



**BAGALKOT UNIVERSITY  
JAMKHANDI**

**PROGRAM /COURSE STRUCTURE AND SYLLABUS  
For**

**Bachelor of Science with BOTANY  
I and II Semester**

**w.e.f.  
Academic Year 2024-25 and onwards**

## PROGRAM STRUCTURE

Syllabus and Credits Structure under Choice Based Credit System [CBCS] General Degree for the Three Years B.Sc. with Botany Undergraduate Programme with effect from 2024-25

### First Semester B.Sc. With Botany Scheme

<b>SEMESTER-I</b>											
Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of Exam (Hrs)	Teaching Department
			IA	SEE	Total	L	T	P			
L1	-----	Language 1	20	80	100	4	-	-	3	3	-----
L2	-----	Language 2	20	80	100	4	-	-	3	3	-----
Major	2A1BOTM01T	Diversity of viruses, microbes, algae, fungi and their applications	20	80	100	4	-	-	3	3	Botany
	2A1BOTM01L	Diversity of viruses, microbes, algae, fungi and their applications Lab	10	40	50	-	-	4	2	3	Botany
Major		Major Subject 2	20	80	100	4	-	-	3	3	---
		Practical	10	40	50	-	-	4	2	3	---
Major		Major Subject 3	20	80	100	4	-	-	3	3	---
		Practical	10	40	50	-	-	4	2	3	---
	2S1XXXC01T	Constitutional Values/	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment studies									Environmental Studies: Chemistry/ /Geography/ Botany
<b>Total Marks</b>					<b>700</b>	<b>Semester Credits</b>			<b>23</b>		

## Second Semester B.Sc. Botany Scheme

SEMESTER-II											
Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of exams (Hrs)	Teaching Department
			IA	SE E	Total	L	T	P			
L3	-----	Language 3	20	80	100	4	-	-	3	3	-----
L4	-----	Language 4	20	80	100	4	-	-	3	3	-----
Major	2A2BOTM02T	Diversity and Applications of Bryophytes, Pteriophytes, Gymnosperms and Paleo botany	20	80	100	4	-	-	3	3	Botany
	2A2BOTM02L	Diversity and Applications of Bryophytes, Pteriophytes, Gymnosperms and Paleo botany Lab	10	40	50	-	-	4	2	3	Botany
Major	----	Major Subject 2	20	80	100	4	-	-	3	3	-----
	-----	Practical	10	40	50	-	-	4	2	3	-----
Major	-----	Major Subject 3	20	80	100	4	-	-	3	3	-----
	-----	Practical	10	40	50	-	-	4	2	3	-----
	2S1XXXC01T	Constitutional Values	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment Studies									Environmental Studies: Chemistry/Geography/ Botany
<b>Total Marks</b>					<b>700</b>	<b>Semester Credits</b>			<b>23</b>		

**Bagalkot University, Jamkhandi**  
**B.Sc. Botany**

**Programme Specific Outcomes (PSO):**

On completion of the 03 years Degree in **Botany** students will be able to:

- Demonstrate, solve and understand the major concepts in all the disciplines of **Botany**.
- Understand practical skills so that they can understand and assess risks and work safely and competently in the laboratory.
- To apply standard methodology to the solutions of problems in **Botany**
- Provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes.
- Develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.
- Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of **Botany**
- To build confidence in the candidate to be able to work on his own in industry and institution of higher education.
- To develop an independent and responsible work ethics.
- The graduate should be able to demonstrate sufficient proficiency in the hands-on experimental techniques for their area of specialization within biology during research and their professional career.
- To enable the students for practicing the best teaching pedagogy as a biology teacher including the latest digital modules.
- The graduates should be knowledgeable and competent enough to appropriately deliver on aspects of global importance like climate change, SDGs, green technologies, etc at the right opportunity.
- Skill development for the collection, preservation, and recording of information after observation and analysis- from simple illustration to molecular database development.
- To enable the graduates to prepare for national as well as international level competitive examinations like UGC-CSIR, UPSC, KPSC, and others.

