



**SARDAR PATEL UNIVERSITY**  
**Vallabh Vidyanagar, Gujarat**  
**(Reaccredited with 'A' Grade by NAAC (CGPA 3.25))**  
**Syllabus with effect from the Academic Year 2022-2023**

**PROGRAMME STRUCTURE**  
**M.Sc. Botany Semester: IV**

<p>Programme Outcome (PO) - For M.Sc. Botany Programme</p>	<p>Students completing M.Sc. Botany course of four semesters will gain thorough knowledge and develop relevant practical skills on different areas of Botany, both the fundamental and traditional aspects as well as the advanced and application oriented aspects such as plant structural and functional diversity and its role in human livelihood, ecological services and human influenced environmental issues, evolution processes resulting the diversified plant groups, their morphological, anatomical, and physiological adaptations to different environmental conditions, plant interactions with microbes and insects, genetic makeup and inheritance of various levels of plants, cell and molecular biology of plants, horticultural crops, physiology, biochemistry, biotechnology, recombinant DNA technology, proteomics and transgenic technology.</p> <p>Students will develop skills of plant explorations and identifications, herbarium preparation and preservation techniques, nursery establishment and management techniques, principles and methods of biodiversity conservation, microscopy and microtomy, reproduction, genetics, genetic structure of populations, microbiology, molecular biology, identification of various pests and diseases of crop plants and their controlling mechanisms, various analytical techniques, acquaintance with the use of bioinformatics tools and databases and application of statistics to biological data, biotechnological tools and techniques used for mass <i>in vitro</i> propagation, genetic transformation of plants, transgenic technology.</p> <p>By performing practical experiments relevant to the theory papers and taking one elective paper of their choice in each semester and a dissertation course in the fourth semester, students will get trained in experimental design and execution, firsthand experience on tools and techniques of research, quantitative and qualitative data analysis and interpretation of data. By presenting seminars in each semester, students will develop science communication and presentation skills.</p>
<p>Programme Specific Outcome (PSO) - For MSc Botany Semester - IV</p>	<p>Having studied the four prescribed papers, by the end of this semester, students will be able to:</p> <ol style="list-style-type: none"><li>1. Recognize and appreciate diversity, classification, ecological and economic significance of various groups of lower plants and higher plants including archibacteria and eubacteria.</li><li>2. Understand how cell interacts with environment, how cell growth and death are regulated.</li><li>3. Understand evolutionary trends among different groups of plants.</li><li>4. Have clear understanding about various tools and techniques to study cells, different cell organelles and their functions.</li><li>5. Become familiar with appropriate statistical methods required for designing a scientific experiments, formulate appropriate hypothesis for a scientific investigation.</li></ol>





**SARDAR PATEL UNIVERSITY**  
**Vallabh Vidyanagar, Gujarat**  
 (Reaccredited with 'A' Grade by NAAC (CGPA 3.25))  
 Syllabus with effect from the Academic Year 2022-2023

To Pass	(1) At least 40% marks in each paper at the University Examination and 40% aggregate marks in Internal and External Assessment. (2) At least 33% Marks in each paper in Internal Assessment.
---------	---

Course Type	Course Code	Name Of Course	Theory/ Practical	Credit	Exam Duration in hrs	Component of Marks		
						Internal Total	External Total	Total Total
Core Course	PS04CBOT51	Plant Physiology and Biochemistry	T	4	3	30	70	100
	PS04CBOT52	Plant Biotechnology	T	4	3	30	70	100
	PS04CBOT53	Practicals	P	4	3	30	70	100
	PS04CBOT54	Viva-Voce	=	1	=	=	50	50
Elective Course (Any Two)	PS04EBOT51	IPR and Biosafety	T	4	3	30	70	100
	PS04EBOT52	Biodiversity and Conservation	T	4	3	30	70	100
	PS04EBOT53	Practicals	P	4	3	30	70	100
		<b>OR</b>						
Core Course	PS04CBOT51	Plant Physiology and Biochemistry	T	4	3	30	70	100
	PS04CBOT52	Plant Biotechnology	T	4	3	30	70	100
	PS04CBOT53	Practicals	P	4	3	30	70	100
	PS04CBOT54	Viva-Voce	=	1	=	=	50	50
Elective Course	PS04EBOT54	Dissertation	=	12	=	=	300	300





(Master of Science) (Botany)  
M.Sc. Botany Semester (IV)

