA.
8. Karp, G.. Cell and Molecular Biology; Concepts and Experiments, John Wiley and Sons Inc. USA. 1999
9. Khush, G. S.. Cytogenetics of Aneuploids, Academic Press, New York, London. 1973
10. Pundhan Singh, , Genetics, Kalyani Publishers, Ludhiana 2006
11. Singh, B. D. Fundamentals of Genetics.Kalyani Publishers, Ludhiana 2015

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: II

Course Type: Lab Course
Course Title: Lab Course –III (Based on DSC-III)
Course Code: 101BOT2103
Credits: 01 **Max. Marks: 50** **Hours: 30**

Leaning Objectives:

LO 1. To predict the mode of inheritance of gene.
LO 2. To identify the different types of genetic disorder and Syndromes.
LO 3. To differentiate syndrome on the basis of physical characteristics.
LO 4. To determine the probability of appearance of genetic disorders.

Course outcomes:

After completion of course, the student will be able to-

CO 1. Identify the different types of Linkage.
CO 2. Correlate the genetic disorder, diseases and Syndromes.
CO 3. Solve the problems of Monohybrid and Dihybrid ratios.
CO 4. Explain the Karyotype.

Sr. No.	Name of the Experiment
1	Problems based on Monohybrid ratio
2	Problems based on Dihybrid ratio -9:3:3:1
3	Problems based on Dihybrid ratio – 9:3:4
4	Problems based on Dihybrid ratio – 9:7
5	Problems based on Dihybrid ratio -12:3:1
6	Problems based on Dihybrid ratio – 15:1
7	Problems based on collaborator genes- 9:3:3:1
8-9	Problems based on sex-linked inheritance- Color blindness and Hemophilia (Human being)
10	Problems based on sex-linked inheritance- White eye color (Drosophila) and Hypertrichosis (Man).
11	Study of Karyotype
12	Study of Syndromes: Down's syndrome, Klinfelter's Syndrome, Patau syndrome, Edwards syndrome and Turner syndrome
13	Study of genetic diseases- Phenylketonuria (PKU), Alkaptonuria (AKU) and Albinism
14	Botanical excursions (one short, one long excursion and visit to Research laboratory, Field etc. is compulsory)

N.B.: Any Ten Practicals from above list.

Learning Resources:

1. A text book of Practical Botany-I, Bendre and Kumar, Rastogi Publication, 2019
2. A text book of Practical Botany-I, S. N. Pandey and B. P. Pandey, S.Chand Publication
3. A text book of Practical Botany-II, Bendre and Kumar, Rastogi Publication, 2019

4. A text book of Practical Botany-II, S. N. Pandey and B. P. Pandey, S.Chand Publication
5. Cell and Molecular biology: A lab Manual, K.V.Chaitanya,
6. Cell Biology Practical Manual, Dr. Renu Gupta, Dr. Seema Makhija, Dr. Ravi.T, Prestige publisher 2018

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: II

Course Type: DSC- IV

Course Title: Histology, Anatomy and Embryology of Angiosperms

Course Code: 101BOT2102

Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To compare role of Tissue system of plants.
LO 2. To interpret the fertilization and development of embryo.
LO 3. To become familiar with histology and anatomy of plants
LO 4. To analyse the internal structures of root, stem and leaf.

Course outcomes:

After completion of course, the student will be able to-

CO 1. Analyse the different tissues and their functions.
CO 2. Perform sectioning of various anatomical structures.
CO 3. Describe the process of development of male and female gametophyte
CO 4. Evaluate the post fertilization changes during fruit development.

Unit No.	Title of Unit & Contents	Hrs.
I	**Histology**	**12**
	Plant Tissues **A. Meristematic tissues** and their classification based on position **B. Permanent Tissues** **I Simple Tissues: Structure, Types and Functions** 1. Parenchyma 2. Collenchyma 3. Sclerenchyma **II Complex Tissues: Structure and Functions** 1. Xylem 2. Phloem **III Secretary Tissues** **1. Laticiferous Tissues** Ex. Latex cells and Latex Vessels **2. Glandular Tissues** a. External glands **Ex.** Digestive glands b. Internal glands **Ex.** Oil glands	
	Unit Outcome: **UO-1.** Interpret the different tissues and their function. UO-2. Identify the type of tissues.	
Unit No.	**Title of Unit & Contents**	**Hrs.**
II	**Anatomy**	**12**
	1. Anatomy of dicot Root (Sunflower). 2. Anatomy of monocot Root (Maize).	

