

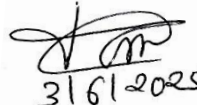


પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે લાઈફ સાયન્સ વિદ્યાશાખા હેઠળનો NEP-૨૦૨૦ અંતર્ગત બોટની વિષય સેમેસ્ટર-૫નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજૂરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન, ૨૦૨૫ થી અમલવારી કરવાની રહે છે. લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.




31/6/2025
ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/ એકેડેમિક/૨૩૧/૨૦૨૫

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,

સરકારી પોલીટેકનિક કેમ્પસ,

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,

ખડીયા, જૂનાગઢ-૩૬૨૨૬૩

તા.૦૩/૦૬/૨૦૨૫

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તરફ....

નકલ સાદર રવાના:-

- માન.કુલપતિશ્રી/ કુલસચિવશ્રીનાં અંગત સચિવશ્રી.
- પરીક્ષા નિયામકશ્રી, ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી, જૂનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

- સીસ્ટમ મેનેજરશ્રી, આઈ.ટી.સેલ વિભાગ (વેબસાઇટ ઉપર પ્રસિદ્ધ થવા અર્થે.)



BHAKTA KAVI NARSINH MEHTA UNIVERSITY
JUNAGADH



BOARD OF STUDIES

FACULTY OF LIFE SCIENCE

SYLLABUS FOR BOTANY (HONOURS)

PROGRAMME (SEMESTER- V)

EFFECTIVE FROM JUNE, 2025

BHAKTA KAVI NARSINH MEHTA UNIVERSITY**Major/Minor****Syllabus of B.Sc. (Honors) as per NEP-2020****Faculty of Life Science****Effective from June 2025****Subject: Botany****SEMESTER- V****SUMMARY OF THE SYLLABUS**

Sem No.	Sr. No.	Category of Course	Course Title	Course Level	Credit	Teaching Hrs.	SEE Marks	CCE Marks	Total Marks	Exam Duration
Sem-5	1	Major- 11	Plant Morphology and Ethnomedicine (IKS)	5.5	4T	60	50	50	100	02:00 Hrs.
	2	Major- 12	Ecology and Plant Systematics	5.5	4T	60	50	50	100	02:00 Hrs.
	3	Major- 13	Plant Structure, Uses, Ecology and Classification	5.5	4P	120	50	50	100	05:00 Hrs.
	4	Minor- 04	Instrumentation and Methodology	5.5	4T	60	50	50	100	02:00 Hrs.
	5	Minor- 05	Instrumentation and Methodology	5.5	4P	120	50	50	100	05:00 Hrs.
				Total	20					

Course Level	5.5	Internal Marks	50
Programme	B.Sc. (Honors)	External Marks	50
Semester	5	Practical Internal	-
Course Type	Major 11 (Theory)	Practical External	-
Course Credit	4T	Prac.Ext. Exam Time	
Teaching Hours	60	Total	100
Course Code		Exam Duration	02:00 Hrs.
Course Title	PLANT MORPHOLOGY AND ETHNOMEDICINE (IKS)		

Course Objectives:

- To understand the morphological features and classifications of leaves and flowers, including phyllotaxy, inflorescence types, and floral structures.
- To explore the diversity and structure of reproductive parts of flowers for accurate botanical identification.
- To introduce the concept and significance of ethnobotany with a focus on traditional knowledge and sacred plant use in India.
- To gain knowledge about traditional systems of medicine such as Ayurveda, Siddha, and Homeopathy.
- To identify and classify medicinal plants based on their therapeutic value, plant parts used, and chemical constituents.

Course Learning Outcomes: After completion of the course, the students will be able to:

- Identify and describe various leaf structures, types of phyllotaxy, stipules, and venation patterns.
- Classify different types of inflorescences and explain floral parts, their arrangement, and modifications.
- Demonstrate an understanding of ethnobotanical concepts and document traditional plant-based knowledge.
- Explain preparation methods of herbal medicines and discuss their role in traditional healthcare systems.
- Recognize key medicinal plants and evaluate their therapeutic uses, active constituents, and adulterants.

Pedagogy:

Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.

Course Contents

Sem	Unit No.	Syllabus	Teaching Hours
5	1	VEGETATIVE MORPHOLOGY 1.1 Habit, Habitat, Root and Stem (Excluding modification) 1.2 Leaf: Parts of leaf; phyllotaxy, types of leaves; venation; stipules; leaf apex	15
	2	REPRODUCTIVE MORPHOLOGY 2.1 Inflorescences: Racemose and Cymose and special types – <i>Cyathium</i> , <i>Verticillate</i> , <i>Hypanthodium</i> 2.2 Typical Flowers 2.2.1 Definition: bract; pedicel; symmetry; sexuality; hypogynous; epigynous; perigynous 2.2.2 Calyx: function and types 2.2.3 Corolla: function forms and aestivation 2.2.4 Perianth 2.2.5 Androecium: Parts of Stamen, Attachment 2.2.6 Gynoecium: Parts of carpels; function; placentation; structure of stigma style and ovary, Types of fruit	15
	3	ETHNOBOTANY 3.1 Concept of Ethnobotany 3.2 Historical development of Ethnobotany with emphasis on India 3.3 Documentation methods of traditional knowledge 3.4 Traditional methods of preparation of herbal drugs (eg. Decoction, paste, powders, oil and infusions) used in Indian systems 3.5 Sacred and Magico-religious beliefs of following plants: Abrus, Khijado, Pipalo, Tal, Tulsi	15
	4	HERBAL MEDICINE 4.1 Traditional systems of Medicine (Siddha, Ayurveda, Homeopathy) 4.2 Forms of Ayurvedic medicine 4.3 Classification of Medicinal plants (Part of plants used, Active constituents, Therapeutic value) 4.4 Screening of Herbal drugs 4.5 Medicinal importance of following plants: Calotropis, Aloe, Datura, Asparagus, Aegle	15

Suggested Reading:

1. Singh (2012). Plant Systematics: Theory and Practice Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
2. Jeffrey, C. (1982). An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge.
3. Judd, W.S., Campbell, C.S., Kellogg, E.A., & Stevens, P.F. (2002). Plant Systematics-A Phylogenetic Approach. Sinauer Associates Inc., U.S.A. 2nd edition.
4. Maheshwari, J.K. (1963). Flora of Delhi. CSIR, New Delhi.
5. Radford, A.E. (1986). Fundamentals of Plant Systematics. Harper and Row, New York.
6. Saklani, A. & Jain, S. K. (1994). Cross-cultural Ethnobotany of Northeast India. Deep Publications, New Delhi.
7. Sood, S. K., Thakur, V. & Lakhanpal, T. N. (2005). Sacred and Magico-religious plants of India. Scientific Publishers, Jodhpur (India).
8. Kumaresan, V. (2015). Herbal Biotechnology and Pharmacognosy. Saras Publications, Kanyakumari, Tamil Nadu, India.

Course Level	5.5	Internal Marks	50
Programme	B.Sc. (Honors)	External Marks	50
Semester	5	Practical Internal	-
Category of Course	Major 12 (Theory)	Practical External	-
Course Credit	4T	Prac. External Exam Duration	-
Teaching Hours	60	Total	100
Course Code		Exam Duration	02:00 Hrs.
Course Title	ECOLOGY AND PLANT SYSTEMATICS		

Course Objectives:

- To understand the fundamental concepts of plant ecology including soil and water properties, energy flow, and biogeochemical cycles.
- To explore ecological relationships, community characteristics, and plant adaptations to different habitats.
- To develop knowledge of plant systematics, including identification, classification, and documentation techniques.
- To familiarize students with taxonomic tools such as herbarium practices, e-flora, virtual herbaria, and floristic documentation.
- To study the classification systems and morphological features of selected dicot and monocot plant families.

Course Learning Outcomes: After completion of the course, the students will be able to:

- Demonstrate an understanding of plant ecology and phytogeography of India.
- Develop critical understanding on angiospermic plants.
- Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of phytogeography and plant taxonomy.

Pedagogy:

Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.

Course Contents

Sem	Unit No.	Syllabus	Teaching Hours
5	1	PLANT ECOLOGY: I 1.1 Soil: structure and type, properties (Physical; Chemical and Biological), profile. 1.2 Water: States of water in the environment, Precipitation types (rain, fog, snow, hail, dew), Hydrological Cycle 1.3 Trophic organisation: Basic source of energy, autotrophy, heterotrophy, Food chains and Food webs; Ecological pyramids. 1.4 Principles and models of energy flow, Biogeochemical cycles: Cycling of Carbon, Nitrogen and Phosphorus.	15
	2	PLANT ECOLOGY: II 2.1 Symbiosis (Mutualism, Commensalism), Antagonism (Parasitism, Predation). 2.2 Characters of communities: analytical and synthetic. 2.3 Phytogeographical regions of India. 2.4 Ecological adaptations: Hydrophytes (<i>Hydrilla</i> , <i>Eichornia</i>), Xerophytic (<i>Nerium</i> , <i>Capparis</i>)	15
	3	PLANT SYSTEMATICS: I 3.1 Origin of Angiosperms 3.2 Concept of Taxon and Taxonomy 3.2.1 Taxonomic categories 3.2.2 Concept of genus and species 3.2.3 Concept of families 3.3 Classification systems of Bentham & Hooker , and brief reference of Angiosperm Phylogeny Group (APG IV) classification. 3.4 Floral diagram and Floral formula	15
	4	PLANT SYSTEMATICS: II 4.1 ICBN: Principles, rules and recommendations, names, why name changes, typification, units of classification 4.2 Study of Dicotyledon Families: 4.3.1 Polypetalae: Capparidaceae, Cucurbitaceae, Fabaceae 4.3.2 Gamopetalae: Asteraceae, Solanaceae, Verbenaceae 4.3.3 Monochlamydae: Euphorbiaceae, Amaranthaceae 4.4 Study of Monocotyledon Families: Cyperaceae and Poaceae (Gramineae).	15

Suggested Reading:

1. Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
2. Singh, J.S., Singh, S.P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
3. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
4. Wilkinson, D.M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A.
5. Kormondy, E.J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition.
6. Singh, (2012). Plant Systematics: Theory and Practice Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
7. Jeffrey, C. (1982). An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge.
8. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics-A Phylogenetic Approach. Sinauer Associates Inc., U.S.A. 2nd edition.
9. Maheshwari, J.K. (1963). Flora of Delhi. CSIR, New Delhi.
10. Radford, A.E. (1986). Fundamentals of Plant Systematics. Harper and Row, New York.

Course Level	5.5	Internal Marks	-
Programme	B.Sc. (Honors)	External Marks	-
Semester	5	Practical Internal	50
Category of Course	Major 13 (Practical)	Practical External	50
Course Credit	4P	Prac. External Exam Duration	05:00 Hrs.
Teaching Hours	120 hrs.	Total	100
Course Code		Exam Duration	-
Course Title	PLANT STRUCTURE, USES, ECOLOGY AND CLASSIFICATION		

Course Objectives:

- To develop practical skills in identifying and classifying leaf types, phyllotaxy, venation, stipules, and incision patterns.
- To study and distinguish various types of inflorescences and floral structures through hands-on observation.
- To enhance understanding of different flower types, floral whorls, aestivation, and reproductive structures using live specimens.
- To identify and classify fruits based on their structure and origin, including simple, aggregate, and composite fruits.
- To understand the key diagnostic features of selected plant families through practical identification and comparative analysis.

Course Learning Outcomes: After completion of the course, the students will be able to:

- Demonstrate an understanding of plant ecology and phytogeography of India.
- Develop critical understanding on angiospermic plants.
- Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of phytogeography and plant taxonomy.
- Apply theoretical knowledge in utilization, and report generation of economical and medicinal plants. Create awareness on conservation of medicinal plants and use of natural plant products as alternatives to synthetic products.

Pedagogy:

Lectures, Tutorials, Assignments, Demonstrations, live specimens, Herbarium specimens, Videos, Team based learning, Field visit and report writing.

Course Contents

Sr. No.	Practical Content Group A	Teaching Hours
1	LEAF MORPHOLOGY (External) Phyllotaxy: • Alternate: Distichous - <i>Polyalthia</i> Tristichous - <i>Cyperus</i> Pentastichous - Shoe Flower • Opposite: Superposed - <i>Quisqualis</i> Decussate - <i>Calotropis</i> • Verticillate (Whorled): <i>Nerium</i> / <i>Alstonia</i> • Leaf Mosaic: <i>Lonia</i> / <i>Acalypha</i>	60
2	STIPULES • Free Lateral - Shoe Flower • Adnate - <i>Rosa</i> • Interpetiolar - <i>Ixora</i> • Intapetiolar - <i>Hamelia</i> • Ochreate - <i>Polygonum</i> • Compound - <i>Delonix</i> • Convolute (Scaly) - <i>Ficus</i> • Spinous - <i>Zizyphus</i>, <i>Acacia</i> • Foliaceous - <i>Pisum</i> • Tendrillar - <i>Smilax</i>	
3	VENATION • Reticulate: Pinnate (Unicostate) - <i>Ficus</i> Palmate (Multicostate): Convergent - <i>Zizyphus</i> Divergent - <i>Ricinus</i> • Parallel: Pinnate (Unicostate) - Banana Palmate (Multicostate): Convergent - Maize Divergent - Fan palm	
4	SIMPLE AND COMPOUND LEAVES • Simple Leaf- Shoe Flower • Compound Leaf- Pinnate: Unipinnate - Paripinnate - <i>Cassia</i> Imparipinnate - <i>Rosa</i> Bipinnate - <i>Caesalpinia</i> Tripinnate - <i>Moringa</i> Decompound - <i>Coriander</i> Palmate: Unifoliate - <i>Citrus</i>	

	Bifoliate - Balanites Trifoliate - Aegle Tetrafoliate - Marcelia Multifoliate (Digitate) – Bombax	
5	BRACTS ● Foliateous Bract - <i>Adhatoda vasica</i> ● Petaloid Bract - <i>Bougainvillea spectabilis</i> ● Spathe Bract - <i>Rhoeo</i> ● Involucre Bract - <i>Helianthus annuus</i> ● Epicalyx Bract - <i>Hibiscus rosa-sinensis</i>	
6	INFLORESCENCE ● Racemose: Raceme - <i>Caesalpinia</i> Spike - <i>Achyranthes</i> Umbel - Simple- onion, Compound- <i>coriander</i> Capitulum - Sunflower ● Cymose: Solitary - Terminal - <i>Datura</i> Axillary - Shoe Flower Monochasial Cyme (Helicoid - <i>Hamelia</i> & Scorpoid - <i>Heliotropium</i>) Dichasial Cyme - <i>Clerodendrum</i> Polychasial Cyme - <i>Calotropis</i> ● Special Inflorescence: Cyathium - <i>Euphorbia</i> Verticillaster - <i>Ocimum</i> Hypanthodium - <i>Ficus</i>	
7	KINDS OF FLOWER Flower: Actinomorphic Flower - Shoe Flower Zygomorphic Flower - Pes /Bean Trimarous Flower - <i>Crinum</i> Tetramarous Flower - Mustard Pentamarous Flower - Shoe Flower Hypogynous Flower - <i>Datura</i> Perigynous Flower - Rose Epigynous Flower - <i>Coccinia</i> Calyx: Polysepalous - Mustard Gamosepalous - <i>Datura</i> Corolla: Polypetalous - Mustard	

	Gamopetalous - <i>Datura</i> Perianth: <i>Crinum</i> Aestivation: Valvate - Calyx of <i>Datura</i> Twisted - Corolla of <i>Hibiscus</i> Imbricate - Corolla of <i>Caesalpinia</i> Quinquencial - Calyx of <i>Thevetia</i> Vexillary - <i>Butea</i> Androecium: Monodelphous Androecium - Shoe Flower Didelphous Androecium - Pea / Bean Polydelphous Androecium - <i>Bombax</i> / Lemon Adnate Anther - <i>Anona</i> Dorsifixed Anther - <i>Sesbania</i> Basifixed Anther - <i>Adhatoda</i> Sagittate Anther - <i>Thevetia</i> Versatile Anther - <i>Crinum</i> / Grass Gynoecium: Apocarpous ovary - Rose Syncarpous ovary - Shoe Flower Placentation: Marginal - Pea / Bean Parietal - <i>Argemone</i> Axile - Shoe Flower Free central - <i>Portulaca</i> Basal - Sunflower	
8	FRUITS ● Simple Fruits: Indehiscent - Caryopsis- Maize/ Wheat Samara- <i>Holoptelea</i> Dehiscent - Capsule- Loculicidal- Cotton Septicidal-<i>Aristolochia</i> Schizocarpic - Lomentum- <i>Acacia nilotica</i> Regma- <i>Ricinus</i> Fleshy Fruits - Drupe- Mango Berry- Tomato / Brinjal ● Aggregate Fruit- Etaerio of berry- <i>Anona squamosa</i> ● Composite Fruit- Sorosis - Pineapple / <i>Morus</i>	
9	Sacred and Magico-religious beliefs of following plants: ● Abrus, Khijado, Pipalo, Tal, Tulsi	
10	Medicinal importance of following plants: ● Calotropis, Aloe, <i>Datura</i>, Asparagus, Aegle	

Sr. No.	Practical Content Group B	Teaching Hours
1	Determination of pH of various soil.	60
2	Analysis for carbonates, nitrates and base deficiency from three soil samples by rapid field tests (0 to 5 scale).	
3	Comparison of water holding capacity of three soil samples.	
4	Determination of minimum size of quadrat and minimum number of quadrats for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).	
5	Quantitative analysis of herbaceous vegetation (any five) in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.	
6	Quantitative analysis of herbaceous vegetation (Any five) for density and abundance in the college campus.	
7	Ecological adaptations: Hydrophytes (Hydrilla stem / Eichornia petiole), Xerophytic (Nerium leaf / Capparis stem).	
8	Study of vegetative and floral characters of the following families (Habitat and Botanical Description, V.S. flower, section of ovary, floral diagram/s, floral formula and systematic position according to Bentham & Hooker's system of classification): ● Capparidaceae ● Cucurbitaceae ● Fabaceae ● Asteraceae ● Solanaceae ● Verbenaceae ● Euphorbiaceae ● Amaranthaceae ● Cyperaceae ● Poaceae	

Suggested Reading:

1. Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
2. Singh, J.S., Singh, S.P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
3. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
4. Wilkinson, D.M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A.
5. Kormondy, E.J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition.
6. Singh, (2012). Plant Systematics: Theory and Practice Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
7. Jeffrey, C. (1982). An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge.
8. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics-A Phylogenetic Approach. Sinauer Associates Inc., U.S.A. 2nd edition.
9. Maheshwari, J.K. (1963). Flora of Delhi. CSIR, New Delhi.
10. Radford, A.E. (1986). Fundamentals of Plant Systematics. Harper and Row, New York.

B. SC.- BOTANY PRACTICAL(MAJOR) - SEMESTER-V
PLANT STRUCTURE, USES, ECOLOGY AND CLASSIFICATION
(GROUP A AND GROUP B)

Date:

Time: 5 hrs.

Place:

Total Marks: 50

Instructions: Strictly follow the instructions given by examiner(s).

Q1. Describe morphology of given specimen (leaf or flower) in detail. 05

Q2. Give floral description, diagram formula, ovary section & systematic position. 05

Q3. Soil Analysis (Any One) 05

- a) pH determination
- b) Rapid field tests (carbonates, nitrates, base deficiency)
- c) Water holding capacity

Q4. Vegetation Study (Any One) 05

- a) Species-area curve (minimum size and number of quadrats)
- b) Frequency analysis (with Raunkiaer's comparison)
- c) Density and abundance

Q6. Spotting

- a) Identify and explain adaptations of **hydropyhtic** and **xerophytic** plant specimens. 06
- b) Identify and mention one key feature (Any 3 specimen): 06

Specimens from: Phyllotaxy, stipules, venation, leaf types, inflorescence, fruit types, etc.

Q7. Floral Family Study (Any two) 08

Complete description of flower from given family:

Habit, habitat, floral parts, V.S. ovary, floral diagram, floral formula, and systematic position.

Q8. a. Viva-voce 05

b. Journal 05

Course Level	5.5	Internal Marks	50
Programme	B.Sc. (Honors)	External Marks	50
Semester	5	Practical Internal	-
Course Type	Minor 4 (Theory)	Practical External	-
Course Credit	4T	Prac.Ext. Exam Time	
Teaching Hours	60	Total	100
Course Code		Exam Duration	02:00 Hrs.
Course Title	INSTRUMENTATION AND METHODOLOGY		

Course Objectives:

- To introduce students to the principles, design, and applications of key laboratory instruments.
- To familiarize students with essential biotechnological techniques and their real-world applications.
- To develop students' skills in conducting fieldwork and maintaining scientific documentation like herbarium and field reports.
- To strengthen students' understanding of basic statistical tools used for analyzing biological data.
- To encourage scientific thinking, precise observation, and data-driven report writing through practical and theoretical exposure.

Course Learning Outcomes: After completion of the course, the students will be able to:

- Explain the working principles, designs, and applications of major laboratory instruments like autoclave, incubator, and centrifuge.
- Demonstrate proficiency in performing key biotechniques such as PCR, chromatography, gel electrophoresis, and microtomy.
- Plan and conduct field studies using simple field equipment and prepare and maintain herbarium specimens effectively.
- Analyze biological data using statistical measures such as mean, median, mode, standard deviation, chi-square test, and variance.
- Write concise and structured laboratory and fieldwork reports by applying appropriate scientific methods.

Course Contents

Sem	Unit No.	Syllabus	Teaching Hours
5	1	INSTRUMENTATION Principle, design, procedure and application of following: 1.1 Laminar Air Flow 1.2 Autoclave 1.3 Incubator 1.4 Centrifuge 1.5 Oven	15

	2	BIOTECHNIQUES 2.1 PCR 2.2 Thin layer chromatography 2.3 Gel electrophoresis 2.4 DNA Sequencing 2.5 Microtomy	15
	3	FIELDWORK AND LABORATORY PRACTICES 3.1 Introduction to field work ● Importance of field studies ● Planning a field visit ● Simple field equipment and their uses (e.g. Quadrate, GPS, Sample bottles) 3.2 Herbarium ● Herbarium equipments ● Herbarium preparation and technique ● Herbarium storage, care and importance ● E- Herbarium 3.3 Introduction to Report Writing ● Writing short field reports or lab reports ● Simple structure: Introduction, Methods, Results, Conclusion	15
	4	BIOSTATISTICS 4.1 Measures of central tendency: Mean, Median and Mode 4.2 Standard Deviation 4.3 Chi-Square Test 4.4 Variance	15

Suggested Reading:

1. Arumugam, N. & Kumaresan, V. (2015). Biotechniques. 1st Edition, Saras Publication, India.
2. Ragland, A. & Kumare3san, V. (2010). Taxonomy of Angiosperms- Systematic Botany, economic Botany and Ethnobotany. Saras Publication, India.
3. Ramakrishnan, P. (2007). Biostatistics. Saras Publication, India.
4. Banerjee, P. K. (2008). Introduction to Biostatistics. S. Chand & Company Ltd., New Delhi, India.

Course Level	5.5	Internal Marks	-
Programme	B.Sc. (Honors)	External Marks	-
Semester	5	Practical Internal	50
Course Type	Minor 5 (Practical)	Practical External	50
Course Credit	4P	Prac.Ext. Exam Time	05:00 Hrs.
Teaching Hours	120	Total	100
Course Code		Exam Duration	5 hrs.
Course Title	INSTRUMENTATION AND METHODOLOGY		

Course Objectives:

- Understand the principles, design, procedure, and applications of laboratory instruments in biological analysis.
- Develop competency in statistical calculations, including central tendencies, standard deviation, chi-square tests, and variance for ecological data analysis.
- Gain proficiency in preparing herbarium specimens (both physical and electronic) using standard techniques.
- Acquire fieldwork skills through the use of simple field equipment for data collection and observation.
- Cultivate the ability to write clear, concise field reports based on data collected in the field and lab.

Course Learning Outcomes:

After completion of the course, the students will be able to:

- Utilize lab instruments effectively, including TLC and microtomy, for biological analysis.
- Apply statistical tools to analyze ecological data, including central tendencies, standard deviation, chi-square tests, and variance.
- Prepare and mount herbarium specimens using traditional and electronic techniques (E-herbarium).
- Conduct field surveys using basic equipment, collect data, and write detailed field reports.
- Operate simple field equipment effectively, enhancing data collection during ecological studies.

Pedagogy: Lectures / Use of Multimedia / Assignments / Hands-on experiments / Demonstrations / Group activities / Peer review.

Sr. No.	Practical Content	Teaching Hours
1	To study the principle, design, procedure and application of the instruments mentioned in theory.	60
2	To prepare the TLC slides and separate the given biological mixture.	
3	Microtomy: Block preparation, Sectioning, Staining methods.	
4	Calculation of central tendencies: Mean, Median and Mode (Minimum four exercises).	
5	Calculation of standard deviation (Minimum three exercises).	
6	Calculation of chi square test (Minimum three exercises).	
7	Calculation of Variance.	
8	Preparation of Five herbarium with techniques.	
9	Preparation of two E-herbarium.	
10	To write short field reports.	
11	To study simple field equipment.	

Suggested Reading:

1. Arumugam, N. & Kumaresan, V. (2015). Biotechniques. 1st Edition, Saras Publication, India.
2. Ragland, A. & Kumaresan, V. (2010). Taxonomy of Angiosperms- Systematic Botany, economic Botany and Ethnobotany. Saras Publication, India.
3. Ramakrishnan, P. (2007). Biostatistics. Saras Publication, India.
4. Banerjee, P. K. (2008). Introduction to Biostatistics. S. Chand & Company Ltd., New Delhi, India.

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Major/Minor
Syllabus of B.Sc. (Honors) as per NEP-2020
Faculty of Life Science
Effective from June 2025
Subject: Botany
SEMESTER- V

B. SC.- BOTANY PRACTICAL(MINOR) - SEMESTER-V
INSTRUMENTATION AND METHODOLOGY

Date:

Time: 5 hrs.

Place:

Total Marks: 50

Instructions: Strictly follow the instructions given by examiner(s).

- Q1. Write the principle, design, and application of one instrument provided (e.g., Laminar Air Flow, Centrifuge, Autoclave, Incubator, Oven). 05
- Q2. Prepare Thin Layer Chromatography slide and show the separation of the given biological sample. 05
- Q3. Demonstrate or describe block preparation, sectioning technique, and one staining method. 05
- Q4. Identify any two simple field instruments and write their use. 05
- Q5. Solve one exercise with full calculation and interpretation. (Mean/Median/Mode) 05
- Q6. Calculate and interpret results from one dataset. (Standard Deviation) 05
- Q7. Perform chi-square calculation from given data and interpret results. 05
- Q8. Display and explain preparation method of one physical or one E-herbarium. 03
- Q9. Write a short report on any one recent field visit with observation highlights. 02
- Q10. A. Viva Voce 05
B. Journal Submission 05

INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	25
2	Class Test	05
3	Open book exam/test	05
4	Open note exam/test	05
5	Self-test/ Online test	05
6	Essay/Article writing	05
7	Quizzes/Objective test	05
8	Class assignment	05
9	Home assignment	05
10	Reports Writing	05
11	Research/Dissertation	05
12	Case Studies	05
13	Viva/Oral exam	05
14	Group Discussion	05
15	Role Play	05
16	Paper presentation/Seminar	05
17	Language Lab work	05
18	Interview	05
19	Craft work	05
20	Co-curricular work	05
21	Field Assignment	05
22	Poster Presentation	05
23	Attendance	05
24	Project Work	05
	Total	50

Note: Sr.No.1 is mandatory. Select any five from Sr.No.2 to 24. Each Contains five marks. Student should secure 18 Marks for passing in internal Exam.

B. Sc. BOTANY: SEMESTER END EXAMINATION**FORMAT FOR QUESTIONS PAPER FOR 4 CREDITS COURSE IN BOTANY**

The university examination paper consists of four questions.

- First question is of 12 marks and will be from Unit – I.
- Second question is of 13 marks and will be from Unit – II.
- Third question is of 12 marks and will be from Unit – III.
- Fourth question is of 13 marks and will be from Unit – IV.

Name of subject: BOTANY		Paper code:
Name of paper:		
Total Hours: 02 hrs.		Total Marks: 50
Instructions: (1) This question paper contains four questions. (2) All questions are compulsory. (3) Figures at right side indicate the marks of question. (4) Illustrate your answer with labelled diagram.		
Q.1 (A)	Describe in detail:(any one) (1) (2)	08
Q.1 (B)	Write a short note on:(any one) (1) (2)	04
Q.2 (A)	Describe in detail:(any one) (1) (2)	09
Q.2 (B)	Write a short note on:(any one) (1) (2)	04
Q.3 (A)	Describe in detail:(any one) (1) (2)	08
Q.3 (B)	Write a short note on:(any one) (1) (2)	04
Q.4 (A)	Describe in detail:(any one) (1) (2)	09
Q.4 (B)	Write a short note on:(any one) (1) (2)	04