Course Code	PS04CBOT51	Title of the Course	Plant Physiology and Biochemistry
Total Credits of the Course	04	Hours per Week	04
Course Objectives:	1. To understand the conversion of light energy to chemical energy 2. To understand plant growth and growth regulators 3. To understand plant mineral nutrition. 4. To understand defense mechanism in plants 5. To understand stress tolerance		

Course Content		
Unit	Description	Weightage* (%)
1.	Water Relations of Plants: Water potential, osmotic potential and pressure potential - water and ion absorption and transport- passive and active absorption, Transpiration. Translocation of organic solutes – source – sink relationship. Mineral nutrition, Mineral deficiency, hydroponics. Phytochrome, Physiological effects of Phytochrome, mechanism of Phytochrome action. Photoperiodism and Rhythmic Phenomena: the Biological Clock, photoperiodism, and rhythms.	25
2.	Photosynthesis: Light reactions; sequence of photosynthetic pathway - Electron Transport Chain, Photophosphorylation. Pathways of CO <sub>2</sub> fixation. Respiration: Photorespiration, glycolysis, metabolic significance of TCA cycle, electron transport and oxidative phosphorylation, pentose phosphate pathway and dark respiration.	25
3.	Nitrogen Metabolism: sources of nitrogen, molecular nitrogen-inorganic nitrogen-organic nitrogen, Conversion of nitrate into ammonia. Biological nitrogen fixation – non symbiotic and symbiotic-reductive amination and Transamination. Plant Growth Hormones: Auxins, Gibberellins, Cytokinins and Brassinosteroids- their physiological effects and mode of action. Plant Growth Retardants: Abscic acid and ethylene. Senescence and aging, Photoperiodism. Phytochromes: In movements and flowering.	25
4.	Secondary metabolites and plant defense: Terpenes- phenolic compounds nitrogen containing compounds. Plant response to stresses – Biotic stress- induced plant defenses against insect herbivores and pathogen. Abiotic- water deficit, salinity stress - heat and chilling stress- mechanism of tolerance and resistance. Classification and structure of carbohydrates, Amino acids, Proteins and Lipids.	25





Teaching-Learning Methodology	Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos. Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure. Course materials will be provided from primary and secondary sources of information.
-------------------------------	---

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed the course, students will develop clear understanding of	
1.	Ability of plants to fix the atmospheric carbon
2.	Growth mechanism of plants
3.	Mineral nutrition in plants, and several symptoms of mineral deficiency
4.	Plants defense mechanism against herbivores and pathogens
5.	Ability of plants to overcome various stress factors

Suggested References:	
Sr. No.	References
1.	Buchanan, B. B., Grussem, W., & Jones, R. L. (Eds.). (2015). <i>Biochemistry and molecular biology of plants</i> . John wiley & sons.
2.	Dey, P. M. (1978). Biochemistry of plant galactomannans. In <i>Advances in Carbohydrate Chemistry and Biochemistry</i> (Vol. 35, pp. 341-376). Academic Press.
3.	Heldt, H. W., & Piechulla, B. (2010). <i>Plant biochemistry</i> . Academic Press.





4.	Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2015). <i>Plant physiology and development</i> (No. Ed. 6). Sinauer Associates Incorporated.
----	---

On-line resources to be used if available as reference material
On-line Resources
Recent review articles and research papers

\*\*\*\*\*





Practical Exercises:

1. Separation of plant pigments by Thin Layer Chromatography.
2. Estimation of Chlorophyll
3. Estimation of Carotenoid pigments.
4. Determination of Total Antioxidant activity by DPPH method.
5. Determination of Superoxide radical scavenging activity
6. Estimation of Nitrate reductase activity.
7. Calculation of stomatal index of upper and lower epidermal peelings.
8. Estimation of Curcumin





M.Sc. (Botany) Semester - 4

Course Code	PS04CBOT52	Title of the Course	Plant Biotechnology
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	<ol style="list-style-type: none"><li>1.To make the students understand the concepts of modern techniques in plant propagation</li><li>2.To facilitate the students with knowledge on recent developments in crop improvement</li><li>3. To address the pros and cons of GM crops.</li><li>4. To facilitate technical and theoretical know how for the application of molecular tools in crop improvement and crop production.</li></ol>
--------------------	--