Unit No.	Title of Unit & Contents	Hrs.
	3. Anatomy of dicot Stem (Sunflower). 4. Anatomy of monocot Stem (Maize). 5. Anatomy of dicot Leaf (Sunflower) 6. Anatomy of monocot Leaf (Maize). 7. Secondary growth in dicot stem. 8. Anomalous secondary growth in *Dracaena* stem.	
	Unit Outcome: UO-1. Perform sectioning of various anatomical structures. UO-2. Differentiates the internal structure of root, stem and Leaves.	
III	**Embryology -I**	**11**
	1 Structure of a Microsporangium (T.S. of anther). 2. Structure of a Microspore. 3. Development of male gametophyte (Microgametogenesis). 4. Structure of a Megasporangium. 6. Types of ovule: i) Orthotropous (Straight) ii) Anatropous (Inverted) iii) Hemi-anatropous iv) Campylotropous (Curved) v) Amphitropous vi) Circinotropous 7. Development of female gametophyte (Monosporic).	
	Unit Outcome: UO-1. Describe the process of development of male and female Gametophyte. UO-2. Identify the types of ovules.	
IV	**Embryology -II**	**10**
	1. Fertilization. 2. Double Fertilization and its Significance. 3. Post fertilization changes. 4. Endosperm and its types. 5. Development of dicot embryo (Crucifer type). 6. Structure of Dicot seed. 7. Structure of Monocot seed.	
	Unit Outcome: **UO-1.** Analyse the post fertilization changes during fruit development. UO-2. Understand the mechanism of double fertilization and its significance	

Learning Resources:

1. A Handbook of Taxonomic Training. Manilal, K. S. and M. S. Muktesh Kumar New Delhi. 1998
2. An Integrated System of Classification of Flowering Plants, Cronquist, A. Columbia University Press, New York. 1981
3. Families of Flowering plants. Judd W. S., Campbell, C. S., Kellogg, E. A., Stevens P. F. and M. J. Donoghue 2008.

4. Flowering Plants: Origin, Evolution and Phylogeny. Taylor, D. V. and L. J. Hickey CBS Publishers & Distributers, New Delhi. 1997
5. Plant microevolution and Conservation in Human-influenced Ecosystems. Briggs David. Cambridge University Press. 2009
6. Plant Systematics: A phylogenetic Approach.Sunderland, Massachusetts,USA.1995
   Press, U.S.A. 1988
7. Principles and Techniques of Contemporary Taxonomy. Quicke, Donald, L. J. Blakie Academic & Professional, London 1993
8. Principles of Angiosperm Taxonomy Davis, P. H. and V. H. Heywood Today and
9. Takhtajan, A..Flowering plants- Origin and Dispersal. 1962
10. Taxonomy and Plant conservation. Leadlay E. and S. Jury Cambridge University Press. 2006
11. Taxonomy of Angiosperms. Naik, V. N. Tata Mc Graw-Hill Publication Com. Ltd. New Delhi 1984
12. *Taxonomy of Vascular Plants.* Lawrence George H. M Oxford and IBH Publ. Co.Pvt. Ltd. New Delhi. 1951
13. The Evolution and Classification of Flowering Plants (2nded.) Cronquist, A.. Allen
    Tomorrow Publications, New Delhi. 1991

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: II

Course Type: Lab Course

Course Title: Lab Course –IV (Based on DSC-IV)

Course Code:

Credits: 01 **Max. Marks: 50** **Hours: 30**

Leaning Objectives:

LO 1. To interpret the role of meristematic tissue.

LO 2. To differentiate between types of tissue.

LO 3. To understand the internal structure of root, stem and leaf.

LO 4. To categories the embryological structures.

Course outcomes:

After completion of course, the student will be able to-

CO 1. Illustrate the internal structure of stem and leaf.

CO 2. Analyse the types of tissue.

CO 3. Identify the abnormal growth.

