Rayat Shikshan Sanstha's

Sadguru Gadge Maharaj College, Karad
(Empowered Autonomous)

Syllabus under Autonomy
For
B. Sc. III (Botany)

Academic Year 2025 - 2026

Rayat Shikshan Sanstha's

Sadguru Gadge Maharaj College, Karad
(Empowered Autonomous)
Syllabus for Bachelor of Science (B. Sc.) Part – III

1. TITLE: Botany
2. YEAR OF IMPLEMENTATION: 2025 - 2026
3. PREAMBLE:

The B. Sc. III Botany course under autonomy will be effective from the academic year 2024 -2025. It has been prepared keeping in view the unique requirements of B. Sc. Botany students. The contents have been drawn up to accommodate the widening horizons of the discipline of biological sciences. The emphasis is to provide students the latest information along with due weightage to the concepts of classical botany so that they are able to understand and appreciate the current interdisciplinary approaches in the study of plant sciences and its role in societal development. The course content also lists new practical exercises so the students gets a hands on experience of 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.

4. GENERAL OBJECTIVES OF THE COURSE:
    1. To impart the knowledge of science is the basic objective of education.
    2. To develop scientific attitude among the students and to make the students open minded, critical and curious.
    3. To develop skill in practical work, experiments and laboratory materials.
    4. To understand scientific terms, concepts, facts, phenomenon and their relationships.
    5. To make the students aware of natural resource and environment.
    6. To enable the students to acquire knowledge of plants and related subjects so as to understand nature and environment in the benefit of human beings.
    7. To develop ability for the application of acquired knowledge to improve agriculture and related fields to make the country self-reliant.
5. DURATION: 01 year
6. PATTERN: CBCS Semester
7. MEDIUM OF INSTRUCTION: English

8. STRUCTURE OF COURSE:

1) FIFTH SEMESTER (NO. OF PAPERS – 04)

Sr. No.	Subject Title	Theory				Practical			
		Paper No. & Paper Code	Title of Paper	No. of lectures per week	Credits	Paper No. &Paper Code	No. of lectures Per week	Credits
1.	Botany Major	Paper IX: MJ-BBT23-**501**	Genetics & Plant Breeding	12	08	Practical Paper V MJ-BBP23- **507** (based on MJ-BBT23- 501, MJ-BBT23-502, MJ-BBT23-503 and MJ-BBT23- 504)	20	08
		Paper X:MJ-BBT23- **502**	Microbiology, Plant Pathology and Mushroom Cultivation Technology					
		Paper XI:MJ-BBT23- **503**	Cytology and Techniques in Biology					
		Paper XII: MJ-BBT23-**504**	Advanced Botanical Skills and Horticulture I					
2.	Botany Major Elective	Elective Paper XIII: MJE-BBT23- **505**	Ethnobotany and Conservation	02	02			
3.		Elective Paper XIII: MJE-BBT23-505	Ethnobotany and Bioprospecting	02	02			
4.	Botany Minor	Paper VII: MN-BBT23-**506**	Ethnobotany and Conservation	02	02			
5.	FP	FP23-**508**	Field Project	01	02			

2) SIXTH SEMESTER (NO. OF PAPERS – 04)

Sr. No.	Subject Title	Theory				Paper No. & Paper Code	Practical	
		Paper No. & Paper Code	Title of Paper	No. of lectures per week	Credits		No. of lectures Per week	Credits
1.	Botany Major	Paper XIV: MJ-BBT23-**601**	Plant Biochemistry and Molecular Biology	12	08	Practical Paper VI: MJ-BBP23- **607** (based on MJ-BBT23- 601, MJ-BBT 23-602, MJ-BBT23-603 and MJ-BBT23- 604)	20	08
		Paper XV: MJ-BBT23-**602**	Bioinformatics, Biostatistics and Economic Botany					
		Paper XVI: MJ-BBT23-**603**	Plant Biotechnology and Paleobotany					
		Paper XVII: MJ-BBT23-**604**	Advanced Botanical Skills and Horticulture II					
2.	Botany Major Elective	Elective Paper XVIII: MJE-BBT23-**605**	Biodiversity Conservation	02	02			
3.		Elective Paper XVIII: MJE-BBT23-605	Plant Biodiversity and Environmental Accounting	02	02			
4.	Botany Minor	Paper VIII: MN-BBT23-**606**	Biodiversity Conservation	02	02			
	OJT	OJTB23-**608**	On the Job Training		02			

2) Structure and titles of papers of B. Sc. Course

B. Sc. III Semester V

Paper IX (MJ-BBT23-501): Genetics and Plant Breeding.

Paper X (MJ-BBT23-502): Microbiology, Plant Pathology and Mushroom Cultivation Technology.

Paper XI (MJ-BBT23-503): Cytology and Techniques in Biology.

Paper XII (MJ-BBT23-504): Advanced Botanical Skills and Horticulture I

Paper XIII (MJE-BBT23- 505): Ethnobotany and Conservation

Paper XIII (MJE-BBT23- 505): Ethnobotany and Bioprospecting

Paper VII (MN-BBT23-506): Ethnobotany and Conservation

Practical Paper V MJ-BBP23- 507 (based on MJ-BBT23- 501, MJ-BBT23-502, MJ-BBT23-503 and MJ-BBT23- 504)

FP (FP23-508) Field Project

B. Sc. III Semester VI

Paper XIV: (MJ-BBT23-601) Plant Biochemistry and Molecular Biology

Paper XV: (MJ-BBT23-602) Bioinformatics, Biostatistics and Economic Botany

Paper XVI: (MJ-BBT23-603) Plant Biotechnology and Paleobotany

Paper XVII: (MJ-BBT23-604) Advanced Botanical Skills and Horticulture II

Paper XVIII (MJE-BBT23- 605): Biodiversity Conservation

Paper XVIII (MJE-BBT23- 605): Plant Biodiversity and Environmental Accounting

Paper VIII (MN-BBT23-606): Biodiversity Conservation

Practical Paper VI: MJ-BBP23-607 (based on MJ-BBT23- 601, MJ-BBT23-602, MJBBT23-603 and MJ-BBT23- 604)

OJTT (OJTT23-608): On the Job Training

3) OTHER FEATURES:

A) LIBRARY:

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

B) SPECIFIC EQUIPMENTS:

a) Computer, LCD projector, Visualizer, Smart Board

b) Laboratory Equipment's:

1. Microscope with digital camera

2. Trinocular Research Microscope
3. Stereo Zoom Microscope
4. Dissecting microscope
5. Laminar Air Flow
6. UV-VIS Double beam spectrophotometer
7. Refrigerated Centrifuge
8. Digital weighing balance
9. pH meter
10. Microtome
11. Autoclave
12. Hot Air Oven
13. Incubator
14. Refrigerator
15. EC meter
16. Colorimeter
17. Thermal Cycler
18. Gel Electrophoresis unit
19. Gel Documentation unit

B.Sc. III Botany Evaluation Pattern

Semester V

	SEE	CCE	Total		Practical	Total
Paper IX	40	10	50	Practical V	200	200
Paper X	40	10	50			
Paper XI	40	10	50			
Paper XII	40	10	50			
Major Elective XIII	40	10	50			
Minor VII	40	10	50	Field Project		50
	240	60	300		150	250
Total	300+250					550

Semester VI

	SEE	CCE	Total		Practical	Total
Paper XIV	40	10	50	Practical VI	200	200
Paper XV	40	10	50			
Paper XVI	40	10	50			
Paper XVII	40	10	50			
Major Elective XVIII	40	10	50			
Minor VIII	40	10	50	On the Job Training		50
	240	60	300		200	250
Total	300+250					550

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

Semester V

Theory Paper IX (MJ-BBT 23-501) Genetics and Plant Breeding

Learning Objectives

1. To impart the basic knowledge of plant genetics.
2. To impart the knowledge of crop improvement.
3. To understand the phenomenon of linkage and crossing over.

