

“Dissemination of Education for Knowledge, Science and Culture”
-Shikshanmaharshi Dr. Bapuji Salunkhe



Shri Swami Vivekanand Shikshan Sanstha's
VIVEKANAND COLLEGE, KOLHAPUR
(AN EMPOWERED AUTONOMOUS INSTITUTE)

DEPARTMENT OF BOTANY
Three/Four- Years UG Programme
Department/Subject Specific Core or Major (DSC)

NEP- 2.0

**Curriculum, Teaching and
Evaluation Structure**

(As per NEP-2020 Guidelines)

for

B.Sc.-II- Botany

Semester-III & IV

(Implemented from academic year 2025-26 onwards)

Department of Botany

Departmental Teaching and Evaluation scheme

Third Year Semester- III & IV

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	ESE	CIE	PR	Marks	
Semester- III										
1	DSC-V	2DSC03BOT31	Diversity of Cryptogams	2	-	40	10	-	50	2
2	DSC-VI	2DSC03BOT32	Diversity of Phanerogams	2	-	40	10	-	50	2
3	MIN-I	2MIN03BOT31	Plant Biotechnology and Molecular Biology	2	-	40	10	-	50	2
4	MIN-II	2MIN03BOT32	Plant Taxonomy	2	-	40	10	-	50	2
5	DSC-PR-III	2DSC03BOT39	DSC-Botany Lab-3	-	8	-	-	50	50	4
6	MIN-PR-I	2MIN03BOT39	MIN-Botany Lab-3	-	4	-	-	25	25	2
7	OEC-PR-III	2OEC03LFS31	Life Science – III (Advanced Entrepreneurship in Botany- I)	-	4	-	-	25	25	2
8	VSC-PR-I	2VSC03BOT39	Bonsai and Terrarium	-	4	-	-	25	25	2
Semester –III Total				08	20	160	40	125	325	18
Semester-VI										
1	DSC-VII	2DSC03BOT41	Resource Botany	2	-	40	10	-	50	2
2	DSC-VIII	2DSC03BOT42	Industrial Botany	2	-	40	10	-	50	2
3	MIN-III	2MIN03BOT41	Plant Tissue Culture	2	-	40	10	-	50	2
4	MIN-IV	2MIN03BOT42	Commercial Botany	2	-	40	10	-	50	2
5	DSC-PR-IV	2DSC03BOT49	DSC-Botany Lab- 4	-	8	-	-	50	50	4
6	MIN-PR-II	2MIN03BOT49	MIN-Botany Lab- 4	-	4	-	-	25	25	2
7	OEC-PR-IV	2OEC03LFS41	Life Science – IV (Advanced Entrepreneurship in Botany- II)	-	4	-	-	25	25	2
8	VSC-PR-II	2VSC03BOT49	Herbal Technology	-	4	-	-	25	25	2
Semester –IV Total				08	20	160	40	125	325	18

Semester-III

Department of Botany

B.Sc. II (Botany), Semester: III

DSC-V: 2DSC03BOT31: Diversity of Cryptogams

Credits: 02

Theory: 30 hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to :

CO1: Provide a foundational understanding of several plant groups.

CO2: Enhance consciousness about the diversity seen in lower plant groups.

CO3: Disseminate information about how lower plant groups reproduce.

CO4: Describe the characteristics and groupings of lower cryptogams.

Unit	Syllabus	Lectures
Unit 1	Algae: Cryptogams: Introduction, General Characters. Algae- Introduction, Range of Thallus organization, Methods of reproduction, Algae Classification (G. M. Smith), Study of example with reference to occurrence, plant body and life cycle of <i>Spirogyra</i> and <i>Sargassum</i> . Economic importance of Algae.	07
Unit 2	Fungi: Fungi- Introduction, Habit (Types of mycelium), Mode of Nutrition. Methods of reproduction, Outline of Classification according to Alexopoulos and Mims (1979), Study of example with reference to occurrence, plant body and life cycle of <i>Rhizopus</i> and <i>Puccinia</i> . Economic importance of Fungi.	07
Unit 3	Bryophyta: Introduction, Distribution in India, Range of Thallus organization, Methods of reproduction, Outline classification according to Parihar (1965), Study of example with reference to occurrence, plant body and life cycle of <i>Riccia</i> and <i>Anthoceros</i> .	08
Unit 4	Pteridophyta: Introduction, Distribution in India, Methods of reproduction, Outline of Classification according to Smith (1955), Heterospory, Study of example with reference to occurrence, plant body, and life cycle of <i>Selaginella</i> and <i>Azolla</i> .	08

Reference Books:

1. Vashista B. R., Sinha A. K. and Singh V. P. (2005), Botany for degree students Algae, S. Chand and Company Ltd., New Delhi.
2. Gangulee H. C. and Das K. S. (1959), College Botany-Vol. I., New Central Book Agency (P), Limited , Delhi.
3. Vashista B. R., Sinha A. K. and Singh V. P. (2016), Botany for degree students Fungi, S. Chand and Company Ltd., New Delhi.
4. Vashista B. R., Sinha A. K. and Singh V. P. (2010), Botany for degree students Bryophytes, S. Chand and Company Ltd., New Delhi.

