Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B^{++}'Grade (CGPA 2.96)

Name of the Faculty: Science &Technology

(As per New Education Policy 2020)

Syllabus: Botany

Name of the Course: B. Sc. I (Sem. I &II)

(Syllabus to be implemented from June 2024)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Nep 2020 Compliant Curriculum

B.Sc. (Botany)

Program Preamble

The Bachelor of Science (B.Sc.) in Botany is a comprehensive and dynamic program designed to provide students with a deep understanding of the fundamental principles of Botany, along with the practical skills required to apply this knowledge in various scientific and technological contexts. Aligned with the vision of the National Education Policy (NEP) 2020, the program offers a flexible, multidisciplinary, and learner-centric curriculum that encourages critical thinking, innovation, and holistic development. The B.Sc. Botany program spans four years, with each year offering a progressively advanced curriculum designed to build a strong foundation in Botany while allowing for specialization and interdisciplinary learning. The curriculum is structured around severalkey components:

1. **Major Courses:** These core courses form the backbone of the program, providing in-depth knowledge and understanding of essential concepts in botany, theories, and methodologies. Students will engage with topics ranging from lower cryptogamic plants like algae, bryophytes, Pteridophytes Fungi, concepts in plant ecology & taxonomy of angiosperms, methods & concepts in plant identification which provides knowledge in botany subject discipline.
2. **Minor Courses:** Students have the opportunity to choose minor courses from related or distinct disciplines, promoting an interdisciplinary approach to learning. This flexibility allows students to complement their Botany education with insights on allied branches like zoology, microbiology, geology which enhancing their versatility and broadening their career prospects.
3. **Open Electives/General Electives:** The program encourages intellectual exploration beyond the core discipline by offering a wide range of electivecourses. These electives enable students to pursue their interests in diverse subjects like horticulture, floriculture & landscape architecture with a well-rounded educational experience.
4. **Vocational and Skill Enhancement Courses:** Practical skills and technical proficiency are integral to the program, with vocational and skill enhancement courses providing hands-on experience in areas such as Biofertilizer & mushroom cultivation. These courses are designed to prepare students for immediate employment and equip them with the tools necessary for career advancement in various scientific and technological fields.
5. **Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):** In alignment with NEP 2020, the program integrates courses that emphasize the Indian Knowledge System, ethical values, and life skills. These courses foster a deep appreciation forIndia's rich cultural heritage, while also developing essential communication and ethical decision-making skills that are vital for personal and professional growth.
6. **Field Projects/Internships/Apprenticeship /On-Job Training:** To bridge the gap between theoretical knowledge and real-world applications, the program includes opportunities for field projects, internships, apprenticeships, and community engagement. These experiences provide students with practical insights, problem-solving abilities, and exposure to professional environments, enhancing their readiness for careers in Botany and related research fields.

7. **Research Methodology and Research Projects:** Research is a critical component of the BSc Botany program, with students acquiring skills in research methodology, qualitative & quantitative analysis, formulation of product and scientific inquiry. By engaging in independent research projects, students are encouraged to develop innovative solutions to complex scientific problems, preparing them for advanced studies and research-oriented careers.

Multiple Entry and Multiple Exit Options

In accordance with the NEP 2020, the BSc Botany program incorporates a Multiple Entry and Multiple Exit framework, offering students the flexibility to enteror exit the program at various stages. This approach ensures that students can tailor their educational journey according to their personal and professional goals, with options to earn certificates, diplomas, or degrees based on the duration of study completed.

- **Year 1:**
  Upon completion of the first year, students may exit with a **Certificate in Botany**.
- **Year 2:**
  After two years, students may choose to exit with a **Diploma in Botany**.
- **Year 3:**
  Completion of the third year qualifies students for a **BSc Degree in Botany**.
- **Year 4:**
  The fourth year offers an advanced curriculum with a focus on research, allowing students to graduate with an **Honors Degree in Botany**.

Eligibility for B.Sc. Botany

i. The candidate passing the higher secondary examination conducted by the Maharashtra State Board of Higher Secondary Education, with science stream MCVC with science subject, D. Pharm., Diploma Engineering, Agriculture Diploma, Diary Diploma shall be allowedto enter upon the B.Sc. I Course.

OR

ii. An examination of any other statutory University or an Examination Body recognized as equivalent thereto.

iii. Repeater Students will be allowed to take fresh admission to the same class with same subjects or different.

Name of the Course: B.Sc. I (Sem I & II)

(Syllabus to be implemented from June 2024

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Three Majors in First Year structure as per NEP-2020 Approved in For AC Meeting on 18/04/2024

4- Year Multidisciplinary UG Program with DSC as a Major (4 -Year Bachelor of Science (Honors)/(Honors with Research))

Level/ Difficulty	Sem.	Faculty			Generic/ Open ElectiveGE/ OE	Vocational and Skill Enhancement Courses (SEC/VSC)	Ability Enhancement Course (AEC) IKS, VEC	Field Project/ RP/CC/Internship/Apprenticeship/ Community Engagement & Services	Credits	Cumulative Credits
		Major		Minor						
		DSC	DSE							
4.5 100-200	I	Algae,Fungi and archegoniate DSC1-1 (2+2)# **G04-0103** **G04-0103 P**			GE1/ OE1(2) **G04-GE- OE-0103 Horticulture**	BOTANY SEC1 (2) **G04-SEC 0103** **Biofertilizer**	L1-1(2) **Eng-103** IKS (2) IKS-103 VEC1(2) (India Constitution of Democracy) **ICD-103**	-	22	**44 UG Certificate (44)**
		DSC2-1(2+2)#								
		DSC3-1 (2+2)#								
	II	Plant Ecology and Taxonomy of Angiosperm DSC1-2(2+2)# **G04-0203** **G04-0203P**			GE1/ OE1(2) **G04- GE-OE 0203 Floriculture and landscape architecture**	BOTANY SEC 2 (2) **SEC- G04-0203 Mushroom Cultivation**	L1-2(2) **ENG-203** VEC2(2) (Environmental Studies) **ENS-24**	CC1 (2)	22	