Unit I- Mendelism and extra chromosomal inheritance **08**

1.1 Introduction

1.2 Principles of inheritance: a) Law of Dominance; b) Law of Segregation; c) Law of Independent Assortment; d) Back Cross and Test Cross

1.3 Gene interaction: a) Complementary gene interaction b) Supplementary gene interaction

1.4 Epistasis: Introduction, Dominant Epistasis, Recessive Epistatis

1.5 Extra-Chromosomal Inheritance: Introduction, Plastid Inheritance and Mitochondrial Inheritance

Unit II- Linkage, Recombination and Quantitative inheritance **08**

2.1 Linkage: Definition, Linkage groups, types, Coupling and Repulsion Phase, significance

2.2 Recombination (Crossing over): Definition, types, mechanism of crossing over, significance

2.3 Quantitative inheritance:

a) Multiple Allelism – Introduction, Definition, Self-incompatibility in plants

b) Polygene inheritance – Concept, examples 1) Kernel colour in wheat and 2) Ear length inMaize

c) Population genetics – Hardy-Weinberg's Law

Unit III- Variation in Chromosome Number and Structure **07**

3.1 Chromosome number – Euploidy and Aneuploidy

3.2 Chromosomal structure – Deletion, Duplication, Inversion and Translocation

3.3 Mutation – Spontaneous and Induced mutation. Types of mutagen – Physical and Chemical, Significance.

Unit IV Plant Breeding **07**

4.1 Introduction, Definition, Aims and objectives

4.2 Methods of Plant Breeding

a) Introduction and Acclimatization

b) Selection – i) Mass Selection; ii) Pure Line Selection; iii) Clonal Selection

c) Hybridization techniques in Self and Cross pollinated crops

d) Male Sterility and its significance

e) Mutation Breeding – Gamma garden

Learning Outcomes

1. The students should be able to explain genetic basis of inheritance.
2. The students should be able to define concepts regarding development of variation and population genetics.
3. The students should be able to define concepts regarding chromosome structure and variation.
4. The students should be able to write answers and brief notes about plant breeding.

References

1. Allard, A.W., (2010) Principles of Plant Breeding. Wiley Publications **(Unit IV)**
2. Chahal, G.S., Gosal, S.S., (2010) Principles and Procedures of Plant Breeding: Biotechnological and Conventional Approaches. Narosa Publishing Co., New Delhi **(Unit III)**
3. Gardener, J., Simmons, H.J., Snustad, D.P. (1991) Principles of Genetics (8th Edition). John Wiley & Sons, New York. **(Unit I, II)**
4. Gupta P.K., (1997) Genetics. Rastogi Publications. Shivaji Road, Meerut. **(Unit I, II)**
5. Gupta, P.K., (2018) Cytogenetics. Rastogi Publications, Meerut. **(Unit III)**
6. Hartl, D.L., Jones, E.W. (1998) Genetics: Principles and Analysis (4thEdition) Jones & Barlett Publishers. Massachusetts. USA. **(Unit I, II)**
7. Singh, B.D., (2009) Genetics. Kalyani Publications, New Delhi. **(Unit III)**
8. Singh, B.D., (2010) Cytogenetics and Plant Breeding. Kalyani Publications, New Delhi. **(Unit IV)**
9. Singh, B.D., (2011) A text Book of Plant Breeeding: A dynamic View Designed for Under Graduate Courses of Indian Universities. 3rd Edition. Kalyani Publications, New Delhi. **(Unit IV)**
10. Singh, B.D., (2018) Plant Breeding: Principles and Methods. Kalyani Publications, New Delhi. **(Unit IV)**
11. Verma, P.S., Agarwal, V.K. (2001) Cell Biology, Genetics, Evolution and Ecology. S. Chand Publications. **(Unit I, II)**

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

Semester V

Theory Paper X (MJ-BBT23- 502) Microbiology, Plant Pathology and Mushroom CultureTechnology

Learning Objectives

1. To impart the knowledge of microbes, microbial techniques, and industrial microbiology.
2. To impart the knowledge of plant pathology, plant diseases and their management.
3. To impart the knowledge of mushroom cultivation, storage and its economic importance.

Unit I- Microbiology **07**

1.1 General characters of microbes: Bacteria, Viruses, Actinomycetes and Phytoplasma

1.2 Methods in Microbiology: Staining for microbes-bacteria and Sterilization Methods, Pure Culture Techniques

1.3 Industrial Microbiology: Applications of micro-organisms with reference to production of Antibiotics (Penicillin), Organic Acids (Lactic Acid), Alcohol (Ethyl Alcohol), Microbial Pesticides- Concept, Types and Significance

Unit II- Microbial Genetics **07**

2.1 Bacterial genome.

2.2 Recombination in Bacteria - Transformation and Transduction

2.3 DNA and RNA viruses

2.4 Importance of microbial genetics

Unit III- Plant Pathology **08**

3.1 Concept and Importance of Plant Pathology, General symptoms of plant diseases

3.2 Transmission of Pathogen- Air, Seed, Soil and Water.

3.3 Methods of plant disease management: Physical, Mechanical, Chemical and Biological.

3.4 Role of quarantine in plant disease management.

3.5 Study of Plant Diseases w.r.t. Pathogen, Symptoms and Management.

i) Grassy Shoot of Sugarcane (Phytoplasmal),
ii) Citrus Canker (Bacterial),
iii) Yellow Vein Mosaic of Bhendi (Viral),
iv) White Rust of Crucifers (Fungal)
v) Early leaf spot (Tikka) disease of ground nut (Fungal)

Unit IV- Mushroom cultivation technique **08**

4.1 Introduction, History, Economic importance of mushrooms. Types of Mushrooms: Poisonous mushrooms, Edible and (Non-poisonous) - Button, Oyster, Straw, Shiitake and Black ear mushrooms.

4.2. Cultivation Technology: Preparation of spawn, Sterilization and preparation of mushroom bed, Spawning, Factors affecting quality of mushroom beds, Harvesting of mushrooms.

4.3 Storage: Short Term (Refrigeration), Long Term Storage (Canning, Pickles, Papads) and Drying in Salt Solutions

4.4 Nutritional Value: Proteins, Carbohydrates, Mineral Elements, Vitamins, Crude Fibre Content of Mushrooms. Medicinal value of Mushrooms.

Learning Outcomes

1. The student understands knowledge about microbes, Microbial techniques, and Application of microbes in Industry.
2. The student understands the knowledge about microbial genetics and its applications.
3. The student understands knowledge about plant pathology, plant diseases and their management.
4. The student understands knowledge about mushroom cultivation, storage and its economic importance.