Department of Botany

B.Sc. II (Botany), Semester: III

DSC-VI: 2DSC03BOT32: Diversity of Phanerogams

Credits: 02

Theory: 30 hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to :

CO1: Introduce pupils to the fundamentals of diversity of phanerogams.

CO2: Convey concepts on lower phanerogams.

CO3: Identify various plant forms according to their distinct groups using distinguishing characteristics along with examples.

CO4: Determine each group's life cycle pattern.

Unit	Contents	Lectures
1	Phanerogams: Introduction, Distinguishing characters of Gymnosperms and Angiosperms.	03
2	Gymnosperms: Introduction, Distribution of Gymnosperms in India, Methods of Reproduction, Outline of classification system According to Sporne (1965), Study of example with reference to occurrence, plant body and life cycle of <i>Pinus</i> and <i>Gnetum</i> .	09
3	Angiosperms: Introduction, Habit and Habitat diversity, Methods of reproduction, Evolutionary history, Taxonomic hierarchy, Bentham and Hooker System of Classification (Merit and Demerit), Difference between Dicot and Monocot plant, Study of Sunflower and Maize root and stem.	09
4	Taxonomic Importance: Morphology, Anatomy, Chemotaxonomy and Palynology, Brief introduction to Cytotaxonomy, Chemotaxonomy, Numerical taxonomy, Molecular taxonomy and DNA Barcoding of plants. Herbaria, Herbarium technique and Digital herbaria.	09

Reference Books:

1. Singh, Pande and Jain (2013), A Textbook of Botany Angiosperms, Rastogi Publications, Meerut, India.
2. Vashishta P.C., Sinha A. K. and Kumar A. (2010), Gymnosperms , S. Chand and Company, Ltd, Ramnagar, New Delhi, India.
3. Pandey B. P (2010), College Botany Vol II., S. Chand and Company Ltd., New Delhi, India
4. Sporne K. P. (1965), The Morphology of Gymnosperms, Hutchinson, London, Hillary house, New York.

Department of Botany

B.Sc. II (Botany), Semester: III

MIN- I: 2MIN03BOT31: Plant Biotechnology and Molecular Biology.

Credits: 02

Theory: 30 hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to:

CO1: Know the scope and importance of molecular biology.

CO2: Gain knowledge about the mechanism and essential component required for the DNA replication.

CO3: Know the fundamentals of recombinant DNA technology.

CO4: Gain the knowledge of genetic engineering.

Unit	Contents	Lectures
Unit 1	Genetic Material: Nucleic acids (DNA and RNA), Griffith's and Avery's transformation experiment, Hershey – Chase bacteriophage experiment, DNA structure and Types of DNA, DNA replication, RNA structure and types of RNA.	08
Unit 2	Recombinant DNA technology: Introduction and Principle, General methods and Enzymes involved in recombinant, DNA technology, Cloning vectors, Blotting techniques – Northern, Southern and DNA fingerprinting.	08
Unit 3	Genetic Engineering: Introduction, Methods of gene transfer – Agrobacterium mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment, Transgenic plants, Applications of plant biotechnology.	08
Unit 4	Gene Amplification: An overview of the PCR technique, its principles, mechanism of DNA amplification, types of PCR and key applications in healthcare, forensics, biotechnology.	06

Reference Books:

1. Russell P. J. (2010), Genetics – A Molecular Approach, Benjamin Cummings, 3rd Edition, U.S.A
2. Stewart C. N. (2008), Plant Biotechnology and Genetics – Principles Techniques and Applications, John Wiley and Sons, U.S.A
3. Bhojwani S. S. and Razdan M. K. (1996), Plant Tissue Culture – Theory and Practice, Elsevier Science Amsterdam, The Netherlands.
4. Glick B. R. and Pasternak J. J. (2003), Molecular Biotechnology, Principles and Applications of Recombinant DNA, ASM Press Washington.

Department of Botany

B.Sc. II (Botany), Semester: III

MIN- II : 2MIN03BOT32: Plant Taxonomy

Credits: 02

Theory: 30 hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to:

CO1: Expose the student to the basic principles and methods of plant taxonomy.

