Karmaveer Bhaurao Patil University, Satara

Syllabus for

B. Sc. I (Botany)

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year 2024-2025

Syllabus for Bachelor of Science (B. Sc.) Part – I Botany

PREAMBLE:

The B. Sc. Botany course under autonomy will be effective from the academic year 2024 - 2025. It has been prepared to keep in view the unique requirements of B. Sc. Botany students as per NEP-2020. The contents have been drawn up to accommodate the widening horizons of the discipline of biological sciences. The emphasis is to provide students with the latest information along with due weightage to the concepts of classical botany so that they can understand and appreciate the current interdisciplinary approaches in the study of plant sciences and their role in societal development. The course content also lists new practical exercises so the students get a hands-on experience with the latest techniques that are currently in use. The course will also inspire students to pursue higher studies in botany, for becoming an entrepreneur, and enable students to get employed in plant-based industries.

GENERAL OBJECTIVES OF THE COURSE:

i. To impart the knowledge of plant science is the basic objective of this course.

ii. To develop a scientific attitude among the students and to make the students open-minded, critical, and curious.

iii. To develop skills in practical work, experiments, and laboratory materials.

iv. To understand scientific terms, concepts, facts, phenomenon, and their relationships.

v. To make the students aware of natural resources and the environment.

vi. To enable the students to acquire knowledge of plants and related subjects to understand nature and the environment for the benefit of human beings.

vii. To develop the ability for the application of acquired knowledge to improve agriculture and related fields to make themselves self-reliant.

PROGRAMME OUTCOMES

After completing B. Sc. Programme the students will…….

1.Graduate with proficiency in the subject.

2.Develop scientific attitude and become open minded, critical and curious so that they enter research field with a positive approach.

3.Develop skill in practical work, experiments and laboratory materials.

4.Become eligible to continue higher studies in their subject in India as well as abroad.

5.Become eligible to appear for the examinations for jobs in government organizations.

6.Become eligible to appear for jobs with minimum eligibility as science graduate.

7.Be able to establish their own entrepreneurial ventures.

8.Acquire increased ability of critical thinking, development of scientific attitude, handling of problems and generating solution, improve practical skills, enhance communication skill, social interaction, increase awareness in judicious use of plant resources by recognizing the ethical value

system

PROGRAM SPECIFIC OBJECTIVES:

1.The students are expected to understand the fundamentals, principles, concepts and recent developments in the botany.

2. The practical course is framed in relevance with the theory courses to improve the understanding of the various concepts in botany.

3. It is expected to inspire and boost interest of the students in botany.

4. To develop the power of appreciations, the achievements in science and role in nature and society.

5. To enhance student sense of enthusiasm for science and to involve them in an intellectually stimulating experience of Course in a supportive environment.

PROGRAMME SPECIFIC OUTCOMES:

After completing B. Sc. (Botany) Programme the students will…….

1.Explain, describe, discuss and ask questions related to the different aspects of plant sciences.

2.Perform and design experiments related to plant sciences

3.Critically analyze the interactions between the living and non- living entities around them.

4.Apply the knowledge of plant sciences in finding sustainable solutions for the society as well as industry.

5.Apply the knowledge of plant sciences in becoming self- reliant either through entering into a job, establishing a model agricultural set up or initiating a plant based entrepreneurial venture

6.Design and undertake projects related to plant sciences

7.Attain skills needed in the plant based industries through internship.

8.Improve the research based skills by entering into a research internship as well as in house project.

9.Present their research findings in research conglomerations like conferences and in research journals in the form of publications.

10.Critically analyze their role as an environment sustainability goals oriented citizen

1. TITLE: Botany

2. YEAR OF IMPLEMENTATION: 2024 - 25

5. DURATION: 01 year

6.PATTERN: Semester examination.