References

1. Agrios. G. N. 1997. Plant Pathology Academic Press London. **(Unit III)**
2. Anonymous, 1991. Economics of mushroom cultivation. National Centre for Mushroom Research and Training, Solan, India. **(Unit IV)**
3. Anonymous, 2011. Cultivation Technology and Technical standards of components of Integrated Button Mushroom Unit, Protected Production under NHB Scheme. National Horticulture Board. **(Unit IV)**
4. Balazs, S. 1985. Mushroom cultivation the past and the present of oyster mushroom. Kerteszetes Szoleszet. **(Unit IV)**
5. Clifton, A. 1958 Introduction to the Bacteria. McGraw Hill Co., New York. **(Unit I)**
6. Cunasekaran P. 1995. Laboratory Manual in Microbiology. New Age International Pvt. Ltd. **(Unit I)**
7. Hackett. P.B. Fuchs. J.A. and Messing J.W. 1988. An Introduction to Recombinant DNA Techniques: Basic Experiments in Gene Manipulation. The Benjamin /Cummings Publishing Co., Inc., Menlo Park California. **(Unit II)**
8. Harris, Bob. Growing Wild Mushrooms: A Complete Guide to Cultivating Edible and Hallucinogenic Mushrooms. Homestead Book Company. Revised edition. **(Unit IV)**
9. Mandahar, C. L. 1998 Introduction to plant Viruses Chand & Ltd., Delhi. **(Unit I)**
10. Mehta P.R. and Verma, Plant Protection. **(Unit III)**
11. Meynell, E and Meynell, G.G. 1970. Theory and Practice in Experimental Bacteriology University Press, Cambridge. **(Unit I)**
12. Old R.W. and Primrose, S.B. 1989. Principles of Gene Manipulation. Blackwell Scientific Publications. Oxford. UK. **(Unit II)**
13. Peicar and Reid, Microbiology. **(Unit I)**
14. Rangswamy, G. and Mahadevan A. 1999. Diseases of Crop Plants in India. **(Unit III)**
15. Suman B C and Sharma V P, 2007. Mushroom Cultivation in India. **(Unit IV)**

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

Semester V

Theory Paper XI (MJ-BBT23-503) Cytology and Research Techniques in Biology

Learning Objectives

1. To impart the basic knowledge of cell biology.
2. To impart the knowledge of techniques used in biological studies.
3. To impart the knowledge of microorganisms in biological world.

Unit I- Cell as a unit of life **08**

1.1 The Cell Theory, Prokaryotic and Eukaryotic cell (Ultrastructure)

1.2 Nucleus: Ultrastructure, Nuclear Envelope, Nuclear Pore Complex, DNA Packaging in Eukaryotes.

1.3 Mitochondria and Chloroplasts -Ultrastructure and Role.

1.4 Ribosomes – Prokaryotic and Eukaryotic.

Unit II- Sub Cellular Structures and Cell Membrane **07**

2.1. Endoplasmic Reticulum, Golgi body and Lysosomes: Structure and Role.

2.2 Peroxisomes and Glyoxysomes: Structure and Role.

2.3 Cell membrane – Structure, Lipid bilayer, Fluid Mosaic Model, Role.

Unit III- Cell Cycle and Cell division **07**

3.1 Cell cycle

3.2 Cell division: Mitosis and Meiosis with their significance.

3.3 Apotosis and autophagy

Unit IV- Research Techniques in Biology **08**

4.1 Principles of microscopy, Light, Phase contrast and Electron microscopy (EM)- SEM and TEM.

4.2 Spectrophotometry, Micrometry, Photomicrography, Colorimetry

Learning Outcomes

1. The students should be able to explain Ultrastructure of cell.
2. The students should be able to define concepts regarding roles of cell organelles.
3. The students should be able to define concepts regarding cell cycle.
4. The students should be able to write answers and brief notes about all the techniques studied.

References

1. Alberts B et al (2014) Molecular Biology of Cell; 6th edition; Garland Science, Taylor and Francis, New York. **(Unit I)**
2. Aneja KR Text Book of Experimental Biology. **(Unit IV)**
3. Charlothe JA (1986): Molecular Cell Biology; Addison. Wesley Publ. Company. **(Unit II)**
4. Cooper GM and RE Housemen (2015) The Cell: Molecular Approach; 7th edition. **(Unit I)**
5. De Robertis and De Robertis (1997) Cell and Molecular Biology (VIII), B.I. Waverly Pvt. Ltd., New Delhi. **(Unit III)**
6. Dupraw EJ (1970) Cell and Molecular Biology, Academic Press, London. **(Unit III)**
7. Engstrom A and JB Finean-Biological Ultrastructure. **(Unit IV)**
8. Horst Piller-Microscope photometry. **(Unit IV)**
9. John PCL (Ed.) (1981) The Cell Cycle, Cambridge University Press. **(Unit III)**

10. Lewin, B., Genes – VI, VII and VIII, Oxford Press. **(Unit II)**

11. Lewis, J., (2004) Cell Biology, Sarup and sons, New Delhi. **(Unit I)**

12. Powar, C.B., (1992) Cell Biology; Himalaya Publishing House. **(Unit I)**

13. Purvis MJ and DC Collier and D Wallis, Laboratory techniques in Botany. **(Unit IV)**

14. SandhyaMitra (1988) Elements of Molecular Biology, McMillan India Ltd., N. Delhi. **(Unit I)**

15. Turner PC et al (2002) Molecular Biology (II); Viva Books, Pvt. Ltd., New Delhi. **(Unit II)**

16. Verma and Agarwal- Text book of Biotechnology, S. Chand Publication. **(Unit IV)**

17. Watson et al (2004) Molecular Biology of the Gene (V) Pearses Educatias, Inc India. **(Unit II)**

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

Semester V

Theory Paper XII (MJ-BBT23- 504) Advanced Botanical Skills and Horticulture I

Learning Objectives

1. To impart the knowledge of advanced skills required in plant sciences.
2. To impart the basic knowledge of Horticulture and nursery management.
3. To impart the knowledge of IPR.

Unit I- Intellectual Property Rights **08**

1.1 Introduction to Intellectual Property Right (IPR): Concept and kinds. Economic importance. IPR in India and World: Genesis and scope, some important examples. IPR and WTO (TRIPS, WIPO).

1.2 Patents: Objectives, Rights, Patent Act and its amendments. Procedure of obtaining patents, working of patents, Infringement.

