SKE Society's

Govindram Seksaria Autonomous Science College, Belagavi

SYLLABUS

For

Bachelor of Science (Botany)
B.Sc. I & II Semester

w.e.f.

Academic Year 2024-25 onward

PREAMBLE

The objective of a B.Sc. (Honors) programme in Higher Education system is to prepare its students for the society. The current pattern is designed to provide a focused learning outcome-based syllabus at the Honors level providing structured teaching-learning experiences catering to the needs of the students. The honors courses will prepare the students both academically and in terms of employability. The programme also inculcates various attributes at the Honors level. 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 new curriculum based on learning outcomes of BSc (Honours) Botany offers knowledge of areas including Plant Systematics, Plant Biotechnology, Resource Botany, Genetics, Ecology, Conservation biology, Physiology and Bioinformatics, Medicinal plants, Plant diseases management etc. The courses define clearly the objectives and the learning outcomes, enabling students to choose the elective subjects broadening their skills in the field of Botany. The course also offers 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 the bachelor-level program in Botany is developed keeping in view of the student-centric learning pedagogy, which is entirely outcome-oriented and curiosity-driven. To avoid a rote-learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on the pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works.

Aims of Bachelor's degree programme in Botany

The broad aims of the bachelor's degree programme in Botany are:

1. To provide an environment that ensures the cognitive development of students in aholistic manner. A dialogue about plants and their significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects
2. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A botany graduate as envisioned in this framework would

be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.

3. To mould a responsible citizen who is aware of the most basic domain-independent knowledge, including critical thinking and communication.
4. To enable the graduate to prepare for national as well as international competitive examinations, especially UGC-CSIR NET, and UPSC Civil Services Examination.

Program Learning Outcomes

The students graduating with the Degree B.Sc. Three years and B. Sc. (Honors) Botany shouldbe able to acquire.

Core competency: Students will acquire core competency in the subject Botany, and alliedsubject areas.

1. The student will be able to identify major groups of plants and compare thecharacteristics of lower (e.g. algae and fungi) and higher (angiosperms andgymnosperms) plants.
2. Students will be able to use the evidence-based comparative botany approach to explain the evolution of organisms and understand the genetic diversity on the earth. The studentswill be able to explain various plant processes and functions, metabolism, concepts of gene, genome, and how organism's function is influenced at the cell, tissue, and organ level.
3. Students will be able to understand the adaptation, development, and behavior ofdifferent forms of life.
4. The understanding of networked life on earth and tracing the energy pyramids throughnutrient flow is expected from the students.
5. Students will be able to demonstrate the experimental techniques and methods of theirarea of specialization in Botany.

Analytical ability:

The students will be able to demonstrate the knowledge in understanding research and addressing practical problems.

1. Application of various scientific methods to address different questions by formulating the hypothesis, data collection, and critically analyze the data to decipher the degree to whichtheir

scientific work supports their hypothesis.

Critical Thinking and problem-solving ability:

An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinkers and acquire problem-solving capabilities.

Digitally equipped:

Students will acquire digital skills and integrate the fundamental concepts with modern tools.

Ethical and Psychological strengthening: Students will also strengthen their ethical and moralvalues and shall be able to deal with psychological weaknesses.

Team Player: Students will learn team workmanship in order to serve efficiently institutions, industry, and society.

Independent Learner: Apart from the subject-specific skills, generic skills, especially in botany,the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations and employment. Learning outcomes-based curriculum would ensure equal academic standards across the country and a broader picture of their competencies. The Bachelor's program in Botany and Botany honors may be mono-disciplinary or multidisciplinary with following broad objectives.

1. Critically evaluation of ideas and arguments by collecting relevant information about theplants, to recognize the position of the plant in the broad classification and phylogenetic level.
2. Identify problems and independently propose solutions using creative approaches,acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant Identification.
3. Accurately interpretation of collected information and use taxonomical information toevaluate and formulate a position of the plant in taxonomy.
4. Students will be able to apply the scientific method to questions in botany by formulatingtestable hypotheses, collecting data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.
5. Students will be able to present scientific hypotheses and data both orally and in writingin the formats

that are used by practicing scientists.

