Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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# -: પરિપત્ર :-

યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૫–૨૬ થી અમલમાં આવનાર T. Y. B.Sc. Botany Sem.-5 & 6 Major અને Minor નો પેટાસમિતિ દ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમ સંદર્ભે વનસ્પતિશાસ્ત્ર વિષયની અભ્યાસ સમિતિની તા.૦૪/૦૪/૨૦૨૫ ની સભાના ઠરાવ ક્રમાંક:૦૨ થી કરેલ ભલામણ સ્વીકારી વિજ્ઞાન વિદ્યાશાખાની તા.૩૦/૦૪/૨૦૨૫ ની સભાનાં ઠરાવ ક્રમાંક: ૨૦ થી કરેલ ભલામણ સ્વીકારી એકેડેમિક કાઉન્સિલની તા.૦૫/૦૫/૨૦૨૫ની સભાનાં ઠરાવ ક્રમાંક:૮૭ થી મંજુર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણ: ઉપર મુજબ

ક્રમાંક:ઓથો./પરિપત્ર/સિલેબસ/૧૧૮૮૫/૨૦૨૫
તા.૨૬–૦૫–૨૦૨૫

કુલસચિવ

પ્રતિ,
૧) યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.
.....આપશ્રીની કોલેજના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સારૂ.
૨) ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સારૂ.

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Encl. 19

# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

# Undergraduate Programme
# In
# Botany

**[3 Years (Degree) & 4 Years (Honours/Honours with Research)]**

## Programme Outcome (PO):

**PO-01:** Scientific Knowledge & Conceptual Understanding: Develop a strong foundation in scientific principles, theories and concepts across disciplines, fostering interdisciplinary learning, advance knowledge and problem-solving abilities.

**PO-02:** Analytical & Critical Thinking: Apply critical thinking and analytical reasoning to evaluate scientific data, hypotheses and real-world problems, leading to evidence-based conclusions.

**PO-03:** Research & Inquiry-based Learning: Develop investigative skills through experimentation, data analysis and scientific inquiry to contribute to research and innovation.

**PO-04:** Laboratory & Technical Skills: Gain hands-on experience with laboratory techniques, instrumentation and computational tools relevant to scientific research and industry applications.

**PO-05:** Digital & Computational Literacy: Utilize digital tools, computational techniques and emerging technologies such as AI, bioinformatics and statistical modelling to enhance scientific learning and problem-solving.

**PO-06:** Environmental & Societal Responsibility: Understand the role of science in addressing environmental, health and societal challenges, promoting sustainability and ethical responsibility.

**PO-07:** Effective Communication & Collaboration: Develop proficiency in scientific communication, both written and oral, for effective dissemination of knowledge while collaborating in multidisciplinary teams.

**PO-08:** Innovation & Entrepreneurship: Foster an entrepreneurial mind-set by applying scientific knowledge for innovation, technology development, and industry-oriented applications. Develop sustainable solutions to address real-world challenges in research and environmental management.

**PO-09:** Lifelong Learning & Professional Growth: Cultivate curiosity and adaptability for continuous learning, equipping students for higher education, research, and professional careers.

**PO-10:** Ethical Leadership & Value-based Education: Develop leadership qualities, ethical values, and a sense of responsibility in applying science for societal progress, aligning with Indian knowledge systems and global perspectives.

## SEMESTER-V

## Programme Specific Outcome (PSO):

1. Remembering (Knowledge)

PSO1: Recall the fundamental concepts of plant physiological processes, biochemical pathways, and traditional ethnobotanical knowledge from ancient Indian systems

2. Understanding (Comprehension)

PSO2: Explain the mechanisms, regulations, and cultural significance of plant physiological, biochemical, and ethnobotanical processes in response to environmental and societal contexts

3. Applying (Application)

PSO3: Apply integrated knowledge of plant physiology, biochemistry, and ethnobotany to address practical challenges in agriculture, healthcare, and conservation.

4. Analyzing (Analysis)

PSO4: Analyze the interconnections among plant physiological responses, biochemical pathways, and traditional ethnobotanical practices, evaluating their impacts on sustainability and modern applications.

5. Evaluating (Synthesis)

PSO5: Evaluate experimental data, biotechnological applications, and the global relevance of integrating physiological, biochemical, and ethnobotanical knowledge for advancing science and conservation.

6. Creating (Evaluation)

PSO6: Design an experiment to study the combined effects of light intensity on photosynthesis and secondary metabolite production, while proposing a community-based project to document and conserve ethnobotanical practices for drought-tolerant medicinal plants.

## SEMESTER-VI

## Programme Specific Outcome (PSO):

1. Remembering (Knowledge)

PSO1: Recall key concepts of plant ecology, such as population characteristics, ecological succession, and biogeochemical cycles.

2. Understanding (Comprehension)

PSO2: Explain the philosophical foundations and basic principles of Ayurvedic herbology, such as taste, potency, and post-digestive effects.

3. Applying (Application)

PSO3: Prepare basic herbal formulations (e.g., decoctions, tinctures) following traditional methods and safety guidelines.

4. Analyzing (Analysis)

PSO4: Analyze the chemical composition of traditional herbal remedies and their alignment with modern pharmacological standards.

5. Evaluating (Synthesis)

PSO5: Evaluate the effectiveness of conservation strategies for protecting plant biodiversity and ecosystems

6. Creating (Evaluation)

PSO6: Design a field study to investigate plant community dynamics or propose a sustainable ecological restoration plan.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Under graduate Programme in Botany -Major

**Teaching & Evaluation Scheme Semester-V & VI**

[Academic Year of Implementation 2025-2026]

**Semester-V**

| Course Code | Course Title | Teaching Schedule Hours/Week | Exam Duration & Marks | | | Total Theory/Practical Marks | Credi |
|---|---|---|---|---|---|---|---|
| | | | Duration (Hours) | (CCE) Internal Marks | (SEE) External Marks | | |
| BO – MJ – 501 | PLANT PHYSIOLOGY | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP – MJ – 502 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |
| | | | **Total** | **50** | **50** | **100** | **4** |
| BO – MJ – 503 | PLANT BIOCHEMISTRY | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP– MJ – 504 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |
| | | | **Total** | **50** | **50** | **100** | **4** |
| BO – MJ – 505 | TRADITIONAL KNOWLEDGE IN ANCIENT INDIA WITH REFERENCE TO ETHNOBOTANY | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP – MJ – 506 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |
| | | | **Total** | **50** | **50** | **100** | **4** |

**Semester-VI**

| Course Code | Course Title | Teaching Schedule Hours/Week | Exam Duration & Marks | | | Total Theory/Practical Marks | Credit |
|---|---|---|---|---|---|---|---|
| | | | Duration (Hours) | (CCE) Internal Marks | (SEE) External Marks | | |
| BO – MJ – 601 | PLANT ECOLOGY | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP–MJ– 602 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |
| | | | **Total** | **50** | **50** | **100** | **4** |
| BO – MJ – 603 | ECONOMIC BOTANY AND PHARMACOGNOSY | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP–MJ– 604 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |
| | | | **Total** | **50** | **50** | **100** | **4** |
| BO – MJ – 605 | PRINCIPLES AND PRACTICES OF TRADITIONAL MEDICINE OF INDIA | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP-MJ-606 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Programme in Botany –Minor Elective

**Teaching & EvaluationScheme Semester-V & VI**

[Academic Year of Implementation 2025-2026]

| Course Code | Course Title | Teaching Schedule Hours/Week | Exam Duration & Marks | | | Total Theory/Practical Marks | Credi |
|---|---|---|---|---|---|---|---|
| | | | Duration (Hours) | (CCE) Internal Marks | (SEE) External Marks | | |
| BO – ME – 501 | PLANT PHYSIOLOGY | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP – ME – 502 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |
| | | | **Total** | **50** | **50** | **100** | **4** |
| BO – ME – 503 | PLANT BIOCHEMISTRY | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP– ME – 504 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |
| | | | **Total** | **50** | **50** | **100** | **4** |

**Semester-VI**

| Course Code | Course Title | Teaching Schedule Hours/Week | Exam Duration & Marks | | | Total Theory/Practical Marks | Credit |
|---|---|---|---|---|---|---|---|
| | | | Duration (Hours) | (CCE) Internal Marks | (SEE) External Marks | | |
| BO – ME – 601 | PLANT ECOLOGY | 2 | 1:00 | 25 | 25 | 50 | 2 |
| BOP – ME – 602 | Practical | 4 | 6:00 | 25 | 25 | 50 | 2 |
| | | | **Total** | **50** | **50** | **100** | **4** |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - V

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-MJ-501 (PLANT PHYSIOLOGY)

BOTANY (Major) PAPER – 501

| | |
|---|---|
| Course code | BO – MJ – 501 |
| Course title | Plant Physiology |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The Plant Physiology course in Botany aims to provide students with an understanding and knowledge of fundamental and advanced concepts in physiological process in plant like photosynthesis, respiration, plant water relation, plant metabolism etc. |
| Course outcomes | CO1: Helps students prepare for research in plant physiology, crop improvement, and stress physiology.<br>CO2: Provides essential knowledge for higher studies in botany, agriculture, biotechnology, and environmental science.<br>CO3: Knowledge of plant hormones aids in plant tissue culture, growth regulation, and disease management.<br>CO4: Knowledge of photosynthesis and respiration is crucial for industries related to biofuels, pharmaceuticals, and herbal medicine. |
| Mapping between COs with PSOs | |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | | |
| CO2 | ✓ | ✓ | ✓ | | | |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| | |
|---|---|
| Pre-requisite | Biology, Basic Botany, Basic Plant Physiology |

| BOT-MJ- 501 | PLANT PHYSIOLOGY | (2 Credits) 30 hours |
|---|---|---|
| Unit-1 | **Plant Water Relations and Mineral Nutrition** | 15 hours |
| | **Water Relations in Plants**<br>➢ Properties of water and its role in plant life<br>➢ Diffusion, osmosis, and water potential | 6 hours |

| | | |
|---|---|---|
| | ➢ Absorption of water: Mechanisms of water uptake (active & passive)<br>➢ (Passive- Osmosis theory, Apoplastic, Symplastic & Transmembrane pathways; Active – Ion pump theory using energy-dependent transport proteins)<br>➢ Transpiration: Types, significance, and factors affecting transpiration<br>➢ Mechanism of stomatal movement (Theories: Starch-sugar conversion theory, K+-Malate ion pump) | |
| | **Ascent of Sap and Translocation of Solutes**<br>➢ Theories of ascent of sap (Cohesion-Tension Theory, Root Pressure)<br>➢ Mechanism of phloem transport: Pressure Flow Hypothesis | 3 hours |
| | **Mineral Nutrition in Plants**<br>➢ Essential elements: Macro and micronutrients<br>➢ Functions and deficiency symptoms of essential nutrients<br>➢ Role of mycorrhiza in nutrient absorption | 6 hours |
| Unit-II | **Plant Metabolism and Growth Regulators** | 15 hours |
| | **Photosynthesis**<br>➢ Structure of chloroplast and photosynthetic pigments (Chlorophyll-a & b, carotene, xanthophyll)<br>➢ Light reaction (Z-scheme, photophosphorylation)<br>➢ Dark reaction (C3, C4, and CAM pathways)<br>➢ Photorespiration and its significance<br>➢ Factors affecting photosynthesis | 5 hours |
| | **Respiration in Plants**<br>➢ Aerobic and anaerobic respiration<br>➢ Glycolysis, TCA cycle, and Electron Transport Chain<br>➢ ATP synthesis (Chemiosmotic hypothesis) | 3 hours |
| | **Plant Growth and Development**<br>➢ Phases of growth and factors affecting growth<br>➢ Plant growth regulators (Auxins, Gibberellins, Cytokinins, Ethylene, ABA)<br>➢ Seed dormancy and germination<br>➢ Photoperiodism and Vernalization | 7 hours |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - V

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOTP-MJ-502