1.3 Copyrights: Introduction, Works protected under copyright law, Rights, Transfer of Copyright, Infringement.

1.4 Trademarks: Objectives, Types, Rights, Protection of goodwill, Infringement, Passing off, Defenses, Domain name.

Unit II -The art of scientific writing and its presentation **07**

2.1 Data Collection and maintenance: Maintaining laboratory record, Tabulation and generation of graphs, Imaging of tissue specimens and application of scale bars, the art of field photography

2.2 Scientific writing: Numbers, units, abbreviations and nomenclature used in scientific writing, writing references, scientific writing and ethics

2.3 Data presentation: PowerPoint presentation, Poster presentation

2.4 Plagiarism: Introduction to copyright-academic misconduct/plagiarism

Unit III- Introduction to Horticulture and Floriculture **08**

3.1 Introduction, Importance and branches of horticulture

3.2 Floriculture: Introduction; a) Cultivation and management of important cut flowers: Rose, Gerbera; b) Flower arrangement, packing and marketing of cut flowers

3.3 Pomology: Introduction; a) Cultivation and management of important fruit plants: Grapes, Mango; b) Fruit preservation technology: Physcial methods (drying, freezing and heat); Chemical (sugar, salt, chemical preservatives); c) Fruit processing: Jam, Jelly, Squash, Pulp, Pickles

Unit IV- Nursery management **07**

4.1 Definition, objectives and scope, Infrastructure for nursery

4.2 Propagation practices: Sexual and Asexual propagation

a) Sexual – Seed sowing and transplantation of seedlings, advantages and disadvantages of sexual propagation

b) Vegetative – i) Cutting – Definition, stem cutting (hard wood and soft wood cutting), use of PGR's for rooting

ii) Layering – Definition, Simple layering, Air layering

iii) Grafting – Definition, Whip grafting, Approach grafting

iv) Budding – Definition, T-budding, Patch budding

c) Propagation of specialized vegetative structure - Bulbs, Corms, Tubers, Rhizomes

Learning outcomes

1. The students would be able to understand the basics and importance of IPR.
2. The students would be able to communicate the experimental data to scientific community.
3. The students would be able to understand the basics of horticulture and its applications.
4. The students would be able to understand the techniques used in nursery management.

References

1. Acharya, N.K., (2001) Textbook on intellectual property rights, Asia Law House. **(Unit I)**

2. Bose, T.K., Mukherjee, D., (1972) Gardening in India. Oxford & IBH Publishing Co., New Delhi. **(Unit IV)**

3. Dawson, C. (2002) Practical research methods. UBS Publishers, New Delhi. **(Unit II)**

4. Edmond, M., Andres, Fundamentals of Horticulture. McGraw Hill Book Co., New Delhi. **(Unit III)**

5. Ganguli, P., (2001) Intellectual Property Rights: Unleashing the Knowledge Economy, Tata McGraw-Hill. **(Unit I)**

6. Guru, M., Rao, M.B., (2003) Understanding Trips: Managing Knowledge in Developing Countries, Sage Publications. **(Unit I)**

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11. Randhawa, G.S., Mukhopadhyay, A., (1986) Floriculture in India. Allied Publishers. **(Unit III)**

12. Sandhu, M.K., (1989) Plant Propagation. Wile Eastern Ltd., Bangalore. **(Unit IV)**

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

Semester V

Theory Paper XIII (MJE-BBT23-505) Ethnobotany and Conservation

Learning Objectives

1. To impart the basic concept and importance of Ethnobotany.
2. To impart the knowledge of traditional medicines and their importance in Ethnobotany.
3. To impart the basic knowledge of ethnobotanical medicines.

Unit I : Fundamentals of Ethnobotany **07**

1.1 Ethnobotany an Introduction, Scope and branches.

1.2 Research methodology in Ethnobotany.

1.3 Application of Ethnobotany

Unit II : Ethnobotanical Studies **08**

2.1 Tools and Techniques

2.2 Equipment /field work and collection

2.3 Collection of ethnobotanical data

2.4 Steps of collection of traditional knowledge

2.5. Problems occurs during ethnobotanical survey

Unit III : Ethnobotany and conservation **07**

3.1 The Ethnic groups

3.2 IUCN and Ethnobotanical species.

3.3 Ethnobotany and conservation of plant resources.

3.4 Role of Sacred groves in Conservation

Unit IV : Role of Ethnobotany in medicine **08**

4.1 Indigenous knowledge about traditional healthcare practices

4.2 Different systems of indigenous medicines.

4.3 To study the important commercial drugs of plant base with examples.

Learning Outcomes:

Student will be able to understand

1. The concept and importance of Ethnobotany
2. The traditional medicines and their importance in Ethnobotany
3. About Problems occurs during ethnobotanical survey

References:

1. A manual of Ethnobotany by S.K Jain, published by Scientific publishers Jodhpur.
2. Ethnobotany by Vinay Sharma & Afroz Alam published by Rastogi publication, Meerut
3. Compendium of Indian Folk Medicine and Ethnobotany Vartika Jain and S K Jain, 2016. Deep Publications, New Delhi, India.
4. Altschul, S.V.R., 1968. Useful food Plants in Herbarium records. Econ. Bot. 22: 293-296.
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Bachelor of Science (B. Sc.) Part – III: Botany

Semester V

Theory Paper XIII (MJE-BBT23-505) Ethnobotany and Bioprospecting

Learning Objectives

1. To impart the basic concept and importance of Ethnobotany.
2. To impart the knowledge of medico-ethnobotany and Phyto ethnobotany.
3. To impart the basic knowledge of ethnobotanical medicines.

Unit I: Fundamental of Ethnobotany **07**

1.1 Ethnobotany an Introduction, Scope and Branches.

1.2 Methods of research in Ethnobotany.

1.3 Application of Ethnobotany.

Unit II: Tools and techniques of Ethnobotany **08**

2.1 Manners of collection,

2.2 Collection of ethnobotanical data

2.3 Equipment /field work and collection.

2.4 Problems occurs during ethnobotanical survey.

Unit III: Phytomedicine and modern medicine **07**

3.1 Different methods of preparation of traditional medicines

3.2 Traditional medicine and its relationship with modern medicine.

3.3 The Phytomedicines and Modern Medicines

Unit IV: Ethnobotany in practice **08**

4.1 Medico-ethnobotany

4.2 Tribals and Ethnomedicines and Phytomedicines.

4.3 Phytopharmaceutical Drugs and Phyto-repellents.

Learning Outcomes:

Student will be able to understand

1. The concept and importance of Ethnobotany
2. The traditional medicines and their importance in Ethnobotany
3. The knowledge of medico-ethnobotany and phyto-ethnobotany

References:

1. A manual of Ethnobotany by S.K Jain, published by Scientific publishers Jodhpur.
2. Ethnobotany by Vinay Sharma & Afroz Alam published by Rastogi publication, Meerut
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Bachelor of Science (B. Sc.) Part – III: Botany

Semester V

Theory Paper VII (MN-BBT23-506) Ethnobotany and Conservation

Learning Objectives

1. To impart the basic concept and importance of Ethnobotany.
2. To impart the knowledge of traditional medicines and their importance in Ethnobotany.
3. To impart the basic knowledge of ethnobotanical medicines.