Course Content		
Unit	Description	Weightage* (%)
1.	Cell & tissue culture in plants; in-vitro morphogenesis, organogenesis and embryogenesis; Artificial Seeds, Micro propagation (Clonal propagation); Haploidy; anther and ovule cultures, Embryo cultures; Protoplast isolation, culture and protoplast fusion and somatic hybridization, Cybrids, Somaclonal Variation;; Virus elimination, pathogen indexing; Cryopreservation	25%
2.	Production of secondary metabolites; Sources of plant secondary metabolites;criteria for cell selection, factors affecting the culture of cells; different bioreactorsand their use in secondary metabolite production; biochemical pathways for theproduction of different secondary metabolites; and biotransformation.	25%
3.	Methods for genetic transformation and transgenic plants production through <i>Agrobacterim tumefaciens</i> and <i>A. rhizogenes</i> ; Gene transfer methods in plants; PEG mediated, particle bombardment, Molecular markers and their importance in plant breeding, Marker Assisted Selection (MAS).	25%
4.	Commercially grown Transgenic plants: BT crops, Golden rice, transgenic crops for herbicide tolerance, disease and abiotic stress resistance. Indian laws and regularions for the release and cultivation of transgenic plants. Biotechnology and intellectual property rights (IPR); Plant geneticresources GATT & TRIPS; Patent for higher plant genes and DNA sequence	25%





Teaching-Learning Methodology	Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos. Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure. Course materials will be provided from primary and secondary sources of information.
-------------------------------	---

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the significance of plant biotechnology for improving crop productivity
2.	They can apply this knowledge to establish clonal propagation methods for important as well as endangered plants
3.	Students will also understand the pros and cons of transgenic plants as well as intellectual property management and handling of GMOs.
...	

Suggested References:	
Sr. No.	References
1.	Plant Biotechnology: The genetic manipulation of plants – Adrial Slater, Nigel W. Scott and Mark R. Fowler
2.	An Introduction to Plant Biotechnology: H.S. Chawla







...	
-----	--

On-line resources to be used if available as reference material
On-line Resources

\*\*\*\*\*

### Practicals for Plant Biotechnology

1. Preparation of MS medium and Hormone stocks
2. Callus induction from Tobacco leaf/carrot explants (Medium preparation, surface sterilization, inoculation, observation and interpretation of results)
3. Micropropagation of banana
4. Shoot induction through organogenesis from tobacco callus
5. Somatic embryogenesis induction from carrot cell suspension
6. Tobacco anther culture for haploid plant production
7. Culture of zygotic embryos (embryo isolation and culture)
8. Synthetic seed preparation.





Course Code	PS04CBOT53	Title of the Course	LAB-I
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	<ol style="list-style-type: none"><li>1. To make biochemical estimations of various plant pigments and metabolites in different organs.</li><li>2. To get skills developed involved in plant micropropagation.</li><li>3. To get trained in production of synthetic seeds.</li></ol>
--------------------	--

PS04CBOT54 (Lab IA)  
(Plant Physiology and Biochemistry)

Sr.No.	Practical Exercises
1	Separation of plant pigments by Thin Layer Chromatography.
2	Estimation of Chlorophyll
3	Estimation of Carotenoid pigments.
4	Determination of Total Antioxidant activity by DPPH method.
5	Determination of Superoxide radical scavenging activity
6	Estimation of Nitrate reductase activity.
7	Calculation of stomatal index of upper and lower epidermal peelings.
8	Estimation of Curcumin





PS04CBOT54 (Lab IIB)  
(Plant Biotechnology)

Sr.No.	Practical Exercises
1	Preparation of MS medium and Hormone stocks.
2	Callus induction from Tobacco leaf/carrot explants (Medium preparation, surface sterilization, inoculation, observation and interpretation of results).
3	Micropropagation of banana.
4	Shoot induction through organogenesis from tobacco callus.
5	Somatic embryogenesis induction from carrot cell suspension.
6	Tobacco anther culture for haploid plant production.
7	Culture of zygotic embryos (embryo isolation and culture).
8	Synthetic seed preparation.