		DSC2-2 (2+2)#								
		DSC3-2(2+2)#								
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor										
5.0/200	III	DSC1-3 (2+1)	---	DSC2-3 (2+1)	GE2 / OE2 (2)	VSC1 (2 (Discipline Specific to Major) VSC2 (2) (DSC2)	L2-1 (2)	CC2 (2)	22	**44 UG Diploma (88)**
		DSC1-4 (2+1)	---	DSC-2-4 (2+1)						
	IV	DSC1-5 (2+1)	---	DSC2-5 (2+1)	GE3/ OE3 (2)	VSC2 (2) (Discipline Specific to Major) (DSC1) VSC4(2) (DSC2)	L2 -2(2)	FP1/CEP1(2) FP1/CEP2 (2)	22	
		DSC1-6 (2+1)	--	DSC2-6 (2+1)						
Exit option: Award of UG Diploma in Major with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major										
5.5/300	V	DSC1-7 (3+2)	DSE1-1(2+1) or DSE1-2(2+1)	----	----	VSC3(2) (Hands onTrainingrelated toDSE)	IKS2(2) (related tomajorsubject)	--	22	**44 UG degree(132)**
		DSC1-8(3+2)								
		DSC1-9(3+2)								
	VI	DSC1-10(3+2)	DSE1-3(2+1) orDSE1-4(2+1)	----	---	VSC4(2) (Hands onTrainingrelated toDSE)		FP2/CEP2/OJT1 (2)	22	
		DSC1-11(3+2)								
		DSC1-12(3+2)								
	Total Credits 3Yrs	**66-8#**	**6**	**12+8# 20**	**08**	**16**	**16**	**08**	**132**	
Exitoption:AwardofUGdegreeinMajorwith132CreditsORContinuewithMajor										

6.0/400	VII	DSC1-13(4+2) DSC1-14(4+2)	DSE1-5(4+2)	ResearchMethodology(4)	------	----	----	---	22	**44 UG Honours Degree inMainfaculty(176)**
	VIII	DSC1-15(4+2) DSC1-16(4+2)	DSE1-6(4+2)		----	-----	----	OJT/In-house Project/Internship/ Apprenticeship(4)	22	
	Total 4Yrs	**90-8#**	**18**	**16+8#**	**08**	**16**	**16**	**12**	**176**	
AwardofBachelorofScienceHonors.,(B.Sc.Honors.)degreewithMajorandMinor(176credits)										
OR										
6.0/400	VII	DSC1-13(4) DSC1-14(4)	DSE1-5(4)	ResearchMethodology(4)	------	----	----	ResearchProject(6)	22	**44 UG Honours withresearchDegreein Mainfaculty(176)**
	VIII	DSC1-15(4+2) DSC1-16(4+2)	DSE1-6(4)		----	-----	----	ResearchProject(6)	22	
	Total 4Yrs	**86-8#**	**14**	**16+8#**	**08**	**16**	**16**	**20**	**176**	

5.5/300	V	DSC1-7 (3+2) DSC1-8 (3+2) DSC1-9 (3+2)	DSE1-1 (2+1) or DSE1-2 (2+1)	----	----	VSC3 (2) (Hands on Training related to DSE)	IKS 2 (2) (related to major subject)	--	22	**44 UG degree (132)**
	VI	DSC1-10 (3+2) DSC1-11 (3+2) DSC1-12 (3+2)	DSE1-3 (2+1) or DSE1-4 (2+1)	----	---	VSC4 (2) (Hands on Training related to DSE)		FP/CEP/OJT (2)	22	
	Total Credits 3 Yrs	**66-8#**	**6**	**12 +8# 20**	**10**	**12**	**16**	**10**	**132**	
Exit option: Award of UG degree in Major with 132 Credits OR Continue with Major										
6.0/400	VII	DSC1-13 (4+2) DSC1-14 (4+2)	DSE1-5 (4+2)	Research Methodology (4)	------	----	----	---	22	**44 UG Honours Degree in Main faculty (176)**
	VIII	DSC1-15 (4+2) DSC1-16 (4+2)	DSE1-6 (4+2)		----	-----	----	OJT/In-house Project/ Internship/ Apprenticeship (4)	22	
	Total 4 Yrs	**90-8#**	**18**	**12+8#+4**	**10**	**12**	**16**	**14**	**176**	
Award of Bachelor of Science Honors., (B.Sc. Honors.) degree with Major and Minor(176 credits)										

6.0/400	VII	DSC1-13(4) DSC1-14(4)	DSE1-5(4)	Research Methodology (4)	---- --	----	----	Research Project (6)	22	**44 UG Honours with research Degree in Main faculty (176)**
	VIII	DSC1-15 (4+2) DSC1-16(4+2)	DSE1-6(4)		----	-----	----	Research Project (6)	22	
	Total4 Yrs	**86-8#**	**14**	**12+8#+4**	**10**	**12**	**16**	**10+12**	**176**	
		OR								