Unit I : Fundamental of Ethnobotany **07**

1.1 Ethnobotany an Introduction, Scope and Branches.

1.2 Methods of research in Ethnobotany.

1.3 Application of Ethnobotany

Unit II : Tools and techniques of Ethnobotany **08**

2.1 Manners of collection,

2.2 Collection of ethnobotanical data

2.3 Equipment /field work and collection.

2.4 Problems occurs during ethnobotanical survey.

Unit III : Ethnobotany and conservation **07**

3.1 The Ethnic groups and Ethnobotanical studies,

3.2 IUCN and Ethnobotanical species.

3.3 Ethnobotany and conservation of plant resources.

3.4 Role of Sacred groves in Ethnobotany

Unit IV : Role of Ethnobotany in medicine **08**

4.1 Indigenous knowledge about traditional healthcare practices

4.2 Different systems of indigenous medicines.

4.3 Natural resources of Medicinal Plants.

Learning Outcomes:

Student will be able to understand

1. The concept and importance of Ethnobotany
2. The traditional medicines and their importance in Ethnobotany
3. About Problems occurs during ethnobotanical survey

References:

1. A manual of Ethnobotany by S.K Jain, published by Scientific publishers Jodhpur.
2. Ethnobotany by Vinay Sharma & Afroz Alam published by Rastogi publication, Meerut
3. Compendium of Indian Folk Medicine and Ethnobotany Vartika Jain and S K Jain, 2016. Deep Publications, New Delhi, India.
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Bachelor of Science (B. Sc.) Part - III: Botany

Semester V

Practical Paper MJ-BBP 23-507 (Based on MJ-BBT23-501, MJ-BBT23-502, MJ-BBT23-503 and MJ-BBT23-504)

Experiments based on Theory paper MJ-BBT23-501

1. Genetic problems on Linkage.
2. Genetic problems on Crossing over.
3. Genetic examples on Polygene inheritance.
4. Determination of chromosome count in PMCs in *Allium* / *Cynotis*.
5. Detection of meiotic anomalies in chromosomes in *Rhoeo.*
6. Preparation of karyotypes – idiograms by using chromosomal photographs.
7. Methods of emasculation.
8. Breeding techniques in a) Malvaceae b) Fabaceae c) Poaceae.
9. Visit to Krishi Vidnyan Kendra/ Seed Company and submission of visit reports.

Experiments based on theory paper MJ-BBT23-502

1. Preparation and sterilization of culture media –PDA (slants and plates).
2. Isolation and separation of soil fungi by serial dilution method.
3. Methods of inoculation - on slants and plates.
4. Study of different types of stains: Cotton blue and Gram's stain.
5. Study of plant diseases - Grassy Shoot disease of Sugarcane.
6. Citrus Canker and Yellow Vein Mosaic of Bhendi.

7. Study of plant diseases - White Rust of Crucifers and Early leaf spot (Tikka) disease of ground nut.
8. Demonstration of Mushroom Cultivation.
9. Demonstration of Harvesting and Storage of mushrooms.
10. Submission of local plant diseases /crop diseases (any ten).

Experiments based on Theory paper MJ-BBT 23-503

1. Preparation of percent (%), molar (M), normal (N) and PPM solutions.
2. Study of the photomicrography technique and submission of photomicrograph.
3. Study of cell structure in *Nostoc*, Onion and *Hydrilla* leaf filament.
4. Study of mitosis and preparation of permanent cytological slides.
5. Study of meiosis and preparation of permanent cytological slides.
6. Use of dialysis to separate smaller molecules from larger molecules.
7. Micrometry technique.
8. Isolation of mitochondria from plants
9. Study of Beer and Lambert's Law.
10. Visit to Instrumentation laboratory (CFC) and submission of report.

Experiments based on theory paper MJ-BBT 23-504

1. Demonstration of patent filing
2. Technical writing and plagiarism checking
3. Study of budding technique – Patch and T-budding
4. Study of layering technique – Air layering
5. Study of Grafting technique – Whip and Approach
6. Garden implements (Any five) – Garden shear, sickle, cutter, shovel, budding knife,

secateur, water can, pruning scissors, sprayer, spade

7.Study of ornamental plants – Rose, Gerbera, Marigold

8.Study of hedge and edge plants.

9.Study of indoor plants.

10.Visit to nursery (Separate handwritten report to be submitted by student)

Semester V

Field Project (FB23-508)

Learning Objectives:

1. Self-study and reference work of relevant topics and concepts by the student.
2. The Project Work must involve practical work related to selected discipline.
3. Students are expected to work on "Project Work" for about 05 periods per week.
4. The project work must be group allotted.
5. The student invests his energy, time and resources in a project. The project therefore should, if possible, have important bearing on some practical aspect. This will help student to justify his efforts on project.
6. It is the joint responsibility of student and project supervisor to maintain daily register book of his/her project work and has to be produced at the time of examination if asked.
7. Submission Process: Student should prepare 2 copies of the Project Report. At the beginning, the respective Project Supervisor must approve both copies positively before final examination. Then respective Head or Coordinator approves both copies of the Project Report.
8. The student has to submit one of these approved copies of project report, duly signed by the project Supervisor and Principal, before practical examination.

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

Semester VI

Theory Paper XIV (MJ-BBT23-601) Plant Biochemistry and Molecular Biology

Learning objectives

1. To impart the basic knowledge of Plant biochemistry.
2. To impart the knowledge of Molecular biology.
3. To impart the knowledge of properties and classification of carbohydrates and proteins.

Unit I- Carbohydrates **07**

1.1 Introduction, broad classification and properties of carbohydrates.

1.2 Isomerism: definition, types of isomers: epimers, anomers and enantiomers with suitable examples.

1.3 Structure of monosaccharaides (pentose and hexose), oligosaccharides (sucrose and lactose), and polysaccharides (starch and cellulose)

1.4 Functions of carbohydrates in biological system

Unit II- Lipids **08**

2.1 Introduction and Classification of Lipids

2.2 Structure and properties of saturated fatty acids (Stearic and Palmitic acid) and unsaturated fatty acids (Oleic acid, Linoleic and Linolenic acids)

2.3 Beta Oxidation: Gluconeogenesis and its role in mobilization of fatty acids during seed germination

2.4 Significance of Lipids

Unit III- Proteins **07**

3.1 Introduction, structure**,** properties and classification of amino acids

3.2 Brief outline of biosynthesis of amino acids – proline

3.3 General structure, classification of proteins

3.4 Protein biosynthesis in eukaryotes

3.5 Significance of proteins

Unit IV- Nucleic Acids **08**

4.1 Composition and structure of nucleotides

4.2 DNA as carrier of genetic information (early experiments)

4.3 DNA: Watson and Crick Model, forms of DNA (A, B and Z)

4.4 DNA replication in eukaryotes

4.5 RNA: types, structure and role of RNA

4.6 Regulation of gene expression- Lac Operon

Learning Outcomes

1. The students should be able to explain concepts of plant biochemistry.
2. The students should be able to define concepts regarding molecular biology
3. The students should be able to define concepts regarding structure**,** properties and classification of amino acids
4. The students should be able to write answers and brief notes about plant biochemistry and molecular biology.

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1. Ahmad, M., Essentials of Biochemistry, Merit Publisher Multan Ltd. **(Unit II, III)**
2. Alberts B., et al., (2014) Molecular Biology of Cell; 6th edition; Garland Science, Taylor and Francis, New York **(Unit IV)**
3. Cooper, G.M., Housemen, R.E., (2015) The Cell: Molecular Approach; 7th edition. **(Unit IV)**
4. Jain, J.L., Jain, S., Jain, N., Fundamentals of Biochemistry, S. Chand & Company Ltd. **(Unit I, II)**

5. Lehninger, A.L., (2004) Principles of Biochemistry. 4th Edition, W.H. Freeman Ltd. **(Unit I, II, III)**

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

Semester VI

Theory paper XV (MJ-BBT23-602) Bioinformatics, Biostatistics and Economic Botany

Learning objectives

1. The students should be able to understand and use bioinformatics databases.
2. The students should be able to understand and use biostatistics concepts in their academics and research.
3. The students should be able to understand the economic aspects of plants and their use in day to day life.