6. Students will be able to access the primary literature, identify relevant works for aparticular topic, and evaluate the scientific content of these works.
7. Students will be able to apply fundamental mathematical tools (statistics, calculus) andphysical principles (physics, chemistry) to the analysis of relevant biological situations.
8. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will beable to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and other forms of life.
9. Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of lifeon earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history.
10. Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate thephysical features of the environment to the structure of populations, communities, and ecosystems
11. Students will be able to demonstrate proficiency in the experimental techniques andmethods of analysis appropriate for their area of specialization within biology.

B. Sc. Botany Course outcomes

The framework of curriculum for the Bachelor's program in Botany aims to transform the course content and pedagogy to provide a multidisciplinary, student-centric, and outcome-based, holistic education to the next generation of students.

Aside from structuring the curriculum to be more in-depth, focused, and comprehensive with significant skill-set for all exit levels; keeping in mind the job prospects; the emphasis has been to maintain academic coherence and continuum throughout the program of study and help build a strong footing in the subject, thereby ensuring a seamless transition into their careers.

Special attention is given to eliminate redundancy, discourage rote learning, and espouse a problem-solving, critical thinking, and inquisitive mindset among learners.

The curriculum embraces the philosophy that science is best learned through experiential learning, not limited to the confines of a classroom but rather through hands-on training, projects, field studies, industrial visits, and internships.

This updated syllabus, with modern technology, helps students stay informed on the leading- edge developments in plant sciences and promotes curiosity, innovation, and a passion for research, that will serve them well in their journey into scientific adventure and discovery beyond graduation.

The goal is to equip students with holistic knowledge, competencies, professional skills, and a strong positive mindset that they can leverage while navigating the current stiff challenges of the job market.

Program Outcomes:

By the end of the program the students will be able to:
(Refer to literature on outcome based education (OBE) for details on Program Outcomes)

PO1: Skill development for the proper description using botanical terms, identification, naming and classification of life forms especially plants and microbes.

PO2: Acquisition of knowledge on structure, life cycle and life processes that exist among plant and microbial diversity through certain model organism studies.

PO3: Understanding of various interactions that exist among plants and microbes; to develop the

curiosity on the dynamicity of nature.

PO4: Understanding of the major elements of variation that exist in the living world through comparative morphological and anatomical study.

PO5: Ability to explain the diversity and evolution based on the empirical evidences in morphology, anatomy, embryology, physiology, biochemistry, molecular biology and life history.

PO6: Skill development for the collection, preservation and recording of information after observation and analysis- from simple illustration to molecular database development.

PO7: Making aware of the scientific and technological advancements- Information and Communication, Biotechnology and Molecular Biology for further learning and research in all branches of Botany.

PO8: Internalization of the concept of conservation and evolution through the channel of spirit of inquiry.

PO 9: To enable the graduates to prepare for national as well as international level competitive examinations like UGC-CSIR, UPSC and KPSC etc.

PO10: To enable the students for practicing the best teaching pedagogy as a biology teacher including the latest digital modules.

PO 11: 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.

PO 12: 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 in the professional career.

Concept Note, Abbreviation Explanation and Coding:

Concept Note:

1. **CBCS** is a mode of learning in higher education which facilitates a student to have some freedom in selecting his/her own choices, across various disciplines for completing a UG/PG program.
2. A credit is a unit of study of a fixed duration. For the purpose of computation of workload as per UGC norms the following is mechanism be adopted in the University:
   One credit (01) = One Theory Lecture (L) period of one (1) hour.
   One credit (01) = One Tutorial (T) period of one (1) hour.
   One credit (01) = One practical (P) period of two (2) hours.
3. Course: paper/subject associated with AECC, DSC, DSEC, SEC, VBC, OEC, VC, IC and MIL
4. In case of **B.Sc**. **Once a candidate chose two courses/subjects of a particular two department in the beginning, he/she shall continue the same till the end of the degree, then there is no provision to change the course(s) and Department(s).**
5. A candidate shall choose **one of the Department's courses as major and other Department course as minor in fifth and sixth semester and major course will get continued in higher semester.**
6. Wherever there is a practical there will be no tutorial and vice-versa
7. A major subject is the subject that's the main focus of Core degree/concerned.
8. A minor is a secondary choice of subject that complements core major/ concerned.
9. Vocational course is a course that enables individual to acquire skills set that are required for a particular job.
10. Internship is a designated activity that carries some credits involving more than **25 days** of working in an organization (either in same organization or outside) under the guidance of an identified mentor. Internship shall be an integral part of the curriculum.
11. **OEC: For non- Botany science students. Botany Science students have to opt for OEC from departments other than major and minor disciplines.**

Abbreviation Explanations:

1. AECC: Ability Enhancement Compulsory Course.
2. DSC: Discipline Specific Core Course.
3. DSEC: Discipline Specific Elective Course.
4. SEC: Skill Enhancement Course.
5. VBC: Value Based Course.
6. OEC: Open/Generic Elective Course
7. VC: Vocational Course.
8. IC: Internship Course
9. L1: Language One
10. L2: MIL
11. L= Lecture; T= Tutorial; P=Practical.
12. MIL= Modern Indian Language; English or Hindi or Telugu or Sanskrit or Urdu

Program Coding:

1. Code 21: Year of Implementation
2. Code BSC: BSC Program under the faculty of Applied Science of the University
3. Code 1: First Semester of the Program, (2 to 6 represent higher semesters)
4. Code AE: AECC, (C for DSC, S for SEC, V for VBC and O for OEC)
5. Code 1: First "AECC" Course in semester, similarly in remaining semester for such other courses
6. Code LK: Language Kannada, similarly Language English, Language Hindi, Language Telugu, Language Sanskrit, &Language Urdu
7. Code 1: Course in that semester.
8. Bot: Botany

COURSE-WISE SYLLABUS
Semester I

<table>
<tr><td>Year</td><td>I</td><td colspan="3" rowspan="2">Course Code: SEP BSCBOT T-1
Course Title: Microbial diversity</td><td>Credits
03</td></tr>
<tr><td>Sem.</td><td>I</td><td>Hours
60</td></tr>
<tr><td colspan="2">Teaching hours</td><td colspan="3">4 hours per week</td></tr>
<tr><td colspan="2">Marks: Th-80+IA-20</td><td colspan="2"></td><td>Duration of ESA: 3 hours</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Understand the fascinating diversity, evolution, and significance of microorganisms.
2. Comprehend the systematic position, structure, physiology and life cycles of microbes and their impact on humans and environment.
3. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry.</td></tr>
<tr><td>Unit No.</td><td colspan="4">Course Content</td><td>Hours</td></tr>
<tr><td>Unit I</td><td colspan="4">Chapter No. 1: Microbial diversity -Introduction to microbial diversity; Whittaker’s five-kingdom system. Distribution of microbes in soil, air, food and water. Significance of microbial diversity in nature. 5 Hours
Chapter No. 2: History and developments of microbiology-Microbiologists and their contributions (Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Dmitri Iwanowski, Sergius Winogradsky, M. W. Beijerinck, Paul Ehrlich and Anand Mohan Chakrabarty. 5 Hours
Chapter No. 3 Microscopy-Working principle and applications of light, dark field, phase contrast and electron microscopes (SEM and TEM). Microbiological stains (acidic, basic and special) and Principles of staining. Simple, Gram’s and differential staining. 5 Hours</td><td>15</td></tr>
<tr><td>Unit II</td><td colspan="4">Chapter No. 4. Culture media for Microbes-Natural and synthetic media, Routine media -basal media, enriched media, selective media, indicator media, transport media, and storage media. 5 Hours
Chapter No. 5. Definition: Sterilization, disinfection and antiseptic. Sterilization methods:Tyndallisation, Pasteurization, Sterilization by dry heat, moist heat, UV light, ionization radiation and filtration. Chemical methods ofsterilization-phenolic compounds, anionic and cationic detergents. 5 Hours
Chapter No. 6. Microbial Growth-Bacterial growth curve and bacterial measurement by Direct cell count (hemocytometer). Nutritional types of Microbes- autotrophs and heterotrophs, phototrophs and chemotrophs; lithotrophs and organotrophs. 5 Hours</td><td>15</td></tr>
</table>