#Out of the three major courses in the first year, one major (comprising 4 credits for the 1st semester and 4 credits for the 2nd semester) will transition into a minor starting from the second year. Consequently, 8 credits will be reallocated from the major course credit count and added to the minor credit count, thereby meeting the requisite credit criteria for the minor

PAH SOLAPUR UNIVERSITY, SOLAPUR Certificate course in Botany (As per NEP 2020)					
Semester – I					
Course Code	**Title of Papers**	Distribution of Marks for Examination			**Total credit**
		CA	UA	Total	
DSC1-1 (2+2) **G04-0103**	Algae, Fungi andArchegoniate	20	30	50	2
DSC1-2 (2+2)	To be selected from Other than Botany	40	60	100	4
DSC1-3 (2+2)	To be selected from Other than Botany	40	60	100	4
PRDSC1-1 (2) **G04-0103 P**	Practical based on DSC1-1	20	30	50	2
GE 1/OE1(2) **G04-GE-OE- 103**	Horticulture	20	30	50	2
SEC 1 (2) **G04-SEC-0103**	BOTANY –SEC 1 Biofertilizer	20	30	50	2
L1-1 (2) **ENG-103**	English	20	30	50	2
IKS (2) **IKS- 103**	IKS	20	30	50	2
VEC1 (2) **ICD-103**	Constitution of India	20	30	50	2
FP/RP/CC	-	-	-	-	-
Total Marks + Credit for Semester - I		**220**	**330**	**550**	**22**
Semester - II					
DSC1-1-2 (2+2) **G04-0203**	Plant Ecology and Taxonomy of Angiosperm	20	30	50	2
DSC1-2-2 (2+2)	To be selected from Other than Botany	40	60	100	4
DSC1-3-2 (2+2)	To be selected from Other than Botany	40	60	100	4
PRDSC1-2 **G04- 0203P**	Practical based on PRDSC1-2	20	30	50	2
GE/OE-2 (2) **G04-GE-OE -0203**	Floriculture and landscape architecture	20	30	50	2
SEC 2 (2) **G04-SEC- 0203**	BOTANY SEC 2(2) Mushroom Cultivation Technology	20	30	50	2
L1-2(2) **ENG- 203**	English	20	30	50	2
VEC2(2) **ENG-24**	(Environmental Studies)	20	30	50	2
FP/RP/CC	NCC/NSS/Culture/sports/Social activities	20	30	50	2
Total Marks + Credit for Semester - II		**220**	**330**	**550**	**22**
Total Marks + Credit for Semester - I		220	330	550	22

Total Marks + Credit for Semester - II	220	330	550	22
Total Marks and Credit	**440**	**660**	**1100**	**44**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty – Science and Technology

Name of the Course – B.Sc. I (Botany)

Semester – I

Total no. of Marks- 550 **Total no. of Credits** - 22

Sr No.	Course Name	Course code	No. of Credits	Max no. of Marks	No. of Clock Hours
1	DSC1-1 Algae, Fungi and Archegoniate	**G04-0103**	2	50 (20+30) Unit 1 25 Marks Unit 2 25 Marks	30
2	DSC1-2 (2+2) To be selected from Other than Botany	-	4	100(40+60)	60
3	DSC1-3 (2+2) To be selected from Other than Botany	-	4	100(40+60)	60
4	PRDSC1-1 Practicals	**G04-0103 P**	2	50 (20+30)	30
5	GE 1/OE1(2) Horticulture	**G04-GE-OE-103**	2	50 (20+30) Unit 1 25 Marks Unit 2 25 Marks	30
6	SEC 1 (2) BOTANY –SEC 1 Biofertilizer	**G04-SEC-0103**	2	50 (20+30)	30
7	L1-1 (2) English	-	2	50 (20+30)	30
8	IKS (2) IKS	IKS1	2	50 (20+30)	30
9	VEC1 (2) Constitution of India	-	2	50 (20+30)	30

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty – Science and Technology
Name of the Course – B.Sc.I (Botany)

Semester – II
Total no. of Marks- 550 **Total no. of Credits** - 22

Weightage

Sr No.	Course Name	Course code	No. of Credits	Max no. of Marks	No. of Clock Hours
1.	DSC1-1-2 (2+2) Plant Ecologyand Taxonomy of Angiosperm	**G04-0203**	2	50 (20+30) Unit 1 25 Marks Unit 2 25 Marks	30
2.	DSC1-2-2 (2+2) To be selected from Other than Botany	-	4	100(40+60)	60
3.	DSC1-3-2 (2+2) To be selected from Other than Botany	-	4	100(40+60)	60
4.	PRDSC1-2 Practical based onPRDSC1-2	**G04-0203P**	2	50 (20+30)	30
5.	GE/OE-2 (2) Floriculture	**G04-GE-OE-203**	2	50 (20+30) Unit 1 25 Marks Unit 2 25 Marks	30
6.	SEC 2 (2) BOTANY SEC 2(2) Mushroom Culti vationTechnology	**G04-SEC-0103**	2	50 (20+30)	30
7.	L1-2(2)	-	2	50 (20+30)	30
8.	VEC2(2) (Environ mentalStudies)	**-**		50 (20+30)	30
9.	**FP/RP/CC** NCC/NSS/Culture/sports/Soc ial activities	-	2	50 (20+30)	30