Unit 1 Bioinformatics **07**

1.1 Introduction, Aim, Scope and Branches of Bioinformatics

1.2 Biological Databases: Classification Format and Retrieval system of Biological Database, National Center for Biotechnological Information (NCBI), Basic Local Alignment Search Tool (BLAST)

1.3 Protein Information Resource (PIR) - Concept, Resources, Databases and Data Retrieval

1.4 Genome Information Resources (GIR) – Concept, Resources, Databases

1.5 Applications of Bioinformatics- BLAST, Molecular Phylogeny (Concept, Methods, Analysis and Consistency)

Unit II Biostatistics **08**

2.1. Introduction, definition, terminology.

2.2. Collection and presentation of data- Types of data, techniques of data collection- Census method, sampling method- simple random, stratified and systematic sampling. Classification, tabulation, graphical representation- Histogram and polygon.

2.3. Measures of central tendency and Dispersion- Arithmetic mean, Mode, Median, Range, Deviation, Mean deviation, Standard Deviation, Coefficient of Variation.

2.4. Statistical methods for testing the hypothesis- i) Students' T-test; ii) Chi-square test.

Unit III Economic Botany: Cereals, Legumes and Oils 07

3.1 Origin of Cultivated Plants - Concept of centers of origin, their importance with reference to Vavilov's work.

3.2 Cereals: Origin, Botanical Name, Morphology, Sources and Economic importance of Jowar and Wheat.

3.3 Legumes: Origin, Botanical Name, Morphology, Sources and Economic importance of Gram and Pigeon Pea.

3.4 Oils and Fats: Origin, Botanical Name, Morphology, Parts used and uses of Ground nut and soybean.

Unit IV Economic Botany: Spices, Beverages and Fibers 08

4.1 Spices and Condiments - Origin, Botanical Name, Morphology, Parts used and uses of Ginger and Chilly

4.2 Beverages – Origin, Botanical Name, Morphology, Parts used and uses of Tea and coffee.

4.3 Fibre yielding Plants - Origin, Botanical Name, Morphology, Parts used and uses of Cotton and *Agave*.

Learning Outcomes

1. The student will know the basics of databases, their types and their applications in plant sciences.
2. The student will know the basics of Biostatistics and its application in plant sciences.
3. The student will learn the scope of economic uses of the plants.

References

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2. Deshmukh, S.D., (2008) Statistical Methods for Biologists. Vision Publications. **(Unit II)**

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4. Kocchar, S.L., (1998) Economic Botany in Tropics, 2nd edition. MacmillanIndia Ltd., New Delhi. **(Unit III, IV)**

5. Sambamurthy, A.V.S.S., Subramanyam, N.S., (1989) A Textbook of Economic Botany Wiley Eastern Ltd., New Delhi. **(Unit III, IV)**

6. Sharma, O.P., (1996) Hill's Economic Botany. Tata McGraw Hill Publishing Company Ltd., New Delhi. **(Unit III, IV)**

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

Semester VI

Theory Paper XVI (MJ-BBT23-603) Plant Biotechnology and Paleobotany

Learning Objectives:

1. To impart the basic knowledge of Plant Biotechnology.
2. To impart the knowledge of Paleobotany.
3. To impart the knowledge of genetic engineering.

Unit I- Plant Biotechnology and Plant Tissue Culture **08**

1.1 Introduction, History, Scope and Importance

1.2 Biotechnology in India

1.3 Plant Tissue Culture: Principles (Totipotency, cellular differentiation and competency), Culture media, and specific laboratory requirements (Conditions & instruments)

1.4 Types of tissue culture: Micropropagation, Embryo culture, Organ culture, Callus culture, Cell suspension culture, Protoplast culture, Somatic Embryogenesis, Somaclonal variation

Unit II- Recombinant DNA Technology **07**

2.1 Introduction, principle and enzymes involved in recombinant DNA technology

2.2 Cloning vectors: a) Prokaryotic - Plasmid, Lambda phage and Cosmid; b) Eukaryotic-YAC [Yeast Artificial Chromosomes]

2.3 Blotting techniques: Southern blotting and Northern Blotting

2.4 DNA fingerprinting: DNA marker – RAPD, ISSR, RFLP

2.5 Polymerase chain reactions (PCR)

2.6 DNA sequencing – Sanger's dideoxy method

Unit III- Genetic Engineering **08**

3.1 Introduction.

3.2 Method of Gene transfer - *Agrobacterium* mediated, direct gene transfer by Electroporation, Microinjection, Micro-projectile bombardment in crop biotechnology.

3.3 Reporter genes, selectable marker genes

3.4 Transgenic plants – Bt cotton, Golden rice

Unit IV- Paleobotany **07**

4.1 Form, Genera and Nomenclature

4.2 Study of following genera with reference to systematic position, external morphology, and affinities: a) *Lyginopteris* and b) *Enigmocarpon*

4.3 Applications of paleobotany: Role of microfossil in oil and coal exploration

Learning outcomes

1. The student will know the basics of plant tissue culture and biotechnology.
2. The student will know the basics of recombinant DNA technology and genetic engineering.
3. The student will learn the concept and scope of paleobotany.

References

1. Andrews, H.N., (1961) Studies in Palaeobotany. John Wiley & Sons Limited, Canada. **(Unit IV)**
2. Arnold, C.A., (1972) An Introduction to Palaeobotany. Tata McGraw-Hill, New Delhi. **(Unit IV)**
3. De, K. K., Plant Tissue Culture. New Central Book Agency (P) Ltd., New Delhi. **(Unit I)**
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Bachelor of Science (B. Sc.) Part – III: Botany

Semester VI

Theory Paper XVII (MJ-BBT23-604) Advanced Botanical Skills and Horticulture II

Learning Objectives

1. To impart the knowledge of advanced skills required in plant sciences.
2. To impart the importance of protection of traditional knowledge with respect to plants.
3. To impart the basic knowledge of Horticulture and landscape gardening.

Unit I- Plant Techniques **08**

1.1 Microtechniques:

a) Mounting Techniques: Whole mounts, peel mounts, squash preparations.

b) Maceration and sectioning.

c) Microtomy techniques: Tissue preparation: living vs fixed, physical vs chemical fixation, coagulating fixatives, noncoagulant fixatives; tissue dehydration using graded solvent series, Paraffin and plastic infiltration, Preparation of thin and ultrathin sections.

1.2 Staining Techniques:

a) Molecular stains- Introduction, Preparation and importance.

b) Plant related stains- Introduction, Preparation and importance.

Unit II- Protection of Traditional Knowledge **08**

2.1 Traditional Knowledge: Objective, Concept of Traditional Knowledge, Bio-Prospecting and Bio-Piracy, Traditional Knowledge Digital Library

2.2 Plant Varieties Protection: Objectives, Justification, International Position, Plant varieties protection in India. Rights of farmers, Breeders and Researchers. National gene bank, Benefit sharing. Protection of Plant Varieties and Farmers' Rights Act, 2001.

2.3 Geographical Indications: Objectives, Justification, International Position, MultilateralTreaties, National Level, Indian Position, Geo tagging.