Unit III	**Chapter No. 7** Microbial cultures and preservation-Microbial cultures. Pure culture, axenic cultures and subculturing. Preservation methods-overlaying cultures with mineral oils and lyophilisation. Microbial culture collections and their importance. A brief account on ITCC, MTCC and ATCC. **6 Hours** **Chapter No. 8. Viruses-** General Characters and classification of Viruses; ICTV system of classification. Structure and multiplication of TMV. Cultivation of viruses. Vaccinesand types. Economic importance of Virus. **6 Hours** **Chapter No. 9. Viroids**-Definition, characters and structure of Potato Spindle Tuber Viroid (PSTVd); **Prions** – Definition, general characters and Prion diseases (CJD Creutzfeldt-Jakob Disease). **3 Hours**	15
Unit IV	**Chapter No. 10. Bacteria-** General characteristics and classification. A brief account of Archaebacteria, Eubacteria, Actinomycetes, Cyanobacteria, Mycoplasmas and Phytoplasmas. Ultrastructure of Bacteria; Reproduction in bacteria- asexual and sexual methods. Study of *Rhizobium* and its applications. -. Economic importance of Bacteria. **6 Hours** **Chapter No. 11. Fungi-** General characteristics, Classification (Alexopoulos Classification). Thallus organization and Reproduction in fungi (asexual and sexual). Heterothallism and Para sexuality. Type study of *Rhizopus and Puccinia***.** Economic importance of Fungi **6 Hours** **Chapter No. 12. Lichens –** Structure and reproduction. **VAM Fungi** and their significance. **Fungal diseases**-. Black stem rust of wheat; Downy Mildew of Bajra and Grain smut of Sorghum. **3 Hours**	15
Recommended Leaning Resources		
	Text Books 1. Ananthnarayan R and Panikar JCK. 1986. Text book of Microbiology. Orient Longman ltd. New Delhi. 2. Arora DR. 2004. Textbook of Microbiology, CBS, New Delhi. 3. William CG. 1989. Understanding microbes. A laboratory text book for Microbiology. W.H. Freeman and Company. New York. 4. Dubey RC and Maheshwari DK. 2007. A textbook of Microbiology, S. Chand and Company, New Delhi. 5. Dubey RC and Maheshwari DK. 2002. A Text book of Microbiology, S. C. Chand andCompany, Ltd. Ramnagar, New Delhi. 6. Sharma R. 2006. Text book of Microbiology. Mittal Publications. New Delhi. 305pp. 7. Sharma PD. 1999. Microbiology and Plant Pathology. Rastogi publications. Meerut,India. 8. Vasanthkumari R. 2007. A textbook of Microbiology, BI Publications Pvt. Ltd., NewDelhi. **References** 1. Alexepoulos CJ and Mims CW. 1989. Introductory Mycology, WileyEastern Ltd., New Delhi.	