CO2: Recognize the different facts of plant classification and nomenclature.

CO3: Explain the ICN and ICBN in terms of their guiding concepts and regulations.

CO4: Develop an appreciation of the scientific and aesthetic values of plants in students mind.

Unit	Contents	Lectures
Unit 1	Introductory Taxonomy: Introduction, Importance of Taxonomy, Functions of Taxonomy - Identification, Nomenclature, Classification, Ranks, Categories and Taxonomic groups.	06
Unit 2	Botanical Nomenclature: Principles and rules (ICN), Salient features of International Code of Botanical Nomenclature (ICBN), Rules and regulations of Binomial nomenclature System, Systems of Classification-Natural, Artificial and Phylogenetic, Bentham and Hootter's system of Classification (Up to series).	08
Unit 3	Tools For Taxonomic Studies: Herbarium - Introduction, Roles and Significance, Botanical gardens -Introduction, Roles and Significance, Sir. J. C. Bose Botanical Garden, Calcutta., Kew Botanical Garden, Kew, Lead Botanical Garden, Shivaji University, Kolhapur.	08
Unit 4	Taxonomic Literature: Flora, Manuals, Monographs, eflora, Revisions, Journals, Periodicals, Reference Books, Research paper, Websites and Catalogues. Plant Families: Morphological, floral, distinguishing characters and economic importance of following families. 1. Malvaceae 2. Amaryllidaceae.	08

Reference Books:

1. Lawrence G. M. H. (1951), Taxonomy of vascular plant, Macmillan, London.
2. Naik V. N. (1984), Taxonomy of Angiosperms, Tata Mc. Graw-Hill Publication, New Delhi.
3. Singh V. and Jain D. K. (2004), Taxonomy of Angiosperms, Rastogi Publications, Meerut.
4. Lawrence G. M. H. (1951), Taxonomy of vascular plant, Macmillan, London

Department of Botany

B.Sc. II (Botany), Semester: III

DSC-PR-III: 2DSC03BOT39: DSC-Botany Lab-3

Credits: 08

Marks: 50

Practical - I and II

(Based on Paper 2DSC03BOT31 and Paper 2DSC03BOT32)

Course Outcomes: After the completion of the course the student will be able to :

CO1: Know the different types cryptogams.

CO2: Understand the different types of pollen grains.

CO3: Know the difference between dicot and monocot plant.

CO4: Understand the anatomy of dicot and monocot plant.

Practicals: I

- 1 to 2) Study of vegetative and reproductive characters of *Spirogyra* and *Sargassum*.
- 3 to 4) Study of vegetative and reproductive characters of *Rhizopus* and *Puccinia*.
- 5 to 6) Study of vegetative and reproductive characters of *Riccia* and *Anthoceros*.
- 7 to 8) Study of vegetative and reproductive characters of *Azolla* and *Selaginella*.
- 9) Study of habit and habitat diversity in angiosperms with suitable example.

Practicals: II

- 10) Study of morphology of dicot plant with reference to vegetative and reproductive structure.
- 11) Study of morphology of monocot plant with reference to vegetative and reproductive structure.
- 12 to 13) Study of anatomy of *Sunflower* root and stem.
- 12 to 15) Study of anatomy of *Maize* root and stem.
- 16) Study of different types of pollen grains.

Reference books:

1. Vashista B. R., Sinha A. K. and Singh V. P. (2016), Botany for degree students Fungi, S. Chand and Company Ltd., New Delhi.
2. Vashista B. R., Sinha A. K. and Singh V. P. (2010), Botany for degree students Bryophytes, S. Chand and Company Ltd., New Delhi.
3. Pandey B. P (2010), College Botany Vol II., S. Chand and Company Ltd., New Delhi, India
4. Sporne K. P. (1965), The Morphology of Gymnosperms, Hutchinson, London, Hillary house, New York.

Department of Botany

B.Sc. II (Botany), Semester: III

MIN-PR-I: 2MIN03BOT39: MIN-Botany Lab-3

Credits: 04

Marks: 25

Practical - I

(Based on Paper 2MIN03BOT31 and Paper 2MIN03BOT32)

Course Outcomes: After the completion of the course the student will be able to:

CO1: Know the different types DNA and RNA.

CO2: Understand the PCR and Electrophoresis techniques.

CO3: Know the herbarium technique.

CO4: Understand the different taxonomic literature.