Learning Methodology	Lab exercises will be performed by the students after understanding the principles and methodologies involved in each experiment. Some of the exercises will be performed individually by each student and others will be done by small groups.
----------------------	---

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Practical Examination (As per CBCS R.6.8.3)	20%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce and Attendance (As per CBCS R.6.8.3)	10%
3.	University Examination	70%

Course Outcomes: Having completed this course, students will be able to:	
1.	Estimate quantitatively various compounds and metabolites from plant materials.
2.	Accurately perform all the stages of exercises involved in plant micropropagation
<b>References:</b>	
1.	Buchanan, B. B., Gruissem, W., & Jones, R. L. (Eds.). (2015). <i>Biochemistry and molecular biology of plants</i> . John Wiley & sons.
2.	Heldt, H. W., & Piechulla, B. (2010). <i>Plant biochemistry</i> . Academic Press.
3.	Chawla, H.S. An Introduction to Plant Biotechnology





Course Code	PS04CBOT55	Title of the Course	LAB-II
Total Credits of the Course	04	Hours per Week	08

**PS01CBOT55 (Lab IIA&B)**

Sr.No.	Practical Exercises
1	<b>Practical Exercises will be related to elective papers</b>

:





Master of Science in Botany  
M.Sc. Botany Semester IV

Course Code	PS04EBOT51	Title of the Course	IPR and Biosafety
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	<p>1. To introduce basic concepts of ethics and safety that are essential for different disciplines of science and procedures involved and protection of intellectual property and related rights.</p> <p>2. To understand balanced integration of scientific and social knowledge in sustainable development.</p>
--------------------	--

Course Content		
Unit	Description	Weightage* (%)
1.	<p><b>Biotechnology and society:</b> Biotechnology and social responsibility, public acceptance issues in biotechnology, issues of access, ownership, monopoly, traditional knowledge, biodiversity, benefit sharing, environmental sustainability, public vs private funding.</p> <p><b>Bioethics:</b> Social and ethical issues in biotechnology. Principles of bioethics. Ethical conflicts in biotechnology- interference with nature, unequal distribution of risk and benefits of biotechnology, bioethics vs business ethics. Introduction and need of bioethics, its relation with other branches, types of risk associated with genetically modified microorganisms, Ethical Issues involving GMOs; ethics related to human cloning, human genome project, prenatal diagnosis, agriculture and animal rights, data privacy of citizens health; ethical issues in India and abroad through case studies; Socio-economic impact of biotechnology.</p>	25%
2.	<p><b>Bio- safety:</b> Definition of bio-safety; History, evolution and concept of biosafety; need and application of biosafety in laboratories and industries; biosafety guidelines and regulations, international and national norms of biosafety; Implementation of biosafety guidelines; Classification and Description of Biosafety levels; Design of clean rooms and biosafety cabinets; Risk assessment and containment levels; biohazard, bio-medical and hazardous wastes, handling and disposal; transportation of biological materials; bio-terrorism; biosafety protocol (Cartagena biosafety protocol) regulations to protect nature, growers and consumers interest and nation interest; Good laboratory practice (GLP) and Good manufacturing practice (GMP), Use of GMO's and their release, GM products, issues in use of GMO's, risk for animal/human/agriculture and environment owing to GMOs., Biotechnology and bio-safety concerns at the level of individuals,</p>	25%





	institutions, society, region, country and world. Bio safety regulation: handling of recombinant DNA products and process in industry and in institutions.	
3.	<p><b>IPR I:</b> The Concept/History of Intellectual Property; Intellectual Property System in India; Kinds of Intellectual Property Rights; Advantages and Disadvantages of IPR. International Instruments concerning Intellectual Property Rights: the Berne Convention, Universal Copyright Convention, The Paris Convention, Patent Co-operation Treaty, Trade Related Intellectual Property Rights (TRIPS), The World Intellectual Property Organization (WIPO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Intellectual Property Organisation (WIPO); World Trade Organization (WTO) European Patent Office (EPO). Patents Act, 1970 ; Trade Mark Act, 1999; The Designs Act, 2000; The Geographical Indications of Goods (Registration and Protection) Act, 1999; Copyright Act, 1957 ; The Protection of Plant Varieties and Farmers' Rights Act, 2001; The Semi Conductor Integrated Circuits Layout Design Act, 2000; Trade Secrets; Utility Models; IPR &amp; Biodiversity; The Convention on Biological Diversity (CBD) 1992;</p> <p>Application forms of IPR and Intellectual property protection. Concept of property with respect to intellectual creativity, Tangible and Intangible property.</p>	25%
4.	<p><b>IPR II:</b> Classification of patents in India, Classification of patents by WIPO, Categories of Patent, Special Patents, Patenting Biological products, Patent document, Granting of patent, Rights of a patent, Patent Searching, Patent Drafting, filing of a patent, different layers of the International patent system, Utility models, Concept related to patents novelty, non-obviousness, utility, anticipation, prior art etc. Type of patents. Indian patent act and foreign patents. Patentability, Patent application, Revocation of patent, Infringement and Litigation with case studies on patent, Commercialization and Licensing. Patent Cooperation Treaty (PCT);</p> <p>Copyright Overview of Copyright, Importance of Copyrights, Process for copyright, case studies.</p> <p>Overview of Trademarks &amp; Trade Secret, Importance of Trademarks &amp; Trade secret, Rights of Trademark &amp; Trade Secret, Types of Trademarks, Registration process for Trademark &amp; Trade Secret, Duration of Trademark and trade secret, Case Studies</p> <p>Geographical Indications Overview of Geographical Indications, Importance of Geographical Indication Protection, Case studies</p>	25%