7. MEDIUM OF INSTRUCTION: English

6. EVALUATION STRUCTURE:

Theory

Assessment Category	**Internal Evaluation**				**ESE**	**Total Marks**	**Credits**
	CCE-I	**CCE-2**	**Mid Sem**	**Total**			
Theory of 2 Credits	05	05	10	20	30	50	02

Practical

Assessment Category	Internal Evaluation	ESE	Total Marks	Credits
	Journal / Viva/Activity			
Practical of 2 Credits	20	30	50	02

7. STRUCTURE OF COURSE:

Course Structure as per NEP-2020

Level	Semester	Course	DSC	OE	AEC/VEC/IKS	Total	Degree/Cum. Cr. MEME
4.5	I	I	DSC-I (2) DSC-II (2) DSC P-I (2)	2	IKS (2)	22	UG Certificate 44
		II	DSC-I (2) DSC-II (2) DSC P-I (2)				
		III	DSC-I (2) DSC-II (2) DSCP-I (2)				
4.5	II	I	DSC-I (2) DSC-II (2) DSC P-I (2)	2	VEC (2)	22	
		II	DSC-I (2) DSC-II (2) DSC P-I (2)				
		III	DSC-I (2) DSC-II (2) DSC P-I (2)				

8.COURSE TITLE

1) FIRST SEMESTER

Sr. No.	Subject Title	Theory				Practical		
		Course No. & Course Code	Title of Paper	No. of lectures per week	Credits		No. of Practical Per week	Credits
1.	Botany	Course – I BBT 111	Diversity of Cryptogams	4	4	Practical Course– I BBP 113	2	2
		Course – II BBT 112	Economic Botany					
2	OE	BBTOE 118	Business Management P-I	2	2			
3	IKS		Introduction to Indian Knowledge System	2	2			

2) SECOND SEMESTER

Sr. No.	Subject Title	Theory				Practical		
		Course No. & Course Code	Title of Paper	No. of lectures per week	Credits		No. of Practical Per week	Credits
1.	Botany	Course – III BBT 121	Diversity of Archegoniates	4	4	Practical Course– II BBP 123	2	2
		Course – IV BBT 122	Fundamentals of Plant Taxonomy					
2	OE		Business Management P-II	2	2			
3	VEC		Role of plant Science in Environment	2	2			

8) OTHER FEATURES:

A) LIBRARY:

Reference books, Textbooks, journals, and Periodicals are available in Institute and Departmental Library. (Separate reference lists are attached along with the respective course syllabus)

B) EQUIPMENT:

a) Computer, LCD projector, visualizer, smart board

b) Laboratory Equipment:

1. Microscope with a digital camera
2. Hot Air Oven
3. Digital weighing balance
4. Incubator
5. pH meter
6. Refrigerator
6. Microtome
7. Autoclave

Bachelor of Science (B. Sc.) Part - I: Botany

Semester I

Course -I (Course Code: BBT 111)
Diversity of Cryptogams

Course Objectives: The students should be able to…….

1. understand knowledge of different plant groups.
2. gain the knowledge of the biodiversity of lower plant groups.
3. know importance of lower plant groups.
4. impart knowledge of opportunities for a career in the uses of lower plant groups.

Unit	Contents of Unit	No. of hours per unit/ credits
Unit- I	**Introduction to the Plant Kingdom**	**07**
	1.1 Evolutionary history of Plants, Evolutionary time scale 1.2 Systems of classification (Two, Three, and Five kingdom systems), General outline of the plant kingdom	
Unit -II	**Algae**	**08**
	2.1 General Characters of Algae 2.2 Classification System of Algae (by G. M. Smith) 2.3 Economic Importance of Algae 2.4 Morphology and life cycles (excluding developmental stages) of *Nostoc* and *Spirogyra*	
Unit- III	**Fungi**	**08**
	3.1 General Characters of Fungi 3.2 Classification System of Fungi (by G. C. Ainsworth) 3.3 Economic Importance of Fungi 3.4 Morphology and life cycle (excluding developmental stages) of *Mucor* and *Penicillium*	
Unit -IV	**Lichens**	**07**
	4.1 General characters of Lichens	

	4.2 Types of Lichens based on thallus morphology 4.3 Methods of Reproduction in Lichens 4.4 Economic Importance of Lichens	

Course Outcomes: The students will be able to….

1. explain the features and uses of lower cryptogams.
2. discuss concepts regarding lower cryptogams.
3. write answers and brief notes about the plant diversity of lower cryptogams.
4. seek career opportunities in academics, research, and entrepreneurship with respect to lowercryptogams.