CO 4. Generate the double stained permanent slides of stem

Sr. No.	Name of the Experiment
1	Study of meristematic tissues with the help of Permanent slides/models/ Charts /photo
2	Study of simple tissues with the help of Permanent slides/models/ Charts /photo
3	Study of Complex tissues with the help of Permanent slides/ models /Charts/ photo
4	Study of secretary tissues with the help of Permanent slides/ models /Charts/ photo
5	Study of T.S. of Anther and structure of pollen grain
6	Study of typical ovule and types of ovule with the help of Permanent slides/ models /charts/photocopies.
7	Study of Leaf anatomy of dicot.
8	Study of Leaf anatomy of dicot.
9	Preparation of double stained permanent slides of Sunflower Stem.
10	Preparation of double stained permanent slides of Maize Stem.
11	Preparation of double stained permanent slides of Dracaena Stem.
12	Study of typical seed of Dicot and Monocot
13	Study of types Endosperms with the help of Permanent slides/models/ Charts/photo
14	Botanical excursions (one short, one long excursion and visit to Research laboratory,

	Field etc. is compulsory)

N.B.: Any Ten Practicals from above.

Learning Recourses:

1. A text book of Practical Botany-I, Bendre and Kumar, Rastogi Publication, 2019
2. A text book of Practical Botany-I, S. N. Pandey and B. P. Pandey, S.Chand Publication
3. A text book of Practical Botany-II, Bendre and Kumar, Rastogi Publication, 2019
4. A text book of Practical Botany-II, S. N. Pandey and B. P. Pandey, S.Chand Publication
5. Cell biology and Cytogenetics lab and physiological Hematologycal Lab –I, Sudha Garg, A Pragati prakashan 2023
6. Ecology: A Practical Manual by A. C. Grubb and P. J. Edwards (1987)

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: II

Course Type: VSC-II

Course Title: Organic Farming

Course Code: 101BOT2501

Credits: 02 **Max. Marks: 50** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To introduce techniques of production of high nutritional food.

LO 2. To restate the methods of increasing long term fertility of soil.

LO 3. To demonstrate methods of organic farming.

LO 4. To criticize the methods of farming.

Course Outcomes:

After completion of course, the student will be able to-

CO 1. Analyse the benefits of organic Farming.

CO 2. Discuss the staple food crops and their cultivation practices.

CO 3. Explain the uptake and Utilization of plant Nutrients.

CO 4. Evaluate the composition of organic manure.

Unit No.	Title of Unit & Contents	Hrs.
I	**Organic Farming**	**04**
	i. Introduction ii. Need of Organic Farming iii. Benefits of Organic Farming iv. Social aspects of Organic Farming v. Market aspects of Organic Farming	
	Unit Outcome: UO-1. Understand the benefits of organic Farming. UO-2. Correlate the Social and Market aspects of organic Farming	
II	**Organic Fertilizers**	**04**
	i. Introduction ii. Need of Organic Fertilizer iii. Benefits of Organic Fertilizer iv. Preparation of Organic Fertilizer v. Demonstration & land preparation	
	Unit Outcome: UO-1 Explain the importance of organic fertilizers.	
III	**Plant Nutrients**	**04**
	i. Introduction ii. Name of plant Nutrients iii. Functions of Nutrients in plant growth and Development iv. Nutrient uptake and Utilization by plant: (From Organics) From Inorganic v. Sources of nutrients for Organic Agriculture	
	Unit Outcome: UO-1 Explain the importance of Nutrient uptake.	

	UO-2. Analyse the mechanism of Utilization Nutrient.	
IV	**Organic Manure**	**04**
	i. Farmyard manures ii. Compost manures iii. Vermicompost iv. Green Manure with Leguminous crop	
	Unit Outcome: UO-1 Students learned about composition of organic manure UO-2. Describe the process of Vermicompost	
V	**Practicals (Included in above 04 units)**	**14**
	5. Preparation of compost 2-4. Indigenous Technology Knowledge (ITK) for nutrient arrangement 1. Preparation of vermicompost 2. Quality analysis of compost (Grading) 3. Packaging of compost 8. Estimation of total nitrogen from plants 9. Estimation of crude protein from plants 10.Visit to organic farms to study the various components andtheir utilization	

Learning Recourses:

1. Arts & Science of Organic Farming : Sujit Chakrabarty, Sumati Narayan, Farooq Ahmad Khan,Notion Press.1995
2. Organic Business Today: Global And Local Hardcover – by Manoj Kumar Menon Tej Partap Scientific Publishers Indian, 2009
3. Organic Farming and Production of Organic Compost: NPCS Board of Consultants & Engineers, Asia Pacific Business Press Inc. 2008
4. Organic Farming Manual: A Comprehensive Guide by Ann Larkin Hansen, Storey Publishing LLC 2008
5. Organic Farming: Amitava Rakshit and H B Singh, Storey Publishing LLC 2008
6. Principles of Organic Farming:E Somasundaram, D UdhayaNandhini, et al.New India Publishing Agency- Nipa. 2010
7. Principles of Organic Farming: P.L. Maliwal, Scientific Publishers Indian 2013
8. Sustainable Development of Organic Agriculture by Kimberly Etingoff, SPI, 2012

Open Elective Courses Offered by the Department

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: I

Course Type: OE

Course Title: Environmental Biology

Course Code:

Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To understand the biological impacts of toxins and contaminants on "Organic Life".