	Infringement: Direct, Contributory, and Induced Infringement; How Infringement is Determined; Who Is an Infringer; Official Machinery, Controller, Powers and Functions Defences to Infringement; Case studies	
--	--	--

Teaching-Learning Methodology	Online / Offline / Presentation / Videos
-------------------------------	--

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Interpret basics of biosafety and bioethics and its impact on all the biological sciences and the quality of human life.
2.	Recognize importance of biosafety practices and guidelines in research.
3.	Comprehend benefits of GM technology and related issues.
4.	Recognize importance of protection of new knowledge and innovations and its role in business.

Suggested References:	
Sr. No.	References
1.	Fleming, D.A., Hunt, D.L., (2000). Biotechnology and Safety Assessment (3rd Ed) Academic press. ISBN-1555811804, 9781555811808.
2.	Thomas, J.A., Fuch, R.L. (1999). Biotechnology and safety assessment (3rd Ed). CRC press, Washington. ISBN: 1560327219, 9781560327219





3.	Law and Strategy of biotechnological patents by Sibley. Butterworth publication.(2007) ISBN: 075069440, 9780750694445.
4.	Intellectual property rights- Ganguli-Tat McGrawhill. (2001) ISBN-10: 0074638602,
5.	Intellectual Property Right- Wattal- Oxford Publicatiopn House.(1997) ISBN:0195905024.
6.	Biotechnology - A comprehensive treatise (Vol. 12). Legal economic and ethical dimensions VCH. (2 <sup>nd</sup> ed) ISBN-10 3527304320.
7.	Encyclopedia of Bioethics 5 vol set, (2003) ISBN-10: 0028657748.
8.	Thomas, J.A., Fuch, R.L. (2002). Biotechnology and safety Assessment (3 <sup>rd</sup> Ed) Academic press.
9.	B.D. Singh. Biotechnology expanding horizons.
10.	H.K.Das. Text book of biotechnology 3 <sup>rd</sup> edition.
11.	Sateesh, M.K., Bioethics and Biosafety, IK International Publishers (2008)
12.	Singh I. and Kaur, B., Patent law and Entrepreneurship, Kalyani Publishers (2006).
13.	Srinivasan, K. and Awasthi, H.K., Law of Patents, Jain Book Agency (1997)
14.	Deepa Goel, ShominiParashar, (2013), IPR, Biosafety and Bioethics, Pearson.

On-line resources to be used if available as reference material

On-line Resources

\*\*\*\*\*







(Master of Science) (Botany)  
M.Sc. Botany Semester (IV)

Course Code	PS04EBOT52	Title of the Course	Biodiversity and Conservation
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	<ol style="list-style-type: none"><li>1. To impart knowledge of fundamental concepts of biodiversity, the range of its extant and the need for conservation.</li><li>2. To provide information of the main threats to biological diversity and the ability to evaluate the effects of human influences on biodiversity.</li><li>3. To demonstrate the differences between the different categories of red listed species.</li><li>4. To understand different modes of biodiversity conservation, their merits and limitations.</li><li>5. To integrate the information generated from scientific investigations and use findings to address conservation and biodiversity issues.</li></ol>
--------------------	---

Course Content		
Unit	Description	Weightage* (%)
1.	Biodiversity: Concepts, levels and types, changes in time and space, evolution, species concept; significance of biodiversity for life security. Biogeography. Terrestrial, Marine, Aquatic and Agricultural biodiversity: Changing patterns and practices. Influence of modern lifestyle on biodiversity. Pros and cons of genetically modified species	25
2.	Global conservation measures, institutions and conventions; IUCN concept of threatened and endangered species. The Red Data Books of Indian plants and animals. Causes and consequences of loss of biodiversity. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): aims, major ratifications and amendments. Exotic and invasive species: A few case studies of intentional and non-intentional introduction of exotic species and their influence on local biodiversity.	25
3.	Principles and strategies of biological diversity conservation: <i>in-situ</i> conservation and <i>ex-situ</i> conservation. Biosphere reserves, major protected areas (sanctuaries, national parks, biosphere reserves) of India and Gujarat. Wetlands, mangroves and coral reefs for conservation of wild biodiversity. Concept of Sacred groves and their role in biodiversity conservation.	25