	2. Allas RM. 1988. Microbiology: Fundamentals and Applications, Macmillan publishing co. New York. 3. Brook TD, Smith DW and Madigan MT. 1984. Biology of Microorganisms, 4th ed. Eaglewood Cliffts. N.J. Prentice- Hall. New Delhi. 4. Burnell JH and Trinci APJ. 1979. Fungal walls and hyphal growth,Cambridge University Press. Cambridge. 5. Michel J, Pelczar Jr.EC and Krieg CR. 2005. Microbiology, Mc. Graw-Hill, New Delhi. 6. Powar CB and Daginawala. 1991. General Microbiology, Vol – I and Vol – II Himalaya publishing house, Bombay. 7. Reddy S and Ram. 2007. Microbial Physiology. Scientific Publishers,Jodhpur, 385pp. 8. Sullia SB and Shantharam S. 1998. General Microbiology. Oxford and IBH publishing Co. Pvt. Ltd. New Delhi

Practicals

Semester-I

Year	I	**Course Code: SEPBSCBOT P01** **Course Title:** Microbial diversity	**Credits**	02
Sem.	I		**Hours**	60
Teaching Hours: 4 Hours/Week				
Marks: Th-40+IA-10				

Practical 1: Safety measures in microbiology laboratory.

Practical 2: study of equipment/appliances used for microbiological studies (Microscopes, Hot air oven, Autoclave/Pressure Cooker, Inoculation needles/loop, Petri plates, Incubator, Laminar flow hood, Colony counter, Haemocytomer, Micrometer etc.).

Practical 3: Enumeration of soil/food /seed microorganisms by serial dilution technique.

Practical 4: Preparation of culture media (NA/PDA) sterilization, inoculation, incubation of Ecoli / B. subtilis/ Fungi and study of cultural characteristics.

Practical 5: Determination of cell count by using Micrometry/hemocytometer.

Practical 6: Simple staining of bacteria (Crystal violet /Nigrosine blue) / Gram's staining ofbacteria.

Practical 7: Isolation and study of morphology of *Rhizobium* from root nodules of legumes.

Practical 8: Study of vegetative structures and reproductive structures – *Rhizopus*, *Puccinia* and *Penicillium*.

Practical 9: Downy mildew of Bajra/Maize/Sorghum, Citrus canker and Tobacco mosaic disease.

Practical 10: Study of any four well-known microbiologists and their contributions through charts and photographs.

Practical-11: Visit to Composting/ microbiology labs/dairy and farms to understand role of microbes in day today life.

Note: Student has to execute a minimum of 10 programs in each part to complete the Lab course

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Govindram Seksaria science college, Belagavi

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DEPARTMENT OF BOTANY

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QUESTION PAPER PATTERN

PAPER CODE: – 24 BSC BOT T1

Title of the paper: MICROBIAL DIVERSITY

Time: 3 Hours **Max. Marks: 80**

Q.I Answer any TEN of the following 10X2=20

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Q.II Answer any SIX of the following 5X6=30

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19
20

Q.III Answer any THREE of the following 3X10=30

21
22
23
24
25

Instructions to the Question paper setting

Q.I Three questions from each Unit
Q.II Two questions from each Unit
Q.III Q. 21 and 22 from Unit I
Q. 23 from Unit II
Q. 24 from Unit III
Q. 25 from Unit IV

Govindram Seksaria science college, Belagavi

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DEPARTMENT OF BOTANY

B.Sc Ist semester

Practical Question Paper

Course Title: Microbial Diversity

Time – 3 hrs **Max. Marks - 40**

1. Gram staining of the given sample **'A'** (Root nodule/curd)	**06 marks**
2. Determination of Microbial cell count/cell dimension of sample **'B'** (Haemocytometer/ Micrometry)	**06 marks**
3. Identify the given specimen **'C' & 'D'** with reason	**06 marks**
4. Identify and Comment on the given specimen/Photographs **'E' & 'F'**	**06 marks**
5. Identify and comment on Photographs/Equipment **'G' & 'H'**	**06 marks**
6. Journal	**05 marks**
7. Visit and Submission of Report	**05 marks**

Scheme of Evaluation

1. A. – (root nodule / curd sample) Preparation & Identification = 4 marks, Procedure = 2 mark,	**06 marks**
2. B. – Haemocytometer/ Micrometer Preparation and calculation= 6 marks,	**06 marks**
3. C & D – Specimens (Fungi type study any two) Identification = 1marks, Reasons = 2	**06 marks**
4. E & F –Disease specimen and Photographs of scientist Identification = 1 mark, Reasons = 1 mark (**2X2)**	**06 marks**
5. G & H – Photographs of microscopes/ equipment. Identification = 1 mark, Comment= 2 **(2X3)**	**06 marks**
7. Journal	**05 marks**
8. Visit and submission of Report and Viva voce	**05 marks**