LO 2. To evaluate environmental topics in the media and the Science.

LO 3. To know the principles of conservation biology.

LO 4. To study the types and levels of diversity.

LO 5. To evaluates the morphological and anatomical adaptations of plants.

Course outcomes:

After completion of course, the student will be able to-

CO 1. Examine the methods of pollution.

CO 2. Analyse the biological impacts of toxins and contaminants on organic life.

CO 3. Correlate the energy flow and food chain in ecosystem.

CO 4. Examine the principles of conservation biology.

CO 5. Evaluate the concept of habitat and niche.

CO 6. Characterize the morphological and anatomical adaptations of plants

Unit No.	Title of Unit & Contents	Hrs.
I	**ENVIRONMENTAL BIOLOGY-I**	12
	1. Ecology- Definition and Scope Structure of Ecosystem (Abiotic and Biotic) 2. Types of Ecosystem (Pond ecosystem and Forest ecosystem) 3. Ecological Pyramids and Energy flow 4. Food chain and Food web 5. Morphological and Anatomical adaptations of plants to water stress conditions a. Hydrophytes: i. Lotus leaf (petiole) ii. Hydrilla stem b. Xerophytes: i. Nerium leaf ii. Casurina Stem	
	Unit Outcomes: UO-1. Characterize the morphological and anatomical adaptations of	

Unit No.	Title of Unit & Contents	Hrs.
	plants UO-2. Correlate the energy flow and food chain in ecosystem. UO-3. The role of plants in the functioning of the global ecosystem	
II	**ENVIRONMENTAL BIOLOGY-II**	**10**
	Pollution: Causes, effects and control measures of: i. Water pollution ii. Soil pollution iii. Air pollution 2. Aforestation and deforestation 3. Chipko movement 4. Biogeochemical cycles: Carbon and Nitrogen	
	Unit Outcomes: UO-1. Examine the methods of pollution. UO-2. Characterize the biological impacts of toxins and contaminants on organic life.	
III	**CONSERVATION ECOLOGY-I**	**12**
	1. Habitat and Niche**:** Concept of habitat and niche; (niche width and overlap; fundamental and realized niche; resource partitioning; character displacement) 2. Conservation Biology: i) Principles of conservation, major approach to management ii) Organisms of conservation concern: Rare, endangered species 3. Ecological Succession: Types; mechanisms; changes involved in succession, concept of climax	
	Unit Outcomes: UO-1. Examine the principles of conservation biology. UO-2. Evaluate the concept of habitat and niche.	
IV	**POPULATION AND COMMUNITY ECOLOGY**	**11**
	1. Biodiversity: Introduction, Definition, plant biodiversity and animal biodiversity of globe 2. Diversity types and levels: Generic, Species Alpha, Beta, Gamma Population Ecology: Characteristics of a population; population growth curves; population regulation, life history strategies (r and K selection); 3. Concept of metapopulation- demes and dispersal, age structure populations. 4. Community Ecology: Nature of communities; community structure and attributes; level of species diversity and its measurement	
	Unit Outcome: UO-1. Examine the types and levels of diversity UO-2. Describe the Characteristics, growth curves and regulation of Population Ecology.	

Learning Resources:

1. A Textbook of Plant Ecology 16 th edition– Ambhast R.S., CBS Publishers and Distributors Pvt Ltd. (2023)
2. A Textbook of Plant Ecology, Ambasht R S 16th Edition 2022