<b>Year</b>	I	<b>Course Code: 2A1BOTM01T</b> <b>Paper Title: Diversity of viruses, microbes, algae, fungi and their applications</b>	<b>Credits</b>	03
<b>Sem.</b>	1		<b>Hours</b>	52
Internal Assessment Marks: 20		External Assessment Marks: 80	Duration of Exam: 03hrs.	

### Course

**Outcomes (COs): At the end of the course students**

**will be able to:**

- CO 1:** Develop an understanding of the concept of microbial nutrition, Classify viruses based on their characteristics and structures. Demonstrate an understanding of Algae.
- CO 2:** Develop a critical understanding of plant diseases and their remediation. Examine the general characteristics of bacteria and their cell reproduction/recombination.
- CO 3:** Increase the awareness and appreciation of human-friendly viruses, bacteria, algae, and their economic importance. Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.
- CO 4:** Demonstrate skills in laboratory, field, and glasshouse work related to mycology and plant pathology.
- CO 5:** Develop an understanding of microbes, fungi, and lichens and appreciate their adaptive strategies Identify the common plant diseases according to geographical locations and devise control measures. Conduct experiments using skills appropriate to subdivisions .

<b>Unit No.</b>	<b>Course content :</b>	<b>Hours</b>
<b>Unit I</b>	<p><b>Viruses and Microbes</b></p> <p><b>Viruses</b> – History; Classification (Baltimore); Living and non-living features; Structure of DNA virus (T4 phage); Lytic and lysogenic cycle; RNA virus (TMV); Viroids and Prions; Viral plant diseases –Banana bunchy top, Yellow mosaic of beans, Tobacco mosaic disease.</p> <p><b>Bacteria</b> – History; Classification; General characteristics of Archaeobacteria and Eubacteria; Morphology and ultrastructure of bacterial cell; Nutrition (autotrophic &amp; heterotrophic); Reproduction and Recombination; Plant diseases – Crown gall and Citrus canker.</p> <p><b>Cyanobacteria</b> – Morphology (Unicellular to multicellular); Cell composition; Classification and distribution; Reproduction; Type study – Nostoc, Oscillatoria.</p>	13 Hours
<b>Unit II</b>	<p><b>Algae</b></p> <p>General characteristics; Distribution; Range of thallus organization, Pigmentation and Classification (according to G. M. Smith); Reproduction; Morphology and life-cycles of <i>Chlorella</i>, <i>Chlamydomonas</i>, <i>Volvox</i>, <i>Chara</i>, <i>Ectocarpus</i>, <i>Batrachospermum</i></p>	13 Hours
<b>Unit III</b>	<p><b>Fungi</b></p> <p>General characteristics; Range of thallus organization; Cell wall composition; Nutrition; Reproduction and classification; (According to Alexopoulos)</p> <p>Life cycle of <i>Albugo</i> (Phycomycetes), <i>Rhizopus</i> (Zygomycetes),</p>	13 Hours

	<p><i>Aspergillus</i> (Ascomycetes), <i>Puccinia</i> (Basidiomycetes), <i>Cercospora</i> (Deuteromycetes); Symbiotic Associations (Lichen). Mycorrhiza: ectomycorrhiza and endomycorrhiza.</p>	
<b>Unit IV</b>	<p><b>Applications</b></p> <p><b>Virus:</b> In biological study – Vaccines, As vectors (gene therapy). Monera: Fermentation, Bioremediation, Bioaccumulation, Vectors (Agrobacterium), N<sub>2</sub> fixation and Industrial Importance (Spirulina and Insulin production).</p> <p><b>Algae:</b> In Agriculture, Industrial Economic importance of macroalgae (Seaweeds); In food, food chain in aquatic ecosystem.</p> <p><b>Fungi:</b> Role of fungi in Biotechnology – Food (Fermented products, Mycoproteins and Mushroom cultivation); Industry (Organic acid –citric acid, Enzyme – Pectinase); Medicine (Penicillin); Baking (Yeast); Biological Control –Mycoherbicides, Mycofungicides, Mycoinsecticides.</p>	13 Hours