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

NEP 2020 Compliant Curriculum

BSC (Botany)

Program Specific Outcomes (PSOs)

Students graduating from B.Sc. (Botany) will able to:

PO1	Produce competent plant biologists who can employ and implement their gained knowledge in basic and applied aspects that will profoundly influence the prevailing paradigm of agriculture, industry, healthcare, and environment to provide sustainable development. Transformed curriculum shall develop educated outcome-oriented candidature, fostered with discovery- learning, equipped with practice & skills to deal practical problems and versed with recent pedagogical trends in education including e-learning, flipped class and hybrid learning to develop into responsible citizen for nation building and transforming the country towards the future with their knowledge gained in the field of plant science.
PO2	Will increase the ability of critical thinking, development of scientific attitude, handling of problems and generating solutions, improve practical skills, enhance communication skill, social interaction, and increase awareness in judicious use of plant resources by recognizing the ethical value system.
PO3	The training provided to the students will make them competent enough for doing jobs in Govt. and private sectors of academia, research, and industry along with graduate preparation for national as well as international competitive examinations, especially UGC-CSIR NET, UPSC, Civil Services Examination, IFS, NSC, FCI, BSI, FRI etc. Lifelong learning is achieved by drawing attention to the vast world of knowledge of plants and their domestication.

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University,Solapur** **First Year B.Sc. (Botany) Semester-I** **Vertical : DSC-1** **Course Code: G04-0103 Course Name: Algae, Fungi and Archegoniate**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: Algae, Fungi and Archegoniate is one of the core course in Botany, it is one of the basic course in botany. The syllabus is prepared to enable students for competitive exams in frontier areas of plant sciences. Students will be able to know about cryptogamic and phanerogamic plant groups, characteristic features of all plant groups, identification marks, their role in industry, pollution control, bio-fuel & biogas production by using cryptogamic plants. Course aim to develop practical skills in identification & commercial applications.

Course objective: During this course , the student is expected to:

1. To get the knowledge about the Introduction, characters, classification, of algae, fungi, bryophytes, Pteridophytes & gymnosperms.
2. To get the knowledge about the general Characters of divisions like Chlorophyta, pheophyyta, zygomycotina their occurrence, classification, Thallus organization & reproduction of examples like *Spirogyra, Sargassum , Cycas* & *Mucor*.
3. To get the knowledge about the Bryophytes, Pteridophytes & gymnosperms their general characters.
4. To understand economic importance of algae, fungi, archegonites, bryophytes, pteridophyes & gymnosperms

1

Course Outcomes: At the end of this course students will be able to:

1. Apply knowledge about identification of algae, fungi which is used in different industries.
2. Apply their identification skills to identify *Spirogyra, Sargassum* & *Mucor, Cycas*
3. Apply knowledge about identification of bryophytes, Pteridophytes & gymnosperms.
4. Gain knowledge about economic importance of Algae, fungi, bryophytes, Pteridophytes & Gymnosperms.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology As per NEP 2020

Semester I Subject Botany

DSC1 (1): Paper I: Algae, Fungi and Archegoniate

(30 L) (Credits: Theory 2 + Practical 2)

Unit-1:	**ALGAE & FUNGI**	**15 L**	**Weigh t age**
1.1	Introduction, General Characters, And Classification of Algae (As Per Smith- 1955) up to Class. Economic importance of algae	(3 L)	5 mark
1.2	Chlorophyta: General Characters Study of ***Spirogyra*** - Occurrence, Classification, Thallus structure and Reproduction (Excluding Developmental Stages)	(3 L)	5 mark
1.3	Phaeophyta: General Characters Study of ***Sargassum*** - Occurrence, Classification, Thallus structure and Reproduction (Excluding Developmental Stages)	(3 L)	5 mark
1.4	General Characters, Classification of Fungi up to Class (As per Ainsworth)	(2 L)	3 mark
1.5	Zygomycotina: General Characters Study of ***Mucor***: Occurrence, Classification, Thallus Organization, Life Cycle(Excluding Developmental Stages)	(3 L)	5 marks
1.6	Economic Importance of Fungi	(1 L)	2 marks
Unit 2	**ARCHEGONIATE**	**15 L**	
2.1	Introduction, General Characters of archegoniate	(2 L)	3 marks
2.2	**Bryophytes:** General Characters, and Classification (As Per G. M. Smith) Study of ***Riccia***- Occurrence, Classification, Thallus Structure (Externaland Internal) and Reproduction (Excluding Development). Economic Importance of Bryophytes	(4 L)	6 marks
2.3	**Pteridophytes** General Characters and Classification Up to Class (As Per G. M.Smith) Study of ***Selaginella***: Occurrence, Classification, Morphology of Sporophyte, Anatomy (Stem) and Reproduction (Excluding Development). EconomicImportance of Pteridophyte	(4 L)	6 marks
2.4	**Gymnosperms:** General Characters and Classification (As Per Sporne) Study of ***Cycas:*** Occurrence, Classification, Morphology (Sporophyte, CoralloidRoot), Anatomy of Leaflet and Reproduction.	(4 L)	6marks
2.5	Economic Importance of Gymnosperm	(1 L)	2 marks

References Book

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
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3.Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.

4. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.