Unit III- Olericulture and arboriculture 07

3.1 Olericulture: Introduction; Cultivation and management of important vegetable crop: *Capsicum*, Tomato.

3.2 Arboriculture: Introduction; Cultivation and management of important timber yielding plants: Teak, *Dalbergia.*

Unit IV- Landscape gardening 07

4.1 Introduction and principals of landscaping, importance and scope of landscape gardening.

4.2 Garden plants: trees, climbers, palms, ferns, cacti and succulents, propagation of ornamental plants.

4.3 Garden types: Terrace gardening, vertical garden Rock garden, water garden.

Learning outcomes

1. The students would be able to understand the basic techniques involved in plant sciences.
2. The students would be able to understand the importance of traditional knowledge.
3. The students would be able to understand the basics of horticulture and its applications.
4. The students would be able to gain basic knowledge of landscape gardening.

References

1. Acharya, N.K., (2001) Textbook on intellectual property rights, Asia Law House. **(UnitII)**
2. Bose, T.K., Mukherjee, D., (1972) Gardening in India. Oxford & IBH Publishing Co.,New Delhi. **(Unit IV)**
3. Dawson, C. (2002) Practical research methods. UBS Publishers, New Delhi. **(Unit I)**
4. Dej, S.C., (2003) Complete Home Gardening. Agrobias, Jodhpur, India. **(Unit IV)**

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

Semester VI

Theory Paper XVIII (MJE-BBT23-605) Biodiversity Conservation

Learning Objectives:

1. Study the different aspects of biodiversity and conservation.
2. Study the methods in biodiversity conservation and utilization.
3. Understand the interrelationship of biodiversity in sustainable development
4. Understand the importance of endemic plants.

Unit I: Biological diversity

1.1 Introduction to Biodiversity: Concept, definition, importance of biodiversity, status in India, Biodiversity values.

1.2 Levels of Biodiversity: Species diversity: Species richness, species evenness, alpha diversity, beta diversity, gamma diversity.

1.3 Types of diversity (alpha, beta, gamma), indirect and ethical values of biodiversity; Loss and reasons for loss of biodiversity

Unit II: Endemism and Hotspot

2.1 Endemism: Definition and types of endemism;

2.2 RED list categories of IUCN

2.3 Hot spots and Hottest hotspots; Keystone and Flagship species; Plant endemism in India with special emphasis on Western Ghats

Unit III: Biodiversity conservation

3.1 Conservation of National Biodiversity: The need of conservation of biodiversity, conservation strategies, biosafety and bioethics, Biodiversity conservation in India.

3.2 Ex-situ conservation: Concept, Botanical gardens, seed banks, germplasm, gene banks, advantages and disadvantages.

3.3 In-situ conservation: Concept, advantages, disadvantages, role of national parks, sanctuaries, biosphere reserves, sacred groves.

Unit IV: Biodiversity for sustainable development

4.1 Wild Plants of ornamental potential; *Delphinium*, *Barleria*, *Pyrostigia* & *Thumbergia*

4.2 Wild relatives of cultivated plants; *Vigna*, *Momordica*, *Cajanus*, Wild edible plants and their nutritive value;

4.3 Energy plants and petro crops; *Jatropa corcus*, *Calotropis procera*, *Euphorbia lathris* and *Pongamia pinnata.*

4.4 Plants suitable in phyto-remediation-Sunflower, Indian mustard, Spinach, Chinese brake fern.

Learning outcomes: Student should able to

1) Understand the knowledge about various aspects of biodiversity.
2) Understand the knowledge of RET plant species.
3) Understand the knowledge about importance of biodiversity conservation.
4) Apply the knowledge of biodiversity for sustainable development.

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

Semester VI

Theory Paper XVIII (MJE-BBT23-605) Plant Biodiversity and Environmental

Accounting

Learning Objectives:

1. Study the different aspects of biodiversity and conservation.
2. To impart the knowledge about different NGO's.
3. To impart the knowledge of Environmental accounting and EIA.
4. Understand importance of endemic plants.

Unit I: Biological diversity

1.1 Introduction to Biodiversity: Concept, definition, importance of biodiversity, status in India, Biodiversity values.

1.2 Levels of Biodiversity: Species diversity: Species richness, species evenness, alpha diversity, beta diversity, gamma diversity.

1.3 Types of diversity (alpha, beta, gamma), indirect and ethical values of biodiversity; Loss and reasons for loss of biodiversity

Unit II: Endemism and Hotspot

2.1 Endemism: Definition and types of endemism;

2.2 RED list categories of IUCN;

2.3 Hot spots and Hottest hotspots; Keystone and Flagship species; Plant endemism in India with special emphasis on Western Ghats

Unit III : Environmental accounting

3.1 Environmental accounting: Concept, importance of natural resources and environment, Carbon credit and Carbon sequestration.

3.2 Environmental impact assessment (EIA): Introduction, definition, importance of environmental

impact assessment

Unit IV: Role of governmental and nongovernmental organization

4.1 Role of Government and Non-Government Organizations (NGOs) in conservation of Biodiversity: Concept of NGOs viz. IUCN, UNCED, BNHS, BSI local NGOs involved in biodiversity conservation

4.2 Role of Green organizations viz. TERI, CES, MOEF & CC, ATREE, FRLHT.

4.3 Role of taxonomy and taxonomists in conservation of Biodiversity.

Learning outcomes: Student should able to

1) Understand the knowledge about various aspects of biodiversity.
2) Understand the knowledge of RET plant species.
3) Apply the knowledge of Environmental accounting and EIA.
4) Understand role of taxonomy and its applications.

References:

1. Briggs, D. 2009. Plant Microevolution and Conservation in Human-influenced Ecosystems.Cambridge University press. (UNIT-II)
2. Groom M. J., Meffe, G. K. and C. R. Caroll. 1997. Principles of Conservation biology.(3rd ed.)
3. Sinauer associates, Inc. publishers Sunderland, Massachusetts, USA. (UNIT-III)
4. Heywood, V. H. and Watson, R. T. (eds.). 1995. Global Biodiversity Assessment. UNEP, UK,Cambridge University Press. (UNIT-I)
5. Leadlay, E. and Jury, S. (eds.). 2006. Taxonomy and Plant Conservation. CambridgeUniversity Press. (UNIT-I)
6. Primack R. B. 2010. Essentials of Conservation Biology. (5th ed.). Sinauer associates, Inc. publishers Sunderland, Massachusetts, USA. (UNIT-III)
7. UNEP. 1992. Convention on Biological Diversity (CBD): Text and Annexes. Geneva,Switzerland: CBD Interim Secretariat. (UNIT-IV)
8. UNEP. 2002a. Global Taxonomy Initiative (GTI). Decision VI/8. UNEP/CBD/COP/6/20Montreal, Canada: CBD Secretariat. (UNIT-IV)

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

Semester VI

Theory Paper VIII (MN-BBT23-606) Biodiversity Conservation

Learning Objectives:

1. Study the different aspects of biodiversity and conservation.
2. Study the methods in biodiversity conservation and utilization.
3. Understand the interrelationship of biodiversity in sustainable development
4. Understand the importance of endemic plants.