3. Ecology and Environment- Sharma, P.D. Rastogi Publications (1 January 2011)
4. Environmental Chemistry- De, A.K. 7th Edition, New Age International Pvt Limited, New Delhi. (2012).
5. Environmental Impact Assessment- Larry Canter. McGraw Hill Higher Education (1 June 1977)
6. Environmental management - BiswarupMuhkerjee V. Vikas Publishing House, 2000
7. Environmental Science- Turk and Turk
8. Environmetal Biology- BiswarupMuhkerjee. McGraw Hill Education India Pvt Ltd (1 January 1980)
9. Fundamentals Air Pollution Vol I - Stern, Arthur C.Published by Elsevier Science & Technology, 1984
10. Fundamentals of Ecology- Dash M.C. McGraw Hill Education; 3rd edition (15 June 2009)
11. Fundamentals of Ecology- E.P. Odum and Gary Barrett. Brooks/Cole; 5th edition (27 July 2004)
12. Indian Manual of Field Ecology- R. Mishra.Scientific Publisher India Jodhpur 2013
13. Modern Concepts of Ecology- Kumar H.D. Vikas Publishing House, 1977
14. Modern Concepts of Ecology- H.D.Kumar. Vikas Publishing House Pvt Ltd; New Ed edition (January 1, 1995)
15. The Biology of Polluted Waters-H.B.N.Hynes,,Liverpool University Press 1980

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: I

Course Type: Lab Course

Course Title: Lab Course –I (Based on GE-I)

Course Code:

Credits: 01 **Max. Marks: 50** **Hours: 30**

Leaning Objectives:

LO 1. To learn the practical skills of plant adaptations.

LO 2. To study methods of water holding capacity of different soils.

LO 3. To study the Vegetation analysis techniques.

LO 4. To study causes, effects and control measures of Pollution.

Course outcomes:

After completion of course, the student will be able to-

CO 1. Evaluate the role of plants in the functional ecosystem.

CO 2. Examine the Vegetation analysis techniques.

CO 3. Correlate the morphological and anatomical adaptations of different plant groups.

CO 4. Characterize the salinity of different water samples

Practical No.	Unit
1	Study of morphological and anatomical adaptations in hydrophytes – *Lotus petiole*
2	Study of morphological and anatomical adaptations in hydrophytes – *Hydrilla stem*
3	Study of morphological and anatomical adaptations in xerophytes – *Nerium leaf.*
4	Study of morphological and anatomical adaptations in xerophytes –*Casurina stem.*
5	Determination of water holding capacity of different soils.
6	Estimation of salinity of different water samples.
7-8	Study of vegetation by quadrate method.
9	Determination of pH of different soils by pH paper/ pH meter.
10	Study of types of Ecosystem
11-14	Study of Pollution: Causes, effects and control measures of- i. Water pollution ii. Soil pollution iii. Air pollution
15	Botanical excursions (one short, one long excursion and visit to Research laboratory, Field etc. is compulsory)

N.B.: Any Ten Practicals from above.

Learning Resources:

1. A text book of Practical Botany-I, Bendre and Kumar, Rastogi Publication, 2019
2. A text book of Practical Botany-I, S. N. Pandey and B. P. Pandey, S.Chand Publication
3. A text book of Practical Botany-II, Bendre and Kumar, Rastogi Publication, 2019
4. A text book of Practical Botany-II, S. N. Pandey and B. P. Pandey, S.Chand Publication

5. Ecology: A Practical Manual by A. C. Grubb and P. J. Edwards (1987)
6. Field and Laboratory Methods for General Ecology by J. E. Brower, J. H. Zar, and C. N. von Ende (1998)
7. Practical Ecology for Geography and Biology by D. Gilbertson, M. Kent, and F.B. Pyatt (1985)
8. Practical Environmental Biology by S.C. Santra (2017) - New Central Book Agency

Skill Enhancement Courses Offered by the Department

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Botany

Class: B. Sc I Semester: I

Course Type: SEC

Course Title: Mushroom Cultivation Techniques

Course Code: 101BOT1601

Credits: 02 **Max. Marks: 50** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To understand the techniques of mushroom cultivation.

LO 2. To categories the edible and non-edible mushroom.

LO 3. To demonstrate the process of picking and packing of mushroom.

LO 4. To understand principles of mushroom farm layout.

Course Outcomes:

After completion of course, the student will be able to-

CO 1. Start a small business of mushroom production.

CO 2. Select important types of Mushrooms, value added products and their cultivation

CO 3. Maintain Mushroom farm in a hygienic and scientific way.

CO 4. Examine nutritional value of mushrooms.

