



(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 ₂ 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: Abscicic 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.
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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., Gruissem, 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.
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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:	1.To make the students understand the concepts of modern techniques in plant propagation 2.To facilitate the students with knowledge on recent developments in crop improvement 3. To address the pros and cons of GM crops. 4. To facilitate technical and theoretical know how for the application of molecular tools in crop improvement and crop production.
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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 bioreactors and their use in secondary metabolite production; biochemical pathways for the production of different secondary metabolites; and biotransformation.	25%
3.	Methods for genetic transformation and transgenic plants production through <i>Agrobacterium 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 regulations for the release and cultivation of transgenic plants. Biotechnology and intellectual property rights (IPR); Plant genetic resources 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.
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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.
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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





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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">1. To make biochemical estimations of various plant pigments and metabolites in different organs.2. To get skills developed involved in plant micropropagation.3. To get trained in production of synthetic seeds.
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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.
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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
	References:
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	Practical Exercises will be related to elective papers

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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:	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. 2. To understand balanced integration of scientific and social knowledge in sustainable development.
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Course Content		
Unit	Description	Weightage* (%)
1.	<p>Biotechnology and society: 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>Bioethics: 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>Bio- safety: 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>IPR I: 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 & 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>IPR II: 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 & Trade Secret, Importance of Trademarks & Trade secret, Rights of Trademark & Trade Secret, Types of Trademarks, Registration process for Trademark & 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	
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Teaching-Learning Methodology	Online / Offline / Presentation / Videos
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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 Publication House.(1997) ISBN:0195905024.
6.	Biotechnology - A comprehensive treatise (Vol. 12). Legal economic and ethical dimensions VCH. (2 nd 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 rd Ed) Academic press.
9.	B.D. Singh. Biotechnology expanding horizons.
10.	H.K.Das. Text book of biotechnology 3 rd 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"> 1. To impart knowledge of fundamental concepts of biodiversity, the range of its extant and the need for conservation. 2. To provide information of the main threats to biological diversity and the ability to evaluate the effects of human influences on biodiversity. 3. To demonstrate the differences between the different categories of red listed species. 4. To understand different modes of biodiversity conservation, their merits and limitations. 5. To integrate the information generated from scientific investigations and use findings to address conservation and biodiversity issues.
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Course Content		
Unit	Description	Weightage* (%)
1.	<p>Biodiversity: Concepts, levels and types, changes in time and space, evolution, species concept; significance of biodiversity for life security. Biogeography.</p> <p>Terrrestrial, Marine, Aquatic and Agricultural biodiversity: Changing patterns and practices. Influence of modern lifestyle on biodiversity. Pros and cons of genetically modified species</p>	25
2.	<p>Global conservation measures, institutions and conventions; IUCN concept of threatened and endangered species. The Red Data Books of Indian plants and animals.</p> <p>Causes and consequences of loss of biodiversity.</p> <p>Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): aims, major ratifications and amendments.</p> <p>Exotic and invasive species: A few case studies of intentional and non-intentional introduction of exotic species and their influence on local biodiversity.</p>	25
3.	<p>Principles and strategies of biological diversity conservation: <i>in-situ</i> conservation and <i>ex-situ</i> conservation.</p> <p>Biosphere reserves, major protected areas (sanctuaries, national parks, biosphere reserves) of India and Gujarat. Wetlands, mangroves and coral reefs for conservation of wild biodiversity.</p> <p>Concept of Sacred groves and their role in biodiversity conservation.</p>	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.
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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 rd 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





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

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">1. Recognize a research problem (topic) and approach it in a scientific way2. Do literature survey from authentic sources.3. Design experiments to understand and investigate the problem(topic)4. Interpret the results and draw conclusions5. Write scientific reports
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Course Content		
Unit	Description	Weightage* (%)
1.	Dissertation work	100%
2.		
3.		
4.		