	Role of botanical gardens, field gene banks, seed banks, in vitro repositories, cryobanks in conservation of plants and animal sperms. Role of Zoos, breeding centers in conservation of animals.	
4.	Biodiversity hot spots in India and world; Indian Biodiversity Act 2002; Major objectives of biodiversity authority board; Biodiversity and economics with special reference to India; People's Biodiversity register: Objectives, importance and modality of preparation. General account of the activities of Botanical Survey of India (BSI) and Zoological Survey of India (ZSI), National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific & Industrial Research (CSIR), Department of Biotechnology (DBT) and Department of Environment and Forest, Wild life Protection Society of India, Wildlife Institute of India (WII), Animal Welfare Board of India and Bombay Natural History Society (BNHS) in the context of Indian biodiversity conservation.	25

Teaching-Learning Methodology	Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos. Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure. Course materials will be provided from primary and secondary sources of information.
-------------------------------	---

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the concept of biodiversity, its role for our survival, different direct and indirect threats on biodiversity.
2.	Appreciate the global and national initiatives and local traditions for biodiversity





	conservation.
3.	Become familiar with different modes of conservation, institutes involved in biodiversity conservation.
4.	Learn various guidelines and regulations for utilizing the biodiversity judiciously.

Suggested References:

Sr. No.	References
1.	Wilson, E., O., (1988). Biodiversity. The National Academies Press. Harvard. Washington, DC.
2.	Hunter, M., L., Gibbs, J.P.,(2007).Fundamentals of Conservation Biology. 3 <sup>rd</sup> Edn. Blackwell Publishing, Malden.
3.	Myers, N., Mittermeier, R., A., Mittermeier, C. G., Fonseca, G., A., da, Kent, J., (2000). Biodiversity Hotspots for Conservation Priorities. Nature, 403, 853-858.
4.	Rodgers, N. A., Panwar, H. S. Planning a Wildlife Protected Area Network in India. Vol. 1. The Report Wildlife Institute of India, Dehradun.

On-line resources to be used if available as reference material

On-line Resources

Biodiversity: **Author:** John Spicer

Brian W. van Wilgen: Biological Invasions in South Africa

Recent review articles and research papers

\*\*\*\*\*





**Biodiversity and Conservation**

1. Ecological sampling and census techniques of selected faunal and floral groups
2. Calculation of species richness and diversity indices
3. Measurement of microbial diversity
4. Preparation of GIS maps
5. Study of preservation techniques for taxidermy
6. Study of biogeographical zones and correlation with floral and faunal diversity
7. Adaptations in plants and animals
8. Ethnobotanically and ethno-zoologically important species
9. Floral faunal diversity studies by line, quadrat and belt transect methods





Master of Science (Botany)  
M.Sc. (Botany) Semester IV

Course Code	PS04EBOT54	Title of the Course	Dissertation
Total Credits of the Course	12	Hours per Week	12

Course Objectives:	<ol style="list-style-type: none"><li>1. Recognize a research <b>problem (topic)</b> and approach it in a scientific way</li><li>2. Do literature survey from authentic sources.</li><li>3. Design experiments to <b>understand and</b> investigate the <b>problem(topic)</b></li><li>4. Interpret the results and draw conclusions</li><li>5. Write scientific reports</li></ol>
--------------------	---

Course Content		
Unit	Description	Weightage* (%)
1.	<b>Dissertation work</b>	100%
2.		
3.		
4.		

Teaching-Learning Methodology	Literature and laboratory work
-------------------------------	--------------------------------

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Thesis evaluation by Internal Examiner	40%
2.	Thesis evaluation by External examiner	40%
3.	Viva voce	20%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Carry out literature survey from various sources relevant to work





2.	Identify the <b>problem (topic)</b> and put forth hypothesis and design experiments to investigate the <b>problem(topic)</b>
3.	Interpret results and discuss them.
4.	Write report, do scientific writing for publication

Suggested References:

Sr. No.	References
1.	As obtained through literature survey

On-line resources to be used if available as reference material

As obtained through literature survey

\*\*\*\*\*