Unit No.	Title of Unit & Contents	Hrs.
I	**Cultivation System & Farm design**	**04**
	Fundamentals of cultivation system- small village unit & larger commercial unit. Principles of mushroom farm layout- location of building plot, design of farm, bulk chamber, composting platform, equipments& facilities, pasteurization room & growing rooms.	
	Unit Outcomes: UO-1 To understand the techniques of mushroom cultivation. UO-2. Analyse the Principles of mushroom farm layout.	
II	**Composting, Spawn & Spawning**	**04**
	Principles of composting, machinery required for compost making, materials for compost preparation. Methods of Composting- Long method of composting (LMC) & Short method of composting (SMC).	
	Unit Outcome: UO-1. Describe the Principles of composting, machinery required and materials of compost. UO-2. To know the methods of composting.	
III	**Casting materials & Case running:**	**04**
	Importance of casing mixture, Quality parameters of casing soil, different types of casing mixtures, commonly used materials.	
	Unit Outcome: UO-1. To understand the importance of casing mixture.	

	UO-2. Describe the different types of casing mixtures	
IV	**Cultivation of Button, Oyster and Straw Mushrooms**	**03**
	Collection of raw materials Compost & composting Spawn & spawning Casing & case run Cropping& crop management, Picking & packing.	
	Unit Outcomes: UO-1. To study picking and packing of mushroom. UO-2. Explain the cultivation methods of Mushroom.	
V	**Practicals (Included in above 04 units)**	**30**
	9. Study of sterilization equipments. 10. Preparation and sterilization composting platform. 11. Study of *Agarics bisporus* 12. Oyster cultivation and demonstration of Button mushroom Cultivation 13. Preparation and sterilization of the PDA medium, slant preparation and Inoculation-spore in PDA. 14. Tissue isolation, Sub culturing, Spawn making and fruiting bags Production, Processing. 15. Field trip to commercial mushroom farms and scientific institutions. 16. Visit to relevant Labs/Field Visits	

Learning Resources:

1. A hand book of edible mushroom, S. Kannaiyan & K. Ramasamy Today & Tomorrows printers & publishers, New Delhi (1980).
2. A text book of Practical Botany-I, Bendre and Kumar, Rastogi Publication, 2019
3. A text book of Practical Botany-I, S. N. Pandey and B. P. Pandey, S.Chand Publication
4. Handbook on Mushrooms, Nita Bahl, oxford & IBH Publishing Co. 2010
5. Mushroom Cultivation, Tripathi, D.P. Oxford & IBH Publishing Co. PVT.LTD, New Delhi. (2005)
6. Mushroom Production and Processing Technology, Pathak Yadav Gour Published by Agrobios (India). (2010)

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year (Semester I/II)

Basket I: Generic/Open Elective (GE/OE)

(GE/OEs offered to the Science & Technology students in Sem.-I & II)

Sr. No.	BoS Proposing OE	Course Title	Credits	Hrs.
1	Commerce	Fundamentals of Statistics	04	60
2	Commerce	Personal Financial Management	04	60
3	Music	Indian Vocal Classical &Light Music	04	60
4	Sports	Counselling and Psychotherapy	04	60
5	English	English for Science and Technology	04	60
6	Geography	General Geography	04	60
7	Marathi	स्पर्धापरीक्षाआणिमराठीभाषा	04	60
8	Political Science	Human Rights	04	60
9.	Sanskrit	Ayurveda in Everyday life	04	60

Note: Student can choose any one GE from the basket

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year

Basket II: Skill Enhancement Courses (SEC)

Sr. No.	BoS Proposing SEC	Course Title	Credits	Hrs.
1	Commerce	Office Management	02	30
2	Computer Science	Data Analysis and Computer Application	02	30-45
3	English	Proof Reading and Editing	02	30
4	English	Communication Skills	02	30
5	Geography	Tourism & Travel Management	02	30-45
6	Information Technology	PC Assemble and Installation	02	30-45
7	Marathi	कथा/पटकथालेखन	02	30
8	English	Leadership and Personality Development	02	30
9	Zoology	Bee Keeping	02	30-45
10	Biotechnology	Food Processing Technology	02	30-45
11	Commerce	Financial Literacy	02	30
12	Botany	Mushroom Cultivation Technology	02	30
13	Chemistry	Pesticides and Green Chemistry	02	30
14.	Commerce	Investment Management	02	30
15.	Computer Science	Cyber Security	02	30
16.	Information Technology	Python Technology	02	30
17.	Physics	Physics Workshop Skills	02	30

Note: Student can choose any one SEC from the basket

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year

Basket III: Ability Enhancement Courses (AEC)