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8.Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
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11. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
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पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University,Solapur** **First Year B.Sc. (Botany) Semester-I** **Vertical : PRDSC-1** **Course Code: G04-0103 P** **Course Name: Based on DSC-1**
***Teaching Scheme** **Practical:02Hours/week, 02Credit**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Practical based on DSC 1-1(2)

1	Study of dissecting and compound microscopes.
2	Identification of Algae (***Nostoc ,Ulva)***
3	Identification of Fungi (***Yeast, , Penicillium***)
4	Study of ***Spirogyra***.
5	Study of ***Sargassum***
6	Study of ***Mucor***
7	Identification of Bryophytes (***Marchantia, Anthocerous***)
8	Identification of Pteridophytes (***Equisetum, Adiantum***)
9	Identification of Gymnosperms (***Araucaria, Thuja***)
10	Study of ***Riccia***.
11	Study of ***Selaginella***- Morphology of sporophyte and anatomy of stem,
12	Study of ***Selaginella***- Reproductive structure: Strobilus, Microsporangium, Megsporangium
13	Study of ***Cycas***- Morphology of sporophyte and anatomy of leaflet.
14	Study of ***Cycas***- Reproductive structure: male cone, microsporophyll, microspore and megasporophyll, L. S. of ovule (permanent slide).
15	Submission (Algae/ Fungi/ Archigoniate)

	Punyashlok Ahilyadevi Holkar Solapur University,Solapur **First Year BSc (Botany) Semester-I** **Vertical :** **Course Code: G04-GE-OE-103** **Course Name: Botany-GE/OE-I(Horticulture)**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: This course is designated to improve the horticulture techniques, concepts horticulture skills of students. Where they apply their knowledge to start their own startup in the form of does develop the nursery or apply their knowledge in development of new plant varieties on commercial basis.

Course objective: **During this course, the student is expected to:**

1. To get the knowledge about the basic concepts of Horticulture
2. To understand the scope and importance of horticulture
3. To get knowledge about the various branches such as floriculture, Pomo-culture,olericulture.
4. To get the knowledge and understand the various garden implements essential for horticulture, potting repotting and transplanting & plant propagation methods.

Course Outcomes: At the end of this course students will be able to:

1. Students will understand concepts in horticulture
2. They get knowledge to apply their skills in gardening to develop the nursery.
3. Apply their practical knowledge in field of floriculture, Pomo-culture,olericulture etc.
4. Students will learn about various garden implements essential for horticulture, Potting repotting and transplanting & plant propagation methods like cutting, layering, budding, grafting.

GE/OE - I
Horticulture
Credit-2 Lecture30

Unit 1. Horticulture: (15L)

1.1. Introduction (1L) 2marks

1.2.Scope and importance of Horticulture (2L) 3marks

1.3.Branches of Horticulture: Floriculture, Pomoculture, Olericulture (4L) 6marks

1.4. Garden Implements: Khurapi, Sickle, Secateur, Digging Fork, Garden shears, budding Knife,grafting knife, Tree pruner, garden rake, Shovel, Water can. (4L) 6marks

1.5. Potting, repotting, and transplanting (4L) 6marks

Unit2. Plant propagation (15 L)

2.1. Introduction (1L) 2 marks

2.2. Sexual method (seed propagation): annuals, biennials, and perennial plant (2L) 3marks

2.3. Vegetative Methods of propagation: Runners, suckers, offsets, Stolon, Tubers, bulb, Rhizome, bulbils, Corms (4L) 6marks

2.4. Asexual methods of propagation (7L) 11marks
Cutting: Root Cutting, stem Cutting, leaf Cutting
Layering: Air layering, simple layering, compound layering
Budding: T budding, patch budding
Grafting: whip grafting, Approach grafting

2.5. Scope and importance of Propagation (1L) 2marks

References:

1. Singh, D. & Manivannan, S. (2009). Genetic Resources of Horticultural Crops. Ridhi International, Delhi, India
2. Kader, A. A. (2002). Post-Harvest Technology of Horticultural Crops. UCANR. Publications, U. S. A.
3. NIIR Board (2005). Cultivation of Fruits, Vegetables and Floriculture. National Institute of Industrial Research Board, Delhi.
4. Kader, A. A. (2002). Post-Harvest Technology of Horticultural Crops. UCANR Publications, U. S. A.
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6. Khan M.R. (1995). Horticulture and Gardening Nirali prakashan Pune
Kumar, N. (1997). Introduction to Horticulture, Rajalakshmi Publication Nagercoil.

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University,Solapur** **First Year BSc (Botany) Semester-I** **Vertical : SEC -1** **Course Code: G04-SEC-103** **Course Name: Biofertilizer**
***Teaching Scheme** **Practical:02Hours/week, 02Credit**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: This course is mainly develop to get practical skills in Biofertilizer in that types of Biofertilizer, methods of isolation, purification of Biofertilizer, standardization, mass production techniques, sterilization methods all that techniques are included.

Course objective: **During this course , the student is expected to:**

1. Create ability to distinguish the types of Biofertilizer.
2. Acquires skills in preparation of bio and vermicompost
3. Acquire skill isolation, identification & to manufacture nitrogenfixing bacteria such as *Rhizobium, Azospirillum, Azotobacter*
4. Acquire skill for mass production and methods of evaluation of biofertilizers.