Teaching-Learning Methodology	Literature and laboratory work
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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 problem (topic) and put forth hypothesis and design experiments to investigate the problem(topic)
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





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

Course Code	PS04EBOT55	Title of the Course	Phytoresources
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	<p>By the end of this course students will have:</p> <ol style="list-style-type: none">1. Clear understanding on extant of diversified local, regional and global phytoresources available for mankind.2. Fair understanding about various kinds of little known phytoresources3. Greater concern towards the exploration and utilization of traditional or local varieties of crop plants.4. Greater concern to recognize and appreciate the knowledge of tribal and traditional societies on phytoresources, and conservation of such knowledge.
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Course Content		
Unit	Description	Weightage* (%)
1.	<p>Concept and extant of plant diversity in wild and cultivation. Innovations meeting for world food demands.</p> <p>Origin and history of plant of domestication and agriculture; centers of crop plant origin and diversity; geographical distribution of crops of Indian origin.</p> <p>Plant genetic resources, their importance in crop improvement, collection and managing genetic resources.</p> <p>Role of biotechnology in germplasm conservation.</p>	25
2.	<p>A brief account on the following major and minor crops of Indian origin, their products and uses. (i) food grains (ii) oil yielding crops (iii) medicinal and aromatic plants.</p> <p>A brief account on the sources, active principles and uses of (i) alcoholic and non-alcoholic beverages (ii) coloring agents (iii) spices (vi) sweetening agents (iv) petrocrops and biofuels.</p>	25
3.	<p>Ethnomedicobotany: Scope and potential applications; collection methods of ethnomedicobotanical data; field methods and scrutiny of Herbarium specimens and folklore; verification of data; collection of materials for voucher specimen and for phytochemical screening; Avenue trees: concept, role, site specific selection criteria for urban</p>	25





	habitations, industrial zones, and highways. Indoor plants: different kinds of indoor plants and their significance; site specific selection and care of indoor plants.	
4.	Forest products: Important timber yielding plants, timber identification/ diagnostic features. Non-timber forest products: bamboos, rattans, gums, resins, tannins. Plants as sources of drugs and pharmaceuticals. Drugs of botanical origin: Structure and physical properties; chemistry of secondary metabolites: phenols, phenolic glycosides, saponins, steroids, alkaloids, vitamins and hormones and natural antibiotics.	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.
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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.	Appreciate the extant and significance of different wild and domesticated plants.
2.	Recognize the extant of traditional knowledge and importance of documenting such knowledge.
3.	Develop the spirit of exploring uses unconventional plants and unconventional uses of popular plants.

Suggested References:





Sr. No.	References
1.	Arora, R., K., Nayar, E., R., (1984). Wild Relatives of Crop Plants in India. National Bureau of Plant Genetic Resources Science Monograph, New Delhi
2.	Bole, P., V., Vaghani, Y., (1986). Field Guide to Common Indian Trees. Oxford University Press, Mumbai.
3.	Chandel, K., P., S., Shukla, G., Sharma, N., (1986). Biodiversity in Medicinal and Aromatic Plants in India: Conservation and Utilization. National Bureau of Plant Genetic Resources, New Delhi.
4.	Ambasta, S., P., (1986). Council of Scientific & Industrial Research. The Useful Plants of India. Publications and Information Directorate, CSIR, New Delhi.
5.	Jain, S., K., (2004). A Manual of Ethnobotany. 2 nd Edn. Scientific Publishers Journals Department, Jodhpur.
6.	Jain, S., K., Sinha, B., K., Gupta, R., C., (1991). Notable plants in Ethnomedicine of India. Deep Publications, New Delhi.
7.	Jain, S., K., (2015). Dictionary of Indian Folk medicine and Ethnobotany. S K Jain Publications, New Delhi.

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

On-line Resources

Relevant review articles/research papers/handouts of latest development in the subject

Practical Exercises:

1. Examining various food crop plants (live or Herbarium specimens) and their products.
2. Examining various cash crop plants, their products.
3. Examining various medicinal plants and their products.
4. Collection, preparation and preservation of voucher herbarium specimens.
5. Study of little known plants used as food or used in food preparations.
6. Diagnostic and identification features of important timbers.
7. Study of various non timber forest produce.
8. Study of various Avenue trees and their qualities.
9. Study of various indoor plants.