References Books:

1. Vashishtha, B. R. and Sinha, A. K., Anil Kumar,2016, Botany for Degree Students- Fungi, S.Chand and Company, New Delhi.
2. Alexopoulus, C. J., Mims, C. W., and Blackwell, M., 2007, Introductory Mycology, 4th EditionWiley India Pvt. Ltd, India.
3. Awasthi, D. D.,Bishen Singh and Mahindra Pal Singh, ,2000, A Handbook of Lichens Kolkata.
4. Gangulee, H. S. and Kar, A. K, 1992, College Botany Vol. I and II., New Central Book Agency
   (P) Ltd., New Delhi.
5. Sharma, O. P.,1992, Textbook of Thallophytes. , Tata Mc Graw Hill, New Delhi.
6. Sharma, P. D.,1991 The Fungi, Rastogi and Company, Meerut.
7. Kumar, H. D. ,1990, Introductory Phycology East Western Press, New Delhi.
8. Dube, H. C. Vikas, 1990, An Introduction to Fungi., Publishing House Pvt. Ltd., Delhi.
9. Sharma, O. P.,1989, Textbook of Fungi Tata Mc Graw Hill, New Delhi.
10. Smith, G. M.1971, Cryptogamic Botany, Vol. I Algae and Fungi, Tata McGraw Hill PublishingCo., New Delhi.
11. Ainsworth, G. C., Sussman, A. S and Sparrow, F. K. 1965, The Fungi- an advanced treatise,Vols. I-V. Academic Press, New York.

Bachelor of Science (B. Sc.) Part - I: Botany

Semester I

Course II (Course Code: BBT 112) Economic Botany

Course Objectives: The students should be able to…….

1. impart knowledge of plant biology and how humans use different plant structures.
2. understand the botanical aspects and origins of important food, medicinal, and economicallyimportant plants.
3. make the students knowledgeable about the importance of plants and their different roles.
4. empower the students with the ability to analyze the plant structures and interactions with hands-on field experiments.

Unit	Contents of Unit	No. of hours per unit/ credits
Unit- I	**Origin of Cultivated Plants**	**07**
	1.1 Introduction, Concept of Centers of Origin, and their Importance with Reference to Vavilov's Work 1.2 Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, the importance of germplasm diversity	
Unit -II	**Cereals, Legumes and Millets**	**08**
	2.1 Cereals: Origin, Botanical Name, Morphology, Sources, and Economic Importance of Rice and Wheat. 2.2 Legumes: Origin, Botanical Name, Morphology, Sources, and Economic Importance of Gram and Pigeon Pea. 2.3 Millets: Origin, Botanical Name, Morphology, Sources, and Economic Importance of Finger Millet and Foxtail Millet	
Unit- III	**Oil-yielding plants and Spices**	**08**
	3.1 Oils and Fats: Origin, Botanical Name, Morphology, Sources, and Economic Importance of Groundnut and Soybean. 3.2 Spices and Condiments: Origin, Botanical Name, Morphology, Sources, and Economic Importance of Ginger and Chilly	
Unit -IV	**Beverages and Fibers**	**07**

	4.1 Beverages: Origin, Botanical Name, Morphology, Sources, and Economic Importance of Tea and coffee. 4.2 Fibre-yielding Plants: Origin, Botanical Name, Morphology, Sources, and Economic Importance of Cotton and *Agave*.	

Course Outcomes: The students will be able to….

1. get knowledge and understanding of the range of plant diversity in terms of function andenvironmental relationships.
2. carry out practical work, in the field and in the laboratory, with minimal risk.
3. get knowledge and understanding of current trends in economic botany.
4. think logically and organize tasks to transfer appropriate knowledge and methods in economicbotany.

References Books:

1. Alphonse De Candolle, 2022, Origin of Cultivated Plants, Legare Street Press Publication
2. Susan Cho and Almeida N , 2017, Dietary Fiber and Health, CRC Press Publication (1st edition)
3. Levetin, E. and McMahon, K., 2016, Plants & Society, 7th Edition. McGraw-Hill, New York.
4. Kocchar, S.L.,2011, Economic Botany in Tropics, 4th Edition. Macmillan India Ltd., New Delhi.
5. Sharma, O.P.,1996, Economic Botany, Tata McGraw Hill Publishing Company Ltd., New Delhi.
6. Sambamurthy, A.V. and Subramanyam, N.S.,1989, A Textbook of Economic Botany., WileyEastern Ltd., New Delhi.
7. Simpson, B.B., 1986, Economic Botany - Plants in Our World. McGraw Hill, New York.

Bachelor of Science (B. Sc.) Part - I: Botany

Semester I

Practical Course I (Course Code: BBP 113)

Practicals based on Theory Course I and II

Course Objectives: The students should be able to…….