COURSE-WISE SYLLABUS
Semester II

Year	I	**Course Code: SEPBSCBOT T-2** **Course Title:** Diversity of non-flowering plants.	**Credits**	03
Sem.	II		**Hours**	60
Teaching hours		4 hours per week		
Marks: Th-80+IA-20				

Course Outcomes	At the end of the course the student should be able to: 1. Understand the diversity and affinities among Algae, Bryophytes, Pteridophytes and Gymnosperms. 2. Understand the morphology, anatomy, reproduction and life cycle across Algae, Bryophytes,Pteridophytes and Gymnosperms, and their ecological and evolutionary significance. 3. Obtain laboratory skills/explore non-flowering plants for their commercial applications.

Unit No.	**Course Content**	**Hours**
Unit I	**Chapter No. 1** Algae – General characteristics and classification of algae (Smith) habitat, thallus organization, pigments, reserve food, flagella types and life-cycle. **5 Hours** **Chapter No. 2** Morphology, reproduction and life-cycles of *Nostoc, Oedogonium, Spirogyra, Ectocarpus, Sargassum and Batrachospermum*. Algal blooms and Diatoms. **6 Hours** **Chapter No. 3** Algal cultivation- Spirulina cultivation. Algal products - Food, Nutraceuticals, Feed stocks, food colorants; fertilizers, aquaculture feed; therapeutics, cosmetics, medicines, dietary fibres from algae and uses. **4 Hours**	15
Unit II	**Chapter No. 4.** Bryophytes – General characteristics and classification (G. M. Smith). **2 Hours** **Chapter No. 5** Morphology, anatomy, reproduction and life-cycles of *Riccia, Anthoceros,*and *Funaria.* Fossil Bryophytes. Ecological and economic importance of Bryophytes. **6 Hours** **Chapter No. 6. Pteridophytes**- General characteristics and classification (G. M. Smith); Distribution, morphology, anatomy, reproduction and life-cycles in Psilotum, *Selaginella*, *Equisetum* and *Pteris*. **7 Hours**	15
Unit III	**Chapter No. 7** A brief account of heterospory and seed habit. Stelar evolution in Pteridophytes. Affinities and evolutionary significance of Pteridophytes. Ecological and economic importance. **5 Hours** **Chapter No. 8. Gymnosperms**- Affinities and evolutionary significance of Gymnosperms. General characteristics and classification of Gymnosperms (Smith). Morphology, anatomy, reproduction and life-cycles in *Cycas, Pinus* and *Gnetum.* **8 Hours** **Chapter No. 9.** Economic importance of Gymnosperms - food, timber, industrial uses and medicines. **2 Hours**	15

Unit IV	**Chapter No. 10. Origin and evolution of Plants:** Geological Time scale. **2 Hours** **Chapter No. 11. Paleobotany-** Paleobotanical records, Preservation of plant fossils - impressions, compressions, petrification's, moulds, casts and pits. Radiocarbon dating. **6 Hours** **Chapter No. 12.** Fossil taxa- *Rhynia, Lepidodendron, Calamites and Lyginopteri.* Exploration of fossil fuels. Birbal Sahni Institute of Paleosciences. **5 Hours**	15

Recommended Leaning Resources

Text books

Text Books

1) Chopra, G.L. A text book of Algae. Rastogi & Co., Meerut, Co., New Delhi, Depot.
Allahabad.
2) Johri, Lataanf Tyagi, 2012, A Text Book of, Vedam e Books, New Delhi.
3) Sharma, O.P. 1990. Text Book of Pteridophyta. McMillan India Ltd. New Delhi.
4) Sharma, O.P. 1992. Text Book of Thallophytes. McGraw Hill Publishing Co. New Delhi.
5) Sharma, O.P., 2017, AlgaeSingh-Pande-Jain2004-05.
6) A Text Book of Botany. Rastogi Publication, Meerut.