Course Outcomes: At the end of this course students will be able to:

1. Able to distinguish the types of Biofertilizer
2. Able to learn about application of Biofertilizer
3. Acquire skill isolation, identification & to manufacture nitrogenfixing bacteria such as *Rhizobium, Azospirillum, Azotobacter* etc.
4. Understand technique involved in mass production and methods ofevaluation of biofertilizers

SEC 1: Biofertilizer (2 Credit - 30L)

1. Study of types of biofertilizers
2. Study of applications of biofertilizer
3. Study of preparation of BGA
4. Study of preparation of Vermicompost
5. Isolation of AM
6. Isolation of *Rhizobium* from root nodules
7. Isolation of *Azospirillium* from plant roots
8. Isolation of *Azatobactor* from soil
9. Isolation of Plant growth promoting rhizobacteria
10. Characterization of plant growth promoting bacteria
11. Mass production of Biofertilizers
12. Methods of evaluation of biofertilizers
13. Pot & Field with inoculated seeds
14. To purify & preserve the biofertilizers
15. Laboratory equipments

References:

1. Dubey, R.C., 2005 ATextbook of Biotechnology S.Chand & Co, New Delhi.
2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi
6. Vayas,S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University,Solapur** **First Year BSc (Botany) Semester-I** **Vertical : IKS -1** **Course Code: IKS-101** **Course** Name**: Introduction to IKS in Science**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Introduction to IKS in Science

Theory Periods: 30 Hours Marks:50 Marks

CourseCredit :2 Credits

Course Outcomes: Upon completion of this course students will be able

1. Understanding Indian Philosophical Systems and Knowledge Development
2. Analyzing Indian Contributions to Science, Astronomy, and Mathematics
3. Exploring Traditional Indian Approaches to Life, Health, and Environment

Unit I: Bhāratīya Civilization and Development of Knowledge System (10 Hours):

- Indian Knowledge Systems (IKS): Foundational concepts and characteristics of Indian philosophical and scientific traditions.
- Significance of Ancient Knowledge: Understand the need of ancient knowledge and its role in shaping modern civilization.
- Indian Philosophical Systems: Development and distinctive features of both Vedic and non-Vedic philosophical systems, analyzing their historical and culturalcontexts.
- Ancient Educational Institutions: Takṣaśilā and Nālandā, and notable alumni whocontributed to the spread of knowledge.

Unit II: Science and Mathematics (10 Hours)

- Physics: Indian concepts related to the atom, laws of motion, electricity, magnetism, and the mystery of light.
- Chemistry: Indian innovations in daily-life chemistry, including dyes, paints, cements, glass, pottery, and metallurgy.
- Mathematics:Indian origin of foundational mathematical and statistical concepts, such as the concept of zero, pi, the decimal number system and Probability. Bodhayana Sutra and Vedic Mathematics, emphasizing their influence on mathematical thinking.

Unit III: Life, Environment, and Health (10 Hours)

- Approaches to Life and Health: Traditional Indian perspectives on life sciences, including plant science, anatomy and physiology, and agriculture.
- Environmental Awareness: India's traditional emphasis on ecology and environmental sustainability. Ancient practices that promote environmental stewardship.

Text books:

1. IKS:The Knowledge System of Bhārata by Bhag Chand Chauhan
2. INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM: CONCEPTS ANDAPPLICATIONS by B. MAHADEVAN
3. History of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishna Mission Instituteof Culture, Kolkata (2014).

Punyashlok Ahilyadevi Holkar Solapur University,Solapur

First Year BSc (Botany) Semester-II

Vertical : DSC -2

Course Code: G04-0203

Course Name: Plant Ecology and Taxonomy of Angiosperm

*Teaching Scheme	*Examination Scheme
Lectures:02 Hours/week, 02 Credits	UA:30 Marks CA: 20 Marks

Course Preamble: This course is designated to get knowledge about concepts in plant ecology, levels of organization, climatic edaphic factors, hydrophytic & xeric adaptations, pyramids & ecological succession along with that various concepts in taxonomy, classification systems, identification of plants, their commercial approach.

Course objective: **During this course, the student is expected to:**

1. Get knowledge about the introduction, basic concept, levels of organization.
2. Get knowledge about the Climatic Factors & Edaphic Factors & Ecological succession.
3. Get knowledge about general characters of angiosperms, different types of classification with its merit & demerits, Principles of ICBN & Nomenclature of plants.
4. Get knowledge about botanical gardens of India & morphological & reproductive characters of families

Course Outcomes: At the end of this course students will be able to:

1. Understand about the basic concept, levels of organization.
2. Understand about the Climatic Factors- Light, Temperature, Humidity, Wind & Rainfall, soil, its origin, formation and components with Morphological, anatomical, and Physiological adaptations in hydrophytes & xerophytes
3. Understand about general characters of angiosperms, primitive and advanced characters of flower, different types of classification and its merit & demerits, Principles of ICBN skills in identification of plants.
4. Understand about Calcutta botanical garden and Lead botanical garden Kolhapur & knowledge of identification of plant families.