### Recommended Learning Resources

1. Kumar,H.D.(1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2<sup>nd</sup>edition.
2. Tortora, G.J.,Funke,B.R., Case,C.L.(2010). Microbiology: An Introduction, PearsonBenjamin Cummings, U.S.A.10<sup>th</sup> edition.
3. Sethi, I.K.and Walia,S.K. (2011). Text book of Fungi & Their Allies, MacMillanPublishers Pvt. Ltd., Delhi.
4. Alexopoulos,C.J.,Mims,C.W.,Blackwell,M.(1996).IntroductoryMycology,JohnWileyandS ons(Asia),Singapore.4<sup>th</sup> edition.
5. Raven, P.H.,Johnson, G.B.,Losos, J.B.,Singer, S.R.,(2005).Biology. Tata Mc Graw Hill,Delhi, India.
6. Smith,G.M.1971.Cryptogamic Botany. Vol.I Algae & Fungi.Tata McGrawHillPublishingCo.,NewDelhi.
7. Sharma,O.P.1992. Text Book of Thallophytes .Mc Graw Hill PublishingCo.
8. Sharma,P.D.1991.TheFungi.Rastogi&Co.,Meerut.
9. Dube,H.C.1990.An IntroductiontoFungi.VikasPublishingHousePvt.Ltd.,Delhi.
10. Clifton,A.1958 .IntroductiontotheBacteria.McGrawHill&Co.,NewYork.
11. Aneja, K.R. 1993. Experiments in Microbiology, Pathology and Tissue Culture. VishwaPrakashan, New Delhi.
12. Vashista,B.R. 1978. Algae. S Chand & Co.Ltd., New Delhi.
13. Basu A.N. 1993. Essentials of plant viruses, vectors and plant diseases. New AgeInternational, New Delhi.
14. Chopra,G.L. A text book of algae. Rastogi & Co.,Meerut.
15. Fritze,R.E.1977. Structure and reproduction of Algae. Cambridge University Press.
16. Rangaswamy,G. 1988. Diseases of crop plants in India.Prentice Hall of India, NewDelhi.
17. Sundarajan,S.1997. College Botany Vol.I. S Chand & Co.Ltd., New Delhi.
18. Alexopoulos, 1992 .An Introduction to Mycology. New Age International, New Delhi.
19. Vashista,B.R. 1978. Fungi. S Chand & Co.Ltd., New Delhi.
20. H.N.Srivastava, 2003. Algae Pradeep Publication, Jalandhar, India
21. Singh-Pande-Jain 2004-05. A Text Book of Botany. Rastogi Publication, Meerut
22. Anil K.Thakur & Susheel K. Bassi. Diversity of Microbes and Cryptogams. ChandPublication.

<b>Year</b>	I	<b>Course Code: 2A1BOTM01L</b>	<b>Credits</b>	02
<b>Sem.</b>	1		<b>Course Title: Diversity of viruses, microbes, algae, fungi and their applications Lab</b>	<b>Hours</b>

Internal Assessment Marks: 10

External Assessment Marks: 40

Duration of Exam: 03hrs.

**Course Outcomes (COs): At the end of the course, students will be able to:**

**CO 1:** Develop an understanding of the concept of microbial nutrition, Classify viruses based on their characteristics and structures.

**CO 2:** Develop a critical understanding of plant diseases and their remediation. Examine the general characteristics of bacteria and their cell reproduction/recombination.

**CO 3:** Increase the awareness and appreciation of human-friendly viruses, bacteria, algae, and their economic importance. Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.