Practicals :

- 1) Study of Bacteriophage with photograph.
- 2) Study of methods of gene transfer with photograph.
- 3) Study of PCR instrument.
- 4) Study of Griffith's experiment with photographs.
- 5) Study of different types of DNA and RNA with photographs.
- 6) Study of Agarose Gel Electrophoresis.
- 7) Study of DNA isolation by crude method.
- 8) Study of estimation of DNA by spectrophotometer.
- 9) Study of herbarium and its preparation.
- 10) Study of Taxonomic literature with reference to theory syllabus.
- 11 to 14) Study of plant family - Malvaceae, Amaryllidaceae.
- 15) Visit to Botanical garden.

Reference books:

1. Stewart C. N. (2008), Plant Biotechnology and Genetics – Principles Techniques and Applications, John Wiley and Sons, U.S.A
2. Bhojwani S. S. and Razdan M. K. (1996), Plant Tissue Culture – Theory and Practice, Elsevir Science Amsterdam, The Nether lands.
3. Singh V. and Jain D. K. (2004), Taxonomy of Angiosperms, Rastogi Publications, Meerut.
4. Lawrence G. M. H. (1951), Taxonomy of vascular plant, Macmillan, London

Department of Botany

B.Sc. II (Botany), Semester: III

OEC-PR-III: 2OEC03LFS31: Life Science - III

Credits: 04

Marks: 25

Practical - I

(Advanced Entrepreneurship in Botany - I)

Course Outcomes: After the completion of the course the student will be able to:

CO1: Apply knowledge on Mushroom cultivation.

CO2: Gain knowledge about *Spirulina* farming.

CO3: Learn about the designing of Jewellery using natural material.

CO4: Understand the hydroponics technique.

Practicals:

- 1 to 2) Study of Mushroom cultivation.
- 3 to 4) Study of *Spirulina* farming.
- 5 to 6) Designing of Jewelry using natural material.
- 7 to 8) Vegetable and fruit carving technique.
- 9 to 10) Study of Hydroponics technique.
- 11 to 12) Preparation of Soya milk/ Fruit crush.
- 13 to 14) Preparation of Choral.
- 15) Preparation of Coco peat.

Reference books:

1. Shu Ting Chang (2004), Mushrooms, CRC Press, Washington D.C.
2. Priya Lokare (2021), *Spirulina* farming : To ingrain the Entrepreneurship, Notion Press, Chennai, Tamil Nadu.
3. Dr. Sudhir Kumar Pathak (2002), Entrepreneurial Botany and Skill Development, Nitya Publication, Bhopal.
4. Umesh Thapa (2025), Handbook of Hydroponics, Ninetales Publishing, Uttar Pradesh.

Department of Botany

B.Sc. II (Botany), Semester: III

VSC-PR-I: 2VSC03BOT39: VSC-Botany Lab-3

Credits: 04

Marks: 25

Practical - I (Bonsai and Terrarium)

Course Outcomes: After the completion of the course the student will be able to:

CO1: Impart basic principles of bonsai technique.

CO2: Recognize the abilities required to sustain and care for a bonsai plant.

CO3: Emphasize the fundamentals of terrarium construction.

CO4: Apply knowledge on Bonsai cultivation, terrarium construction for marketing.

Practicals :

- 1) Study of Bonsai technique.
- 2) Study of tools and containers used in bonsai technique.
- 3) Study of wiring and preparation of bonsai media.
- 4) Study of different designing and styles of bonsai.
- 5 to 7) Study of bonsai preparation.
- 8) Study of training and pruning techniques in bonsai.
- 9) Study of irrigation, pest and disease management in bonsai.
- 10) Study of terrarium.
- 11) Study of containers, preparation of media used in terrarium technique.
- 12 to 13) Study of terrarium preparation.
- 14) Designing of terrarium.
- 15) Bonsai / Terrarium submission.

Reference books:

1. Acquaah G. (2019), Horticulture: Principles and Practices (4th edition) India, Pearson India Education Services Pvt. Ltd., India.
2. Lancaster S. P., Base T. K. and Mukherjee D. (1997), Gardening in India, Oxford and IBH publishing Co, Calcutta.
3. Zingare A. K. (2013), A manual of Gardening, Satyam Publishers and Distributors, Jaipur.
4. Singh D. B. and Wazin Poonm (2002), Bonsai : An Art, Scientific Publishers, Jodhpur.