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SolapurFaculty of Science and technology

As per NEP 2020

Semester I Subject Botany

DSC 1(2): Paper II: Plant Ecology & Taxonomy ofAngiosperm

(30 L) (Credits: Theory 2 + Practical 2)

Unit 1:	**Plant Ecology**	**15 L**	**weight age**
1.1	Introduction, Basic Concept., Levels of organization	(2 L)	3marks
1.2	Climatic Factors- Light, Temperature, Humidity, Wind & Rainfall.	(2 L)	3marks
1.3	Edaphic Factor: Origin, Formation & Components of soil.	(2 L)	3marks
1.4	**Ecological Adaptation:** Morphological, anatomical, adaptations in hydrophytes	(3 L)	5marks
1.5	Morphological, anatomical, and Physiological adaptations in xerophytes	(3 L)	5marks
1.6	Ecological succession – Introduction, concept & process, Hydrosere andXerosere	(3 L)	5marks
Unit 2:	**Taxonomy of Angiosperm**	15 L	
2.1	Introduction, Aims and Principles of Taxonomy	(2 L)	3marks
2.2	General characters of angiosperms, primitive, and advanced characters of flower	(2 L)	3marks
2.3	Types of classification: Artificial, Natural and Phylogenetic, Salient features,outline of Bentham and Hooker system of classification, Merits, and demerits	(3 L)	5marks
2.4	Principles of ICBN , Nomenclature, Binomial nomenclature of plants	(2 L)	3marks
2.5	Botanical gardens of India- Sir J. C. Bose Botanical Garden, Calcutta &Lead Botanical Garden of Shivaji University Kolhapur	(2 L)	3marks
2.6	Study of Angiosperms families: systematic position, morphological & distinguishing characters with economic importance of following families: a) Caesalpiniaceae b) Solanaceae c) Nyctaginaceae d) Amaryllidaceae	(4 L)	6marks

References.

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Odum, E.P. Ecology. Oxford & F. B. h. Publishing Co. pvt. LTD -New Delhi.
4. Barbour, M.G., Burk, J.H. and Pitts, W.D. 1987. Terrestrial Plant Ecology. Benjamin Cummings Publication Co., California.
5. Kormondy, E.J. 1996. Concepts of Ecology, Prentice-Hall of India Pvt. Ltd., New Delhi.
6. Hill, M.K. 1997. Understanding Environmental Pollution. Cambridge University Press.
7. Mackenzie, A. et al. 1999. Instant Notes in Ecology. Viva Books Pvt. Ltd., New Delhi.
8. Ashok Bendre / Ashok Kumar Economic Botany Rastogi Publications Shivaji Road, Meerut 250002 India.
9. Prof. M.A. Khan – Environment, Biodiversity and Conservation S-B Nangia, A.P.H.Publishing Corporation, 5, Ansari Road, Daryaganj New Delhi – 110002.
10. B.P. Pandey – Modern Practical Botany Vol – I / II Chand & Company Ltd. Ramnagar New Delhi – 110055.
11. R.S. Shukla & P. S. Chandel. Plant Ecology. S. Chand & Company LTD. Ram Nagar, New Delhi.110055.
12. Pavas Divan – Environ Protection – Deep & Deep Publications D-I 124, Rajouri Garden, New Delhi – 110027.
13. P.S. Verma / V.K. Agrawal – Concept of Ecology, S. Chand & Lonpan Ltd. Ramnagar, New Delhi – 110055.
14. Eug Warming – Ecology of Plants, Ambey Publications Delhi (India)
15. Evgene P Odum – Ecology Oxford & IBH Publishing Co. Pvt. Ltd. Kolkata (Calcutta), New Delhi.
16. Ishwar Prakash. Desert Ecology. Scientific Publications, Ratandas Road, Jodhpur. -342001-India.
17. T.W. Woodhead. Plant Ecology. Sonali Publications. New Delhi.110002.
18. Eug. Warming. Ecology of Plant. Ambey Publications Delhi.
19. Jonathan Silvertown. Introduction To Population Plant Ecology. Longman Singapore Publisher, LTD.
20. Morphology of Angiosperms, J M Coulter and C J Chamberlain, Pointer Publishers, Jaipur.
21. Taxonomy of Angiosperm R Pandey, S Chand and Co. Ltd, Ramnagar New Delhi.110055
22. An Introduction to Taxonomy of Angiosperms- Pritish Shukla, Shital P Mishra, Vikas Publishing House, Pvt. Ltd. Ghaziabad, UP.
23. A Textbook of Angiosperms-B P Pandey, S Chand, and Co Ltd. Ramnagar, New Delhi.110055
24. A Textbook of Botany - 'Angiosperm, V Singh C Pande, D K Jain, Rastogi Publication, Shivaji Road Meerut.250002

25. Taxonomy of Angiosperm, Neeru Mathur, Sonali Publications, New Delhi, 110002.
26. Angiosperms-G L Chopra, Pradeep Publications, Jalandhar, 144008.
27. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.
28. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
29. Jeffrey, C. (1982). An introduction to plant Taxonomy, Cambridge University Press, Cambridge.
30. Judd, W.S., Campbell, C.S., Kellog, E.A., Steven, P.F. (2002). Plant Systematics- A Phylogenetic approach. Sinauer Associates Inc., U.S.A. 2nd edition.
31. Maheshwari j.k. (1963). Flora of Delhi. CSIR, New Delhi.
32. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
33. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
34. Gaikwad, S. P. & Garad, K. U. (2015). Flora of Solapur District, Laxmi Book Publication Solapur.

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***Teaching Scheme** **Practical:02Hours/week, 02Credit**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Practical based on DSC 1-2(2)

1	Study of soil p^H by Universal indicator/p^H paper/p^H meter
2	Study of Water holding capacity of different soil
3	Study of meteorological instruments (any three)
4-5	Ecological adaptations of Hydrophytes (*Hydrilla*, *Eichhornia* and *Typha*).
6	Ecological adaptations of Xerophytes (*Nerium* and *Aloe*).
7	Study of typical flower
8	Study of types of placentation
9	Study of types of aestivations
10	Study of floral formula and floral diagram
11	Study of plant family Caesalpiniaceae
12	Study of plant Family Solanaceae
13	Study of Plant family Nyctaginaceae
14	Study of Plant family Amaryllidaceae
15	Excursion report.

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University,Solapur** **First Year BSc (Botany) Semester-I** **Vertical :** **Course Code: G04-GE-OE-203** **Course Name: Botany-GE/OE-II Floriculture & Landscape Gardening**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: This course is designated to develop skills in cultivation of garden plants. basic information on Landscape horticulture & floriculture, Landscape design, principles & practices, types, species of plants used in floriculture, design making, various industries based on floriculture, scope of floriculture and commercial application. So the students will able to make self employment or should use the techniques to start commercial set up.

Course objective: **During this course, the student is expected to:**

1. Understand basics in floriculture, its concepts, equipments used, introduction & scope
2. Understand methods of gardening, its implementation & role in balancing environment
3. Understand landscape gardening, its design making, types of species used in floriculture
4. Understand industrial scope, commercial applications of floriculture.

Course Outcomes: At the end of this course students will be able to:

1. Acquainting basic information on Landscape horticulture & floriculture
2. Apply knowledge to develop Landscape design, principle & practices.
3. Get knowledge about plants species used for landscape.
4. Get knowledge about floriculture industry & scope.

Floriculture & Landscape Gardening

Unit 1: Introduction & Importance of floriculture (15 L)

1.1 Introduction of floriculture, Importance of floriculture (3L) 5marks

1.2 Importance and scope of landscaping, (3L) 5marks

1.3. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening (4L) 6marks

1.4. Garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, otherconstructed features gardens for special purposes. (5L) 8marks

Unit II: Garden Plants & Landscaping (15 L)

2.1. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous (3L) 5marks

2.2. Perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance,selection, propagation, planting (3L) 5marks

2.3. Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cactisucculents. (3L) 5marks

2.4. Pot plants: selection, arrangement, management. (1L) 2marks

2.5. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance, CAD application (5L) 8marks

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University,Solapur** **First Year BSc (Botany) Semester-II** **Vertical : SEC -2** **Course Code: G04-SEC- 203** **Course Name: Mushroom Cultivation**
***Teaching Scheme** **Practical:02Hours/week, 02Credit**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: This course is designated to develop practical skills in mushroom cultivation, identification methods of edible mushroom, spawn preparation, raw materials used for mushroom cultivation, types of mushrooms, nutrient content, industrial & market scope. The course is designated to get overall practical knowledge of mushroom cultivation so students can start or think to start their commercial set up for mushroom cultivation.

Course objective: **During this course, the student is expected to:**

1. Get knowledge about history & importance of mushroom, structure of mushroom, its development process.
2. Understand isolation and media preparation process for mushroomcultivation
3. Analyze different mushroom cultivation centers in India
4. Provide hands on training for the preparation of bed for mushroom cultivation and spawn production.

Course Outcomes: At the end of this course students will be able to:

1. Students will be able to understand earlier history and importance of mushrooms. Understand basic structure of mushroom, developmental process, structure of basidiocarp with its example like Agaricus, to identify edible and poisonous mushrooms.
2. Understand nutritional value of mushrooms; learn mushroom cultivation, harvest, storage, marketing practices for self-employment and income generation
3. Students will be able to analyze different mushroom cultivation centers along with they will get an idea about how mushroom cultivation takes place in commercial sectors.
4. Understand the technique of spore isolation and media preparation. understand techniques of bed and spawnproduction.

SEC 2(2)

Paper I: Mushroom Cultivation

Theory: 30 hours Credits: 2

1. Preparation of Pure culture & maintenance of culture
2. Sterilization conditions in mushroom cultivation
3. Bed preparation & conditions for mushroom cultivation
4. Preparation of mother spawn, & its storage
5. Composting methods
6. Sapwing, casing, cropping & post harvest handling
7. Cultivation of Oyster mushroom
8. Cultivation of Paddy straw mushroom
9. Cultivation of milky mushroom
10. Cultivation of shitake
11. Cultivation of *Ganoderma*
12. Cultivation of *Cordyceps militaris*
13. Identification of insects affecting button mushroom
14. Diseases caused by fungi, bacteria & Abiotic factors
15. Market survey & cost benefit analysis

References:

1. Bahl, N. (2000). Handbook of Mushrooms. Oxford & Ibh Publishing Co. Pvt Ltd.
2. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R. (1991). Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
3. Swaminathan, M. (1990). Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
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Punyshlok Ahilydevi Holkar Solapur University, Solapur

Practical Skeleton

B.SC I

Centre: **Total Marks:30**

Date:

NB: Draw neat & labeled digrams wherever necessary

2. Do not write about points of therotical information unless ask specifically

3. Perform the experiment as per instructions given by the examiners

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Identify & show the important structures observed by you in the given specimen A & B (06)

Identify & show the important structures observed by you in the given specimen C & D (06)

Identify & show the important structures observed by you in the given specimen E & F (03)

Identification (05)

g) Identify & describe (Slide)

h) Identify & describe (Algae/fungi)

i) Identify & describe (bryo/Pteridophyte)

j) Identify & describe (Gymno vegetative/reproductive)

k) Identify & describe (Microscope)

A) Journal (05)

B) Tour report/submission (05)