References

1. Sambamurty, A.V.S.S... A Text Book of Algae. I.K. International Private Ltd., New Delhi.
2. Agashe, S.N. 1995. Paleobotany. Plants of the past, their evolution, paleoenvironment and Allieplants. Hutchinson & Co., Ltd., London.
3. Anderson R.A. 2005, Algal cultural Techniques, Elsievier, London.
4. Publication, Application in exploration of fossil fuels. Oxford & IBH., New Delhi.
5. Eams, A.J., (1974) Morphology of vascular plants - Lower groups. Tata Mc Grew- Hill Publishing CoDelhi, Freeman & Co., New York.
6. Fritze, R.E. 1977. Structure and reproduction of Algae. Cambridge University Press.
Goffinet B and Shaw A.J. 2009, Bryophyte Biology, 2nd ed. Cambridge University Press, Cambridge. Gymnosperms.
8. Srivastava, H N, 2003. Algae Pradeep Publication, Jalandhar, India.
9. Kakkar, R.K. and B.R. Kakkar (1995) The Gymnosperms (Fossils and Living) Central Publishing HouAllahabad.
10. Kumar H. D., 1999, Introductory Phycology, Affiliated East-West Press, Delhi.
11. Lee, R.E., 2008, Phycology, Cambridge University Press, Cambridge. 4th edition. McGraw Hill Publis Co., New Delhi.
12. Parihar, N.S. 1970. An Introduction to Embryophyta. Vol. I. Bryophyta. Central Book, Allhabad.
13. Parihar, N.S. (1976) An Introduction to Pteridophytes, Central Book Depot, Allhabad.
14. Parihar, N.S. 1977.The Morphology of Pteridophytes. Central Book Depot., Allahabad. Press, Cambridge. Rashid, A.1998.
15. An Introduction to Pteridophyta. II ed., Vikas Publishing House, New Delhi.
16. Smith, G.M. 1971. Cryptogamic Botany. Vol. II. Bryophytes &Pteridophytes. Tata Tata McGraw Hill Publishing, New Delhi.

	17. Smith, G.M. 1971. Cryptogamic Botany. Vol. I Algae & Fungi. Tata McGraw Hill Publishing. New Del 18. Sporne, K.R. 1965. The Morphology of Gymnosperms. Hutchinson & Co., Ltd., London. 19. Stewart, W.M. 1983. Paleobotany and the Evolution of Plants, Cambridge University Cambridge.

Practicals
Semester-II

Year	I	**Course Code: SEPBSCBOT P-2** **Course Title: Diversity of Non flowering plants**	**Credits**	02
Sem.	II		**Hours**	60
Teaching Hours: 4 Hours/Week				
Marks: Th-40+IA-10				

Pactical-1: Study of morphology, classification, reproduction and life cycle of Nostoc.
Practical-2: Study of morphology, classification, reproduction and life-cycle of *Oedogonium*, *Spirogyra*, and *Batrachospermum*.
Practical-3: Study of morphology, classification, reproduction and life-cycle of Riccia & Anthoceros / Funaria.
Practical-4: Study of morphology, classification, anatomy, reproduction and life-cycle of and Equisetum and Pteris.
Practical -5: Study of morphology, classification, anatomy, reproduction and life-cycle of Psilotum and. Selaginella
Practical -6: Study of morphology, classification, anatomy and reproduction in Cycas and Pinus.
Practical -7: Study of morphology, classification &anatomy, reproduction in Gnetum.
P**ractical -8**: Preparation of natural media and cultivation of Azolla in artificial ponds.
Practical -9: Study different algal products and fossils impressions and slides.
Practical-10: Visit to algal cultivation unit/lakes with algal blooms/Fern house/Nursery/Geology museum/lab to study plant fossils.
(Note: Botanical study tour to a floristic rich area for 1 day and submission of study report is compulsory)