Sr. No.	BoS Proposing AEC	Course Title	Credits	Hrs.
1	Marathi	भाषिककौशल्यभाग – १	02	30
2	Hindi	हिंदीभाषाशिक्षणभाग – १	02	30
3	Sanskrit	व्यावहारीकव्याकरणवनितिसुभाषिते	02	30
4	Pali	उपयोजितव्याकरण	02	30
5	English*	Communicative English-I	02	30

Note: Student can choose any one AEC from the basket.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year

Extra Credit Activities

Sr. No.	Course Title	Credits	Hours T/P
1	MOOCs	Min. of 02 credits	Min. of 30 Hrs.
2	Certificate Courses	Min. of 02 credits	Min. of 30 Hrs.
3	IIT Spoken English Courses	Min. of 02 credits	Min. of 30 Hrs.

Guidelines:

Extra -academic activities

1. All extra credits claimed under this heading will require sufficient academic input/ contribution from the students concerned.
2. Maximum 04 extra credits in each academic year will be allotted.
3. These extra academic activity credits will not be considered for calculation of SGPA/CGPA but will be indicated on the grade card.

Additional Credits for Online Courses:

1. Courses only from SWAYAM and NPTEL platform are eligible for claiming credits.
2. Students should get the consent from the concerned subject Teacher/Mentor/Vice Principal and Principal prior to starting of the course.
3. Students who complete such online courses for additional credits will be examined/verified by the concerned mentor/internal faculty member before awarding credits.
4. Credit allotted to the course by SWAYAM and NPTEL platform will be considered as it is.

Additional Credits for Other Academic Activities:

1. One credit for presentation and publication of paper in International/National/State level seminars/workshops.
2. One credit for measurable research work undertaken and field trips amounting to 30 hours of recorded work.
3. One credit for creating models in sponsored exhibitions/other exhibits, which are approved by the concerned department.
4. One credit for any voluntary social service/Nation building exercise which is in collaboration with the outreach center, equivalent to 30 hours

5. All these credits must be approved by the College Committee.

Additional Credits for Certificate Courses:

1. Students can get additional credits (number of credits will depend on the course duration) from certificate courses offered by the college.
2. The student must successfully complete the course. These credits must be approved by the Course Coordinators.
3. Students who undertake summer projects/ internships/ training in institutions of repute through a national selection process, will get 2 credits for each such activity. This must be done under the supervision of the concerned faculty/mentor.

Note:

1. The respective documents should be submitted within 10 days after completion of Semester End Examination.
2. No credits can be granted for organizing or for serving as office bearers/ volunteers for Inter-Class / Associations / Sports / Social Service activities.
3. The office bearers and volunteers may be given a letter of appreciation by the respective staff coordinators. Besides, no credits can be claimed for any services/activities conducted or attended within the college.
4. All claims for the credits by the students should be made and approved by the mentor in the same academic year of completing the activity.
5. Any grievances of denial/rejection of credits should be addressed to Additional Credits Coordinator in the same academic year.

Students having a shortage of additional credits at the end of the third year can meet the Additional Credits Coordinator, who will provide the right advice on the activities that can help them earn credits required for graduation

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Examination Framework

Theory:

40% Continuous Assessment Tests (CATs) and 60% Semester End Examination (SEE)

Practical:

50% Continuous Assessment Tests (CATs) and 50% Semester End Examination (SEE)

Course	Marks	CAT & Mid Term Theory				CAT Practical		Best Scored CAT & Mid Term	SEE	Total
1	2	3				4		5	6	5 + 6
		Att.	CAT I	Mid Term	CAT II	Att.	CAT			
DSC/DSE/ GE/OE/Minor	100	10	10	20	10	-	-	40	60	100
DSC	75	05	10	15	10	-	-	30	45	75
LabCourse/AIPC / OJT/FP	50	-	-	-	-	05	20	-	25	50
VSC/SEC/ AEC/VEC/CC	50	05	05	10	05	-	-	20	30	50

Note:

1. All Internal Exams are compulsory
2. Out of 02 CATs best score will be considered
3. Mid Term Exam will be conducted by the Exam Section
4. Mid Term Exam is of Objective nature (MCQ)
5. Semester End Exam is of descriptive in nature (Long & Short Answer)
6. CAT Practical (20 Marks): Lab Journal (Record Book) 10 Marks, Overall Performance 10 Marks

(S. N. Shinde)
Chairperson
Board of Studies in Botany
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)