1. learn and identify lower plant groups.
2. give practical knowledge to students about economic uses of plants.
3. participate students in experiential learning with these practicals.
4. enable students to think about novel uses of plants.

Credits(02)	Practical Name	No. of hoursper unit/ credits 60 Hrs (4 Hrs /Practical)
Section-I	1. Study of Microscope 2. Study of algae -*Nostoc.* 3. Study of algae -*Spirogyra.* 4. Study of fungi -*Mucor.* 5. Study of fungi -*Penicillium.* 6. Study of types of lichens (based on morphology). 7. Study of the botanical name, morphology, parts used, and economic importance of Wheat. 8. Study of the botanical name, morphology, parts used, and economic importance of Rice 9. Study of the botanical name, morphology, parts used, and economic importance of Gram and Pigeon pea. 10. Study of the botanical name, morphology, parts used, and economic importance of Finger millet and Foxtail millet 11. Study of the botanical name, morphology, parts used, and economic importance of Ginger, and Chilly. 12. Study of the botanical name, morphology, parts used, and economic importance of Tea, and Coffee. 13. Study of the botanical name, morphology, parts used, and economic importance of Groundnut and Soybean. 14. Study of the botanical name, morphology, parts used, and economic Importance of Cotton and *Agave*. 15. Field visit any suitable place	

Course Outcomes: The students will be able to…….

1. observe and describe general characters of lower plant groups through representative members.

2. recognize the members of lower plant groups and identify the plant parts.
3. identify the plants and relate their economic uses.
4. compare and predict novel economic uses of the plants.

Reference Books:

1. Bendre, A.,2010, Practical Botany, Rastogi Publications, Meerut.
2. Pande, B.P.,1979, Modern Practical Botany, Vol. II. , S. Chand Publishers, New Delhi.
3. Pande, B.P.,1979, Modern Practical Botany, Vol. I. , S. Chand Publishers, New Delhi.
4. Walllis, C. J.1966, Practical Botany for Advanced Level and Intermediate Students, 5th Edition.William Heinemann Medical Books Ltd.

Bachelor of Science (B. Sc.) Part - I: Botany

Semester I

Subject- Principles of Management Paper -I (OE)

Course Objectives:

1. To aware students about concept of Management.
2. To acquaint with Planning and Decision-making.

Unit No	Contents of Unit	No. of hours per unit/ credits-2
Unit -I	**Introduction to Management** 1.1 Meaning and Definition of Management 1.2 Characteristics of Management 1.3 Management – Art, Science or Profession 1.4 Importance of Management 1.5 Functions of Management (In Brief) 1.6 Fayol's fourteen Principles of Management (Practical: Individual Day's Management)	**15**
Unit -II	**Planning and Decision-making** 2.1 Meaning and Definition 2.2 Importance of Planning 2.3 Steps in planning process 2.4 Decision Making- Meaning and Features 2.5 Process of Decision making 2.6 Techniques of Decision making (Practical: Case Study)	**15**

Course Outcomes:

1. Awareness about concept of Management.
2. Acquaintance with Planning and Decision-making

References:

1. Management (Concept, Practice & Cases) – K. Aswathappa – Tata Mc Graw Hill Education Private Limited.
2. Management – James A.F.Stoner, R.Edward Freeman – Pearson
3. Management Theory & Practice- J.P.Mahajan – Ane Books Pvt.Ltd
4. Business Organization & Management – C.B.Gupta – S Chand

Bachelor of Science (B. Sc.) Part - I: Botany (IKS)

Semester I

Subject- Introduction to Indian Knowledge System

Course Objectives:

Students should be able to …

1. understand the concept of Indian Knowledge system
2. study the various Indian Art and Culture and their influence
3. know the heritage of Indian Science and Technology
4. learn the global influences of IKS

Unit No	Contents of Unit	No. of hours per unit/ credits-2
Unit -I	**Fundamentals of Indian Knowledge System** 1.1 Definition, Concept and Scope of IKS 1.2 Overview of Indian Knowledge systems 1.3 IKS based approaches on knowledge paradigms 1.4 Applications of Indian knowledge systems in modern times	**07**
Unit -II	**Indian Art and Culture** 2. 1 Overview of Indian Art and Culture 2.2 Tribal art and culture 2.3 Folk art and craft traditions 2.4 Influence of Indian Art on western art movements	**08**
Unit -III	**Indian Science and Technology in IKS** 3.1 Indian Science and Technology Heritage 3.2 Case studies of Indian Scientists and technologists 3.3 Applications of Indian Science and technology in modern times 3.4 Relevance of Indian Science and technology in global context	**08**
Unit -IV	**Indian Knowledge Systems : Global Influence** 4.1 Contemporary global interest in Indian culture and spirituality 4.2 Indian influence on development of various sciences. 4.3 Case studies of scientists influenced by ancient Indian knowledge systems 4.4 Relevance of Indian Knowledge systems in addressing global challenges.	**07**

Course Outcomes:

Students should be able to …

1. explain the concept of Indian Knowledge system
2. identify the various Indian Art and Culture and their influence
3. recognize the heritage of Indian Science and Technology
4. describe the global influences of IKS

References:

1. Avari, B. 2016. India: The Ancient Past: A History of the Indian Subcontinent from c. *7000* BCE to CE 1200. London: Routledge
2. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008
3. DK Chakkrabarty, Makkhan Lal, History of Ancient India (Set of 5 Volumes), Aryan book International publication, 2014
4. Jha Amit, Traditional knowledge system in India, Atlantic Publisher
5. Potter, K.H. *Encyclopaedia of Indian Philosophies,* Vol.III. Delhi: Motilal Banarasidass, 2000
6. Kapur K and Singh A.K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute ofAdvanced Study, Shimla. Tatvabodh of sankaracharya, Central Chinmay mission trust, Bombay, 1995
7. Satprakashananda. *The Methods of Knowledge according to Advaita Vedanta.* Calcutta:Advaita Ashram, 2005
8. Singhania Nitin, 5th Edition 2022 Indian Art and Culture, McGraw Will Publication: UP

Bachelor of Science (B. Sc.) Part - I: Botany

Semester II

Course -III (Course Code: BBT 121)

Diversity of Archegoniate

Course Objectives: The students should be able to…….

1. make the students aware of the higher plants and their evolution.
2. impart the knowledge and importance of fossil plants.
3. make the students aware of the economic importance of archegoniate..

Unit	Contents of Unit	No. of hours per unit/ credits
Unit- I	**Bryophytes**	**07**
	1.1 General characters of Bryophytes 1.2 Classification System in Bryophytes (by G. M. Smith) 1.3 Alteration of Generation 1.4 Economic importance of Bryophytes 1.5 Morphology, anatomy, and life cycle (excluding developmental stages) of *Riccia* and *Funaria*	
Unit -II	**Pteridophytes**	**08**
	2.1 General characters of Pteridophytes 2.2 Classification system in Pteridophytes (by G. M. Smith) 2.3 Economic importance of Pteridophytes 2.4 Morphology, anatomy, and life cycles (excluding developmental stages) of Lycopsida - *Selaginella*, Pteropsida - *Pteris* 2.5 Heterospory and seed habit	
Unit- III	**Gymnosperms**	**08**
	3.1 General characters of Gymnosperms 3.2 Classification system in Gymnosperms (by Sporne) 3.3 Economic importance of Gymnosperms	

	3.4 Morphology, anatomy, and life cycle (excluding developmental stages) of Cycadopsida- *Cycas* (primitive) and Gnetopsida - *Gnetum* (advanced)	
Unit -IV	**Palaeobotany**	**07**
	4.1 Introduction to Palaeobotany 4.2 Geological time scale 4.3 Fossil formation process 4.4 Types of fossils - Compression, Impression, Petrification, Pith Cast, Coal balls	

Course Outcomes: The students will be able to……..

1. explain the features and uses of vascular plants.
2. define concepts regarding vascular plants and fossils.
3. write answers and brief notes about plant diversity of vascular plants.

References Books:

1. Sporne, K. R. 2018, Morphology of Pteridophytes ,Creative Media partners Ltd, USA.
2. Arnold, C. A. 2008, An Introduction to Palaeobotany., Read Books, England.
3. Parihar, N. S. 1996, The Biology and Morphology of Pteridophytes. , Central Book Publishers,Allahabad.
4. Vashishtha, P. C. , 1993, Pteridophyta - Vascular Cryptogams. , S. Chand and Company, NewDelhi.
5. Stewart, W. N., 1983, Paleobotany and the evolution of plants. , Cambridge University Press,USA.
6. Vashishtha, P. C., 1976, Botany for Degree Students - The Gymnosperms. ,S. Chand and Company, New Delhi.
7. Parihar, N. S. 1972, An Introduction to Embryophyta: Vol. I Bryophyta. , Central Book Depot,Allahabad.
8. Andrews, H. N., 1967, Studies in Palaeobotany. ,John Wiley and Sons, London.
9. Sporne, K. R., 1965, Morphology of Gymnosperms. , Hutchinson Publishers, London.

Bachelor of Science (B. Sc.) Part – I: Botany

Semester II

Course -IV (Course Code: BBT 122)

Fundamentals of Plant Taxonomy

Course Objectives: The students should be able to……

1. demonstrate to the student how to recognize and identify the common vascular plants.
2. acquaint the student with the principles, methods, and history of plant taxonomy.
3. understand the various aspects of plant nomenclature and classification.
4. develop in the student an appreciation of the scientific and aesthetic values of plants in the localflora.

Unit	Contents of Unit	No. of hours per unit/ credits
Unit- I	**Introductory Taxonomy**	**07**
	1.1 Introduction, Importance of Taxonomy 1.2 Functions of Taxonomy: Identification, Nomenclature, Classification 1.3 Ranks, Categories, and Taxonomic Groups	
Unit -II	**Botanical Nomenclature**	**08**
	2.1 Principles and rules (ICN); Salient features of International Code of Botanical Nomenclature (ICBN) 2.2 Binominal system, Typification, Author citation, Valid publication, Rejection of names, the principle of priority, and its limitations.	
Unit- III	**Tools for Taxonomic Studies**	**08**
	3.1 Herbarium: Introduction, Role, and Significance. 3.2 Botanical Gardens: Introduction, Role, and Significance. Study of A. J. C. Bose Botanical Garden, Howrah; Lead Botanical Garden, Shivaji University, Kolhapur. 3.3 Taxonomic literature – Flora, Monograph	
Unit -IV	**Systems of Classification of Angiosperms**	**07**

	4.1 General characters; Life cycle pattern in angiosperms 4.2 Systems of Classifications: Natural, Artificial, and Phylogenetic 4.3 Bentham and Hooker's System of Classification (up to Series); Engler and Prantl System of Classification (up to Series)	

Course Outcomes: The students will be able to……

1. employ diverse taxonomic resources for plant identification, including electronic and printmedia, reference materials, and herbarium collections.
2. understand plant morphological terminology and use it accurately in the description.
3. recognize ecologically and economically important plant species by sight.
4. discuss current questions in plant evolution and classification

References Books:

1. Patil, D. A.,2021, Plant Taxonomy: Theory, Principles & Practices., Scientific Publishers,Jodhpur
2. Sharma, O. P.,2017, Plant Taxonomy, 2nd Edition. Tata McGraw-Hill Publication Com. Ltd. NewDelhi.
3. Singh, G., 2004, Plant Systematics: An Integrated Approach. Science Publishers Inc.
4. Pandey, B.P. 2001, A Textbook of Botany: Angiosperms. , S. Chand Publications, New Delhi.
5. Manilal, K.S. and Muktesh Kumar, M.S.,1998, A Handbook of Taxonomic Training., DST, NewDelhi.
6. Naik, V.N., 1984, Taxonomy of Angiosperms. , Tata McGraw-Hill Publication Com. Ltd. NewDelhi

Bachelor of Science (B. Sc.) Part - I: Botany

Semester II

Practical Course II (Course Code: BBP 123)

Practicals based on Course Paper III and IV

Course Objectives: The students should be able to……..

1.give practical knowledge to students about the identification of members of archegoniataearound them.

2.give practical knowledge to students about fossil plants and the plants around them.

3.give practical knowledge about morphological and anatomical variations in plants

4.give practical knowledge about use of taxonomic literature and preservation of plants.

Section	Practical Name	No. of hours per unit/ credits 60 Hrs. (4 Hrs / practical)
Section-I	1. Study of Bryophytes through representative members *Riccia* 2. Study of Bryophytes through representative members *Funaria* 3. Study of Pteridophytes through representative members *Selaginella* 4. Study of Pteridophytes through representative members *Pteris.* 5. Study of Gymnosperms through representative members *Gnetum.* 6. Study of Gymnosperms through representative members *Cycas.* 7. Study of types of fossils (Compression, Impression, Petrification, Cast, and Coal Balls). 8. Study of flowering twig morphology - Vegetative characters. 9. Study of flowering twig morphology - Floral/reproductive characters. 10. Preparation of botanical key using vegetative characters. 11. Preparation of botanical key using reproductive characters. 12. Study of preparation of herbarium. 13. Study of use of flora for identification of plants. 14. Visit to botanical garden. 15. Field visit.	

Course Outcome: The students will be able to……

1. identify general characteristics of Archegoniate through representative members.
2. identify the fossil types.

3. describe the plants around them.

4. use taxonomic literature for angiosperm plant identification.

Reference Books:

1. Bendre, A.,2010, Practical Botany. Rastogi Publications, Meerut.

2. Pande, B.P., 1979, Modern Practical Botany, Vol. I. , S. Chand Publishers, New Delhi.

3. Pande, B.P., 1979, Modern Practical Botany, Vol. II. , S. Chand Publishers, New Delhi

4. Walllis, C. J. , 1966, Practical Botany for Advanced Level and Intermediate Students, 5th Edition.William Heinemann Medical Books Ltd.

Bachelor of Science (B. Sc.) Part - I: Botany (OE)

Semester II

Subject- Principles of Management Paper -II (OE)

Course Objectives:

1. To aware students about Organising and Staffing.
2. To acquaint with Motivation and Leadership.

Unit No	Contents of Unit	Credit Assigned
Unit -I	**Organising and Staffing** **1.1 Organising** 1.1.1 Meaning and Definition of Organising 1.1.2 Steps of Organising 1.1.3 Importance of Organising **1.2 Staffing** 1.2.1 Meaning and Definition of Staffing 1.2.2 Sources of recruitment 1.2.3 Scientific Selection Process (Practical: Team Building Activity)	**15**
Unit-II	**Motivation and Morale** **2.1 Motivation :-** 2.1.1 Meaning and Definition 2.1.2 Significance of Motivation 2.1.3 Theories – Maslow's Need Hierarchy Theory, McGregor's X and Y **2.2 Leadership** 2.2.1 Meaning and Definition of Leadership 2.2.2 Leadership styles 2.2.3 Qualities of a good leader (Practical: Leadership Practical)	**15**

Course Outcomes:

1. Awareness about Organising and Staffing.
2. Acquaintance with Motivation and Leadership.

References:

1. Management (Concept, Practice & Cases) – K. Aswathappa – Tata Mc Graw Hill Education Private Limited.
2. Management – James A.F.Stoner, R.Edward Freeman – Pearson
3. Management Theory & Practice- J.P.Mahajan – Ane Books Pvt.Ltd
4. Business Organization & Management – C.B.Gupta – S Chand

Bachelor of Science (B. Sc.) Part - I

Botany (Major)

Semester-II

BBT-VEC-I: Role of Values and Ethics in Plant Sciences

Course Objectives: The students should be able to:

1. understand the universal human values.
2. relate that universal human values are integrated in plant sciences as well.
3. know importance of gender equity.
4. correlate knowledge of cultural heritage with plant sciences.

Credits (02)	Contents of Unit	No. of hours per unit
Unit I	**Universal Human values**	**07**
	Truth, Harmony, Compassion and Justice	
Unit II	**Ethical conduct and Ethical reasoning in Plant Sciences**	**08**
	2.1 Concept of ethical conduct and ethical reasoning 2.2 Examples to differentiate social ethics and ethical reasoning 2.3 Importance of ethics and values in plant sciences 2.4 Famous case studies highlighting consequences of ethical misconduct in plant sciences	
Unit III	**Importance of Gender Equity in Plant Sciences**	**08**
	3.1 Concept of gender, gender divide and gender equity 3.2 Gender participation status in plant sciences 3.3 Significance of gender equity in the development of plant sciences 3.4 Case studies highlighting the direct and indirect achievements of females in plant sciences	
Unit IV	**Importance of culture and heritage in the development of Plant Sciences**	**07**
	4.1 Concept of culture and heritage, Integration of plant sciences with culture and heritage 4.2 Enrichment of plant sciences by cultural and heritage diversity 4.3 Conservation of cultural heritage as an integral part of plant	

	sciences 4.4 Applications of cultural and inherited knowledge in present day scenario of plant sciences	

Course Outcomes: The students will be able to:

1. explain the universal human values
2. discuss concepts related to ethical values and ethical reasoning.
3. discuss the importance of gender equity in academics.
4. Compare and anlayze the importance of culture and heritage in development of plant sciences.

References Books:

1. https://fdp-si.aicte-india.org/download/HVBE_for_NEP2020.pdf