Unit I: Biological diversity

1.1 Introduction to Biodiversity: Concept, definition, importance of biodiversity, status in India, Biodiversity values.

1.2 Levels of Biodiversity: Species diversity: Species richness, species evenness, alpha diversity, beta diversity, gamma diversity.

1.3 Types of diversity (alpha, beta, gamma), indirect and ethical values of biodiversity; Loss and reasons for loss of biodiversity

Unit II: Endemism and Hotspot

2.1 Endemism: Definition and types of endemism;

2.2 RED list categories of IUCN

2.3 Hot spots and Hottest hotspots; Keystone and Flagship species; Plant endemism in India with special emphasis on Western Ghats

Unit III: Biodiversity conservation

3.1 Conservation of National Biodiversity: The need of conservation of biodiversity, conservation strategies, biosafety and bioethics, Biodiversity conservation in India.

3.2 Ex-situ conservation: Concept, Botanical gardens, seed banks, germplasm, gene banks, advantages and disadvantages.

3.3 In-situ conservation: Concept, advantages, disadvantages, role of national parks, sanctuaries, biosphere reserves, sacred groves.

Unit IV: Biodiversity for sustainable development

4.1 Wild Plants of ornamental potential; *Delphinium*, *Barleria*, *Pyrostigia* & *Thumbergia*

4.2 Wild relatives of cultivated plants; *Vigna*, *Momordica*, *Cajanus*, Wild edible plants and their nutritive value;

4.3 Energy plants and petro crops; *Jatropa corcus*, *Calotropis procera*, *Euphorbia lathris* and *Pongamia pinnata.*

4.4 Plants suitable in phyto-remediation-Sunflower, Indian mustard, Spinach, Chinese brake fern.

Learning outcomes: Student should able to

1) Understand the knowledge about various aspects of biodiversity.
2) Understand the knowledge of RET plant species.
3) Understand the knowledge about importance of biodiversity conservation.
4) Apply the knowledge of biodiversity for sustainable development.

References:

1. Briggs, D. 2009. Plant Microevolution and Conservation in Human-influenced Ecosystems. Cambridge University press. (UNIT-II)
2. Groom M. J., Meffe, G. K. and C. R. Caroll. 1997. Principles of Conservation biology. (3rd ed.)
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Semester VI

Practical Paper VII MJ-BBP23-607 (Based on MJ-BBT23-601, MJ-BBT23-602, MJ-BBT23-603 and MJ-BBT23-604)

Experiments based on Theory paper MJ-BBT23-601

1-2. Qualitative test for sugars, proteins and lipids in plant material.

3. Estimation of sugars by DNSA method.

4. Estimation of proteins by Lowry's method.

5. Determination of fatty acid value of oil sample.

6. Separation and identification of amino acids by TLC (Thin Layer Chromatography).

7. Isolation of genomic DNA.

8. Estimation of genomic DNA.

9. Estimation of carotene and anthocyanin pigments.

10. Visit to molecular biology laboratory and report submission.

Experiments based on theory paper MJ-BBT23-602

1. Study of biological databases NCBI, DDBJ, EMBL and Uni Prot.
2. Nucleotide sequence retrieval from NCBI database.
3. Measures of central tendency of given data.
4. Study of frequency distribution and its graphical representation.
5. Determination of Standard deviation and standard error of the given data.
6. Study of Botanical Name, Morphology, Parts used and Economic importance of Jowarand Wheat.
7. Study of Botanical Name, Morphology, Parts used and Economic importance

of Gramand Pigeon pea.

8. Study of Botanical Name, Morphology, Parts used and Economic importance of Ginger,Chilly, Tea and Coffee.
9. Study of Botanical Name. Morphology, Parts used and Economic importance ofGroundnut and Soybean.
10. Study of Botanical Name. Morphology, Parts used and Economic importance of Cottonand *Agave*.
11. Assignment based on Biostatistics/ Bioinformatics.

Experiments based on theory paper MJ-BBT23-603

1. Preparation of plant tissue culture medium (MS).
2. Demonstration of inoculation of explants on suitable medium (MS).
3. Study of Southern blotting technique.
4. Study of PCR.
5. Isolation of Protoplast by enzymatic method.
6. Study of steps in genetic engineering for the production of Golden rice with the help ofphotographs. / Study of genetic transformation methods.
7. Identification of types of Fossils- Impression, Compression, Petrification and Coal ball.
8. Study of *Lyginopteris.*
9. Study of *Enigmocarpon.*
10. Visit to tissue culture laboratory and report submission.

Experiments based on theory paper MJ-BBT23-604

1. To study microtechniques used in plant study (Whole mount, peel mounts, squash preparations, maceration and sectioning).
2. Study of preparation of permanent slides (Cytological/Microbial).
3. Preparation of different stains used in study of plant material.
4. Use of GPS in positioning of plants.
5. Study and documentation of traditional knowledge of medicinal plants (Any two).
6. Study and documentation of traditional knowledge of local plants (Any two).
7. Study of vegetable crops with respect to cultivation and management practices.
8. Study of timber yielding plants with respect to cultivation and management practices.
9. Visit to landscape garden and submission of report.

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Semester VI

(OJTB 23-608)

OJT- On Job Training

Course Objectives:

- Expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.

Guidelines:

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session. Curriculum is flexible to adjust internship duration. Therefore, opportunities must be provided for experiences that cannot be anticipated when planning the course. The institutes have the flexibility to schedule internship, Project work, Seminar etc. according to the availability of the opportunities. However, requirement regarding Internship duration is minimum three weeks. During the vacation after 5th semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO‟s/ Government organizations/ Micro/ Small/ Medium enterprises and our college to make themselves ready for the industry.

Every student is required to prepare a file containing documentary proofs of the activities done by him. The evaluation of these activities will be done by Programmed Head/Cell In-charge/ Project Head/ faculty mentor or Industry Supervisor as specified in evaluation scheme.

General Procedure:_

Step I:- Upon request of student, request Letter/ Email from the department should go to industry to allot various slots of 4-8 weeks during vacation as internship periods for the students. Students request letter/profile/ interest are as may be submitted to industries for their willingness for providing the training.

Step II:- Industry will confirm the training slots and the number of seats allocated for internships via Confirmation Letter/ Email. In case the students arrange the training themselves the confirmation letter will be submitted by the students in the department. Based on the number of slots agreed to by the industry, department will allocate the students to the industry. In addition, the internship slots may be conveyed through Telephonic or Written Communication (by Fax, Email, etc.) by Faculty members who are particularly looking after the Internship of the students.

Step III:- Students on joining Training at the concerned Industry / Organization, submit the Joining Report/ Letters / Email.

Step IV:- Students undergo industrial training at the concerned Industry / Organization. In between faculty Member(s) evaluate(s) the performance of students once/twice by visiting/ coordination with the Industry/Organization and Evaluation Report of the students is submitted in department office.

Step V:- Students will submit training report after completion of internship.

Step VI:- Training Certificate to be obtained from industry.

Step VII:- Presentation along with brief report on training to be given at the time of examinationfor final evaluation.

Course outcomes:

- Students will get exposure to the industrial environment becoming competent professionals for the industry.
- Students will learn, understand and sharpen the real time technical / managerial skills required at the job.
- Student will be exposed to the current technological developments relevant to the subject area of training.