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DEPARTMENT OF BOTANY

QUESTION PAPER PATTERN

PAPER CODE: – 24 BSC BOT T2

Title of the paper: Diversity of Non-flowering plants

Time: 3 Hours Max. Marks: 80

Q.I Answer any TEN of the following 10X2=20

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Q.II Answer any SIX of the following 5X6=30

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Q.III Answer any THREE of the following 3X10=30

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Instructions to the Question paper setting

Q.I Three questions from each Unit
Q.II Two questions from each Unit
Q.III Q. 21 and 22 from Unit I
Q. 23 from Unit II

Q. 24 from Unit III
Q. 25 from Unit IV

Practical Question Paper
Course Title: Diversity of Non flowering plant

Time – 4 hrs **Max. marks – 40**

Q1: Identify and comment on thallus of specimen **A, B, C, and D** giving reasons.

4X3 = 12 marks

Q2: Identify, describe & prepare a slide of specimen **E.**

3X1= 03 marks

Q3: Identify & comment on reproductive/Internal structure of slide/ specimen **F, G and H**

3X3= 09 marks

Q 4: Identify & comment on the fossil specimen and algal products I **& J.** 2X3=06 marks \

Study tour report and viva voce 05 marks

Journal 05 marks

Practical Question Paper
Course Title: Diversity of Non flowering plant

Time – 4 hrs **Max. marks – 40**

Instructions to Examiners.

Q.1. Specimens **A, B, C and D** 4X3= 12 marks

(One each from Algae, Bryophyte, Pteridophytes and Gymnosperms specimens mentioned in practical syllabus. Identification -01- mark, morphological features- 2 mark)

Q. 2. Internal structure (*Riccia, Psilotum, Equisetum* and *Pinus* needle. Identification 01-mark, 01–mark description, 01–mark preparation) 3X1= 03

Q. 3. Slide/Specimens **F, G and H**. 3X3 = 09 marks

(One each from Algae, Bryophyte, Pteridophytes and Gymnosperms slide/specimen mentioned inpractical syllabus. Identification -01-mark, reproductive/Internal structure features- 2 mark)

Q.3. Fossil/Algal products Specimen/ Slide/photos **I & J**. (Identification 1 mark, description -6 marks)

2X3= 06 marks

Study tour report and viva voce 05 marks

Journal 05 marks

CERTIFICATE COURSE

Title: Mushroom Culture Technology

Lectures: 30 Hrs **Theory (2 Hours per week)** **Objectives:**

1. To increase scientific attitude among the students

2. To acquire knowledge about the cultivation efficiency, sustainable production and marketing

3. To gain the knowledge about the nutritional value of edible mushrooms

Unit 1:

Introduction, History. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India -Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus.

02 hours

Unit 2:

Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production**.**

06 hours

Unit 3:

Storage and nutrition: Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in salt solutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins. Calorific value

04 hours

Unit 4:

Food Preparation: Types of foods prepared from mushroom. Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value**.**

03 hours

Practicals:

1. Basic instrumentation, materials and chemicals required for mushroom Cultivation

2. Cultivation practice in laboratory by using oyster mushrooms spawns.

3. Visit to nearby mushroom cultivation Unit.

References

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.

2. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.

3. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.

4. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

5. T. C. Gopal, (2023) Edible Fungi, Mushroom cutivation and handling, Research article, ISBN- 9783346958334, “Natural Science”

Skill Enhancement Course

Medicinal Botany

(Credits 2)

Lectures: 30

Unit 1: History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-e- tabiya, tumors treatments/ therapy, polyherbal formulations. (10 Lectures)

Unit 2: Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding. (10 Lectures)

Unit 3: Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases. (10 Lectures)

Suggested Readings

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.

2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn.

Agrobios, India.

GSS College, belagavi

Accredited with A Grade by NAAC

DEPARTMENT OF BOTANY

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Board of Studies in Botany

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