**CO 4:** Demonstrate skills in laboratory, field, and glasshouse work related to mycology and plant pathology.

**CO 5:** Develop an understanding of microbes, fungi, and lichens and appreciate their adaptive strategies

**CO 6:** Identify the common plant diseases according to geographical locations and devise control

<b>Unit No.</b>	<b>Course content</b>	<b>Hours 50</b>
	<p><b>List of the Experiments, each will have 4rs / Week (Minimum 12 experiments)</b></p> <ol style="list-style-type: none"> <li>1. Electron Micrographs / Models of Viruses – T<sub>4</sub> phage and TMV,</li> <li>2. Line drawing photograph of lytic cycle and lysogenic cycle. Viral plant diseases.</li> <li>3. Simple / differential staining of bacteria and Rhizobium from root nodules.</li> <li>4. Demonstration of VAM in roots / VAM photographs and Khuns fermentation.</li> <li>5. Study of vegetative and reproductive structure of Nostoc, Oscillatoria</li> <li>6. Study of vegetative and reproductive structure of Oedogonium,</li> <li>7. Study of vegetative and reproductive structure of Chara,</li> <li>8. Study of vegetative and reproductive structure of Ectocarpus and Batrachospermum</li> <li>9. Study of vegetative and reproductive structure of Albugo, Rhizopus,</li> <li>10. Study of vegetative and reproductive structure of Aspergillus, Cercospora.</li> <li>11. Study of vegetative and reproductive structure of Puccinia,</li> <li>12. Study of vegetative and reproductive structure of Crustose, Foliose and Fruticose Lichen</li> </ol>	



<b>Year</b>	I	<b>Course Code: 2A2BOTM02T</b> <b>Course Title : Diversity and Applications of Bryophytes, Pteriophytes, Gymnosperms and Paleo botany</b>	<b>Credits</b>	03
<b>Sem.</b>	II		<b>Hours</b>	52
Internal Assessment Marks: 20		External Assessment Marks: 80	Duration of Exam: 03hrs.	
<p><b>Course Outcomes (COs):At the end of the course students will be able to:</b></p> <p><b>CO1:</b> Demonstrate an understanding of Bryophytes, Pteridophytes, and Gymnosperms.</p> <p><b>CO2:</b> Develop a critical understanding of morphology, anatomy, and reproduction of Bryophytes, Pteridophytes, and Gymnosperms.</p> <p><b>CO3:</b> Understanding of plant evolution and their transition to land habitat.</p> <p><b>CO4:</b> Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Bryophytes, Pteridophytes, Gymnosperms</p> <p><b>CO 5:</b> Economic importance of Bryophytes, Pteridophytes, Gymnosperms</p>				
<b>Unit No.</b>	<b>Course content</b>			<b>Hours</b>
<b>Unit I</b>	<p><b>Bryophytes:</b> General account, classification, (According to G.M. Smith) distribution. Structure and reproduction in <i>Riccia</i>, <i>Marchantia</i>, <i>Anthoceros</i>, and <i>Funaria</i>.</p> <p>Evolutionary significance of Bryophytes. Evolution of Gametophyte and Sporophyte in Bryophytes</p>			13 Hours
<b>Unit II</b>	<p><b>Pteriophytes:</b> Origin, general account distribution and classification. (According to G.M. Smith</p> <p>Structure and reproduction of <i>Psilotum</i>, <i>Lycopodium</i>, <i>Selaginella</i>, <i>Equisetum</i>, and <i>Marsilea</i>.</p> <p>Evolution; Heterospory and Seed Habit in Pteridophytes.</p>			13 Hours
<b>Unit III</b>	<p><b>Gymnosperms:</b> General account, classification (According to G.M. Smith and distribution.</p> <p>Structure and reproduction of <i>Cycas</i>, <i>Pinus</i> and <i>Gnetum</i>,</p>			13 Hours
<b>Unit IV</b>	<p><b>Paleobotany:</b> Geological time scale, fossilization and study of fossil types – <i>Rhynia</i>, <i>Lepidodendron</i>, <i>Lepidocarpon</i>, <i>Calamites</i> and <i>Lyginopteris</i>.</p> <p>Economic importance of Bryophytes, Pteridophytes and Gymnosperms</p>			13 Hours