Department of Botany

Distribution of Marks for Practical Examination (LAB):

DSC-PR-III: 2DSC03BOT39: DSC- Botany Lab-3

Practicals	Practical I and II	Journal	Total
Marks	20 + 20	05 + 05	50

Distribution of Marks for Practical Examination (LAB):

MIN-PR-I: 2MIN03BOT39: MIN- Botany Lab-3

Practicals	Practical I	Journal	Total
Marks	20	05	25

Distribution of Marks for Practical Examination (LAB):

OEC-PR-III: 2OEC03LFS31: Botany Lab-3

Practicals	Practical I	Journal	Total
Marks	20	05	25

Distribution of Marks for Practical Examination (LAB):

VSC-PR-I: 2VSC03BOT39: Botany Lab-3

Practicals	Practical I	Journal	Total
Marks	20	05	25

Semester-IV

Department of Botany

B.Sc. II (Botany), Semester: IV

DSC-VII: 2DSC03BOT41: Resource Botany

Credits: 02

Theory: 30 hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to:

CO1: Identification, extraction, and use of plants with economic significance.

CO2: Impart the knowledge of the role of plants in human welfare.

CO3: Update the students about plant dependent industries.

CO4: Encourage students to think about entrepreneurship and start-ups.

Unit	Syllabus	Lectures
Unit 1	Forest as Potential Resource: Introduction and Scope, Major forest produce and their uses- Gum, Resin, Tannin and Pigments.	06
Unit 2	Plant resources used in cosmetics, aromatics and pharmaceuticals : Introduction and scope, Herbal preparations, Methods of extraction- Maceration, Digestion, Decoction aromatic waste, extracts and tinctures. Study of <i>Aloe</i> , Heena, Lemon grass, Rose, Jasmine, Turmeric, Ginger, Neem, Holy basil, Amla.	10
Unit 3	Floricultural Industry: Introduction to floriculture, Cultivation practices, Harvesting and marketing of Rose and Gerbera.	07
Unit 4	Bio- fuel Technology: Introduction and advantages, Concept of Bio-fuel and its need, Plants used for Bio-fuel production, Biodiesel production from Castor.	07

Reference Books:

1. Kochhar, S. L. (1998), Economic Botany in Tropics, Macmillan, New Delhi, India.
2. Satya Prakash Krishan Pal Singh (2023), Fundamentals of Floriculture, Write and Print publications, New Delhi.
3. Sanjay Sahay (2021), Handbook of Biofuels, Academic Press, London.
4. Donald L. Grebner, Jacek P. Siry, Pete Bettinger, Kevin Boston (2021), Introduction to Forestry and Natural Resources 2nd Edition, Academic Press, London.

Department of Botany

B.Sc. II (Botany), Semester: IV

DSC-VIII: 2DSC03BOT42: Industrial Botany

Credits: 02

Theory: 30 hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to :

CO1: Acquire knowledge of different plant species and the components that are employed in industry.

CO2: Acquire an understanding procedures that are used to turn raw materials into finished goods.

CO3: Get knowledge about various sectors and products that are derived from plants and their components.

CO4: Highlight the potential of these studies to become an entrepreneur.

Unit	Contents	Lectures
1	Physical characteristics of Indian Woods: Methods of seasoning and chemical treatment of specialized use, Fire proofing of the wood, Industrial manufacturing of packing material and plywood, the Classification of plywoods according to their use. Some important commercial woods - <i>Dalbergia sp.</i> , <i>Shorea robusta</i> <i>Tectona grandis</i> , <i>Cedrus deodara</i> , Bamboo - the "Green Gold of India." Manufacturing of paper and board from raw plant material Manufacturing of crude and high quality paper, recycled paper.	12
2	Extraction of sugar from sugar cane: Flow diagram of the process with a critical study of the steps involved, problems faced by the sugar industry in India By products of sugar industry, distillation of alcohol and other products with special reference to distilleries in Maharashtra.	09
3	Sources of natural dyes in India and their extraction methods, merits and limitations of plant based dyes.	04
4	Importance of Seed Industry: Seed production, seed processing and marketing, major seed industries and corporation of India.	05

Reference Books:

1. Pandey B. P. (1999), Economic Botany, S. Chand and Company Ltd., New Delhi.
2. Hugh Trotter (1929), The Common Commercial Timbers of India and Their Uses, Government of India Central Publication, New Delhi.
3. Kochhar S. L. (1998), Economic botany in the Tropics - Macmillan India Limited, Delhi.
4. Ambasta S. P. (1994), The Useful Plants of India (3rd Ed), Publications and Information Directorate, CSIR, New Delhi.

Department of Botany

B.Sc. II (Botany), Semester: IV

MIN- III: 2MIN03BOT41: Plant Tissue Culture.

Credits: 02

Theory: 30 hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to:

CO1: Acquire knowledge of plant tissue culture.

CO2: Get knowledge of methodology of plant tissue culture.

CO3: Update the students about plant tissue culture industries.

CO4: Highlight the potential of these studies to become entrepreneur.

Unit	Contents	Lectures
Unit 1	History of Plant tissue culture: History of plant tissue culture and research, Basic principles & terminology of plant tissue, Totipotency of cells, Cellular differentiation.	06
Unit 2	Methodology of Plant tissue culture: Methodology - Sterilization (physical and chemical methods), Plant cell culture methods, Culture media, MS and B5, Phytohormones, Medium for micro-propagation,	08
Unit 3	Culture of organs: Organogenesis, Callus induction and embryogenesis, Protoplast culture Somatic hybridization and Micro propagation media requirements, morphogenetic potential and its applications.	08
Unit 4	Application of Tissue culture: Micro propagation, Production of Disease-free Plants, Tissue culture and crop improvement - Agrobacterium mediated gene transfer technology, Production of Artificial Seeds.	08

Reference Books:

1. Stewart C. N. (2008), Plant Biotechnology and Genetics – Principles Techniques and Applications, John Wiley and Sons, U.S.A
2. Bhojwani S. S. and Razdan M. K. (1996), Plant Tissue Culture – Theory and Practice, Elsevir Science Amsterdam, The Nether lands.
3. Razdan M. K. (2010), Plant Tissue Culture, Scientific Publisher, New Delhi, India
4. Glick B. R, Pastemak J. J. (2003), Molecular Biotechnology- Principles and Application of Recombinant DNA, ASM Press, Washington.

Department of Botany

B.Sc. II (Botany), Semester: IV

MIN- IV: 2MIN03BOT42: Commercial Botany

Credits: 02

Theory: 30 hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to:

CO1: Know about the commercial products produced from algae, fungi, bryophytes and pteridophytes.

CO2: Learn about the chemistry of plants and its commercial products.

CO3: Gain knowledge about developing commercial enterprise of microbial products.

CO4: Understand the role of higher plants in our society and how they can be used for more applied aspects.

Unit	Contents	Lectures
Unit 1	Algae: Introduction, Potential algae, Products, Processing and applications of algae. (Future prospectus) <i>Sargassum, Nostoc, Spirulina, Chlorella, Prophyra</i> .	06
Unit 2	Fungi : Introduction, Potential fungi, Products, Processing and applications of fungi. (Future prospectus) <i>Trichoderma, Metarhizium, Beauveria, Penicillium, Aspergillus, Yeast, Ganoderma, Agaricus</i> .	06
Unit 3	Bryophytes and Pteridophytes : Introduction, Potential member, Products, Processing and applications of organisms. (Future prospectus) Bryophytes - Moss, <i>Marchantia, Riccia</i> Pteridophytes - <i>Adiantum, Nephrolepis, Dryopteris, Polypodium, Lycopodium</i> .	09
Unit 4	Higher Plants : Introduction, Potential member, Products, Processing and applications of organisms. (Future prospectus) Gymnosperm - <i>Cycas, Pinus, Ginkgo, Taxus</i> Angiosperm - <i>Aswaghanda, Ashoka, Atropa, Plumbago, Costus</i> .	09

Reference Books:

1. Sivarajan V. V. and Balachandran I (1994), Ayurvedic drugs and their plant source, Oxford IBH Publishing Co. Pvt. Ltd., New Delhi., India.
2. Smith, R. H. (2000), Plant Tissue Culture and Experiments, 2nd edition, Academic Press, USA.
3. Levetin, F., McMahon, K. (2016), Plants and Society, 7th Edition, McGraw Hill, New York.
4. Sharma, O. P. (1992), Text book of Thallophyta, McGraw Hill Publishing Co. New Delhi.

Department of Botany

B.Sc. II (Botany), Semester: IV

DSC-PR-IV: 2DSC03BOT49: DSC-Botany Lab-4

Credits: 08

Marks: 50

Practical - I and II

(Based on Paper 2DSC03BOT41 and Paper 2DSC03BOT42)

Course Outcomes: After the completion of the course the student will be able to :

CO1: Know the different major forest products.

CO2: Understand the different methods of extraction.

CO3: Know the commercial wood yielding plants.

CO4: Understand the fermentation technique.

Practicals: I

- 1) Study of major forest products like Gum, Resin and Tannin.
- 2) Study of methods of extraction- Maceration, Digestion and Decoction.
- 3 to 5) Study of cosmetic, aromatic plants with reference to botanical name, family, source, botanical description and uses of Heena, Lemon grass, Rose, Jasmine.
- 6) Study of cultivation practices, origin, variety, harvesting and marketing of Rose and Gerbera.
- 7) Study of biodiesel plant - Caster.

Practicals: II

- 8) Study of some important commercial wood yielding plants like *Tectona grandis*, Bamboo.
- 9) Study of sugar production in sugar factory.
- 10) Study of fermentation technique by using sugarcane juice.
- 11) Study of dye yielding plants like *Bixa*, Turmeric.
- 12) Study of different steps of seed industry.
- 13) Preparing the list of seed industries.
- 14) Collect the information regarding different variety of crops.

Reference books:

1. Kochhar, S. L. (1998), Economic Botany in Tropics, Macmillan, New Delhi, India.
2. Satya Prakash Krishan Pal Singh (2023), Fundamentals of Floriculture, Write and Print publications, New Delhi.
3. Pandey B. P. (1999), Economic Botany, S. Chand and Company Ltd., New Delhi.
4. Hugh Trotter (1929), The Common Commercial Timbers of India and Their Uses, Government of India Central Publication, New Delhi.

B.Sc. II (Botany), Semester: IV

MIN-PR-II: 2MIN03BOT49: MIN-Botany Lab-4

Credits: 04

Marks: 25

Practical - I

(Based on Paper 2MIN03BOT41 and Paper 2MIN03BOT42)

Course Outcomes: After the completion of the course the student will be able to:

CO1: Know the different types of habits, habitats of plants.

CO2: Understand the root and stem anatomy.

CO3: Know the herbarium technique.

CO4: Understand the morphological and reproductive characters of dicot and monocot plants.

Practicals:

- 1) Study of M S media preparation.
- 2) Study of different sterilization technique.
- 3) Study of inoculation technique with suitable plant material.
- 4) Study of micro propagation technique.
- 5) Study of protoplast fusion with suitable chemical.
- 6) Study of callus culture.
- 7) Study of artificial seed production technique.
- 8) Visit to plant tissue culture laboratory.
- 9) Study of insect repellent plants and its products. (Neem, *Ocimum*, *Pongamia*, Lemon grass.
- 10) Study of sea weed extract/algal fertilizers.
- 11) Study of oil extraction technique.
- 12) Making of *Spirulina* culture.
- 13) Study of biocontrol agents/*Trichoderma* culture.
- 14) Study of bryophytes.
- 15) Production of *Azolla*.
- 16) Study of flowering plants.

Reference books:

1. Singh, Pande and Jain (2013), A Textbook of Botany Angiosperms, Rastogi Publications, Meerut, India.
2. Levetin, F., McMahon, K. (2016), Plants and Society, 7th Edition, McGraw Hill, New York.
3. Sharma, O. P. (1992), Text book of Thallophyta, McGraw Hill Publishing Co. New Delhi.
4. Vashishta P.C., Sinha A. K. and Kumar A. (2010), Gymnosperms, S. Chand and Company, Ltd, Ramnagar, New Delhi, India.

Department of Botany

B.Sc. II (Botany), Semester: IV

OEC-PR-IV: 2OEC03LFS41: Life Science - IV

Credits: 04

Marks: 25

Practical - II

(Advanced Entrepreneurship in Botany - II)

Course Outcomes: After the completion of the course the student will be able to:

CO1: Update the students about plant based industries.

CO2: Understand the technique of bio pesticides preparation.

CO3: Know the preparation of compost.

CO4: Understand the students about plant based industries.

Practicals:

- 1 to 2) Making of aroma candles.
- 3 to 4) Making of mosquito repellent sticks.
- 5 to 6) Making of ecofriendly articles.
- 7 to 8) Making of Bouquet.
- 9 to 10) Preparation of Floral rangoli.
- 11) Flower arrangement.
- 12 to 13) Preparation of Compost.
- 14 to 15) Preparation of Biopesticide.

Reference books:

1. Siddhi Chauhan (2023), A Bouquet, Book leaf Publishing, 1st edition, Cheyenne, USA.
2. Robert Rynk (2021), The Composting Hand Book, Academic Press, Elsevier
3. Yashpal Singh (2004), Botany For B.Sc. students, Entrepreneurship in Botany, S. Chand Publications, New Delhi.
4. Honeywell E. R. (1958), Principles of flower arrangement Master Gardener, University of Arkansan, Cooperative extension service, Mountain Home, AR.

Department of Botany

B.Sc. II (Botany), Semester: IV
VSC-PR-II: 2VSC03BOT49: VSC-Botany Lab-4

Credits: 04

Marks: 25

Practical - II **(Herbal Technology)**

Course Outcomes: After the completion of the course the student will be able to:

- CO1: A comprehension of the value of the holistic approach to therapy employed in Indian traditional medical systems, as well as the significance of medicinal plants to both traditional and modern medicine.
- CO2: Acquire understanding regarding the limitations in the marketing and promotion of medicinal plants.
- CO3: Transforming knowledge into skills for advancing traditional medicine.
- CO4: Acquiring entrepreneurial skills to create goods with added value, extracts from plants, and the separation of bioactive ingredients.

Practicals :

- 1- 4) Study of herbal medicinal plants with reference to common name, botanical name, family, parts used, botanical description, chemical constituents and medicinal uses of Shikakai, Aloe vera, Turmeric, Neem, Guduchi, Tulsi, Bael and Amla.
- 5) Study of classification of crude drugs.
- 6) Study of different steps of herbal drug production.
- 7) Study of phytochemical analysis of hair care plants. (Reetha, Shikakai)
- 8) Study of phytochemical analysis of skin care plants. (Aloe vera, Turmeric)
- 9) Study of phytochemical analysis of antidiabetic plants. (Guduchi, Neem, Jamun)
- 10) Study of phytochemical analysis of plants used in respiratory disorders. (Adulsa, Jeshthamadh, Tulsi, Ginger).
- 11) Study of phytochemical analysis of plants used in digestive disorders. (Bael, Ajwain)
- 12) Study of phytochemical analysis of plants used in anti aging. (Amla, Basil, Clove, Lemon)
- 13) Visit to herbal drug industries.
- 14) Study of herbal garden.
- 15) Project report (Phytochemical analysis of any two plants).

Reference books:

- 1. Shah and Quadry's, (2005), Pharmacognosy, B. S. Shah prakashan, India.
- 2. Sivarajan V. V. and Balachandran I., (1994), Ayurvedic drugs and their plant source, Oxford IBH Publishing Co. New Delhi.
- 3. Kokate C. K., (2002), Pharmacognosy, Nirali Prakashan, Pune.
- 4. Miller L. and Miller B. (1998), Ayurveda and Aromatherapy, Banarsidas, Delhi.

Department of Botany

**Distribution of Marks for Practical Examination (LAB):
DSC-PR-IV: 2DSC03BOT49: DSC- Botany Lab-4**

Practicals	Practical I and II	Journal	Total
Marks	20 +20	05 + 05	50

**Distribution of Marks for Practical Examination (LAB):
MIN-PR-II:2MIN03BOT49: MIN- Botany Lab-4**

Practicals	Practical I	Journal	Total
Marks	20	05	25

**Distribution of Marks for Practical Examination (LAB):
OEC-PR-IV: 2OEC03LFS41: Botany Lab-4**

Practicals	Practical I	Journal	Total
Marks	20	05	25

**Distribution of Marks for Practical Examination (LAB):
VSC-PR-II: 2VSC03BOT39: Botany Lab-4**

Practicals	Practical I	Journal	Total
Marks	20	05	25

Department of Botany

B.Sc. Part–II Semester- III & IV BOTANY

Semester End Examination

Structure of Question Paper

Total Marks: 40

Time: 2 hours

Question No.	Question Pattern	Marks
Q.1	Choose and rewrite the correct alternative (One mark each):	08
Q.2	Attempt any TWO (Eight marks each):	16
Q.3	Attempt any FOUR (Four marks each):	16
	Total	40

B.Sc. Part–II Semester- III & IV BOTANY

Continuous Internal Evaluation (CIE)

Evaluation Type	Marks
Home Assignment/ Student Project/ Test/ PPT Presentation	10

Department of Botany

Nature of Question Paper:

Seat No.	
----------	--

Q. P. code	
------------	--

VIVEKANAND COLLEGE, KOLHAPUR

(AN EMPOWERED AUTONOMOUS INSTITUTE)

B.Sc. Part- II (Botany) (Semester- III & IV) Examination.....

Course Code and Name: 2DSC03BOT31: Diversity of Cryptogams

Day:

Time: 2 hours

Date: --/--/----

Marks : 40

Instructions:

- 1) All the questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat labelled diagrams wherever necessary.

Q. 1. Choose and rewrite the correct alternative (One mark each):

[08 Mks]

- i) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- ii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- iii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- iv) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- v) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- vi) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- vii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- viii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----

Q.2. Attempt any TWO (Eight marks each):

[16 Mks]

- i) Xyzabcdefghijklmnop.
- ii) Xyzabcdefghijklmnop.
- iii) Xyzabcdefghijklmnop

Q.3. Attempt any FOUR (Four marks each):

[16 Mks]

- i) Xyzabcdefghijklmnop.
- ii) Xyzabcdefghijklmnop.
- iii) Xyzabcdefghijklmnop.
- iv) Xyzabcdefghijklmnop.
- v) Xyzabcdefghijklmnop.
- vi) Xyzabcdefghijklmnop.