### Recommended Learning Resources

1. Smith, G.M. 1971. Cryptogamic Botany, Vol. II. Bryophytes and Pteridophytes. TataMcGraw Hill Publishing Co., New Delhi.
2. Sharma, O.P. 1990. Text Book of Pteridophyta. McMillan India, Ltd.
3. Puri, P. 1980. Bryophyta. Atma Ram & Sons, New Delhi.
4. Parihar, N.S. 1970. An Introduction to Embryophyta. Vol. 1. Bryophyta. Central BookDepot. Allahabad.
5. Sporne, K.R. 1966. Bryophytes.
6. Vashista, B.R. 1978. Bryophytes. S. Chand & Co., Ltd., New Delhi.
7. Bharnagar, S.P. and Moitra, A. 1966. Gymnosperms. New Age International Ltd., NewDelhi.
8. Gifford, E.M. and Foster, A.S. 1988. Morphology and Evolution of vascular plants. W.H.Freeman and Co., New York.
9. Sporne, K.R. 1965. The Morphology of Gymnosperms. Hutchinson & Co., Ltd. London.
10. Stewart, W.M. 1983. Paleobotany and the Evolution of plants. Cambridge University press.Cambridge.
11. Agashe, S.N. 1995. Paleobotany. Plants of the past, their evolution, paleoenvironment and application in exploration of fossil fuels. Oxoford & IBH., New Delhi.
12. Parihar, N.S. 1977. The morphology of Pteridophytes. Central Book Depot. Allahabad.
13. Rashid, A. 1998. An Introduction to Pteridophyta. II Ed., Vikas Publishing House, NewDelhi.
14. Sporne, K.R. 1966. The morphology of Pteridophytes. The structure of ferns and Alliedplants. Hutchinson & Co., Ltd. London.

<b>Year</b>	I	<b>Course Code: 2A2BOTM02L</b>	<b>Credits</b>	02
<b>Sem.</b>	II		<b>Course Title: Diversity and Applications of Bryophytes, Pteriophytes, Gymnosperms and Paleo botany Lab</b>	<b>Hours</b>
Internal Assessment Marks: 10		External Assessment Marks: 40		Duration of Exam: 03hrs.
<p><b>Course Outcomes (COs):At the end of the course, students will be able to:</b></p> <p><b>CO 1:</b> Demonstrate an understanding of Bryophytes, Pteridophytes, and Gymnosperms.</p> <p><b>CO 2:</b> Develop a critical understanding of morphology, anatomy, and reproduction of Bryophytes, PteridophytesGymnosperms.</p> <p><b>CO 3:</b> Understanding of plant evolution and their transition to land habitat.</p> <p><b>CO4:</b> Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of BryophPteridophytes, Gymnosperms</p> <p><b>CO 5:</b> Economic importance of Bryophytes, Pteridophytes, Gymnosperms</p>				
<b>Unit No.</b>	<b>Course content</b>			<b>Hours 50</b>
	<p>List of the Experiments, each will have 4rs / Week (Minimum 12 experiments)</p> <ol style="list-style-type: none"> <li>1. Study of morphology, anatomy and reproductive structure of <i>Riccia, Marchantia Anthoceros,</i></li> <li>2. Study of morphology, anatomy and reproductive structure of <i>Funaria</i></li> <li>3. Study of morphology, anatomy and reproductive structure of <i>Psilotum, Lycopodium,</i></li> <li>4. Study of morphology, anatomy and reproductive structure of <i>Selaginella, Equisetum,</i></li> <li>5. Study of morphology, anatomy and reproductive structure of <i>Marsilea.</i></li> <li>6. Study of morphology, anatomy and reproductive structure of <i>Cycas,</i></li> <li>7. Study of morphology, anatomy and reproductive structure of <i>Pinus</i></li> <li>8. Study of morphology, anatomy and reproductive structure of <i>Gnetum</i></li> <li>9. Geological Time Scale</li> <li>10. Observations of fossil impressions and slides of <i>Rhynia, Lepidodendron, Lepidocarpon,</i></li> <li>11. Observations of fossil impressions and slides of <i>Calamites and Lyginopteris</i></li> <li>12. <i>One day compulsory study tour to nearby forest area / pond. Tour report and field note book in the study tour should be submit during the practical examination</i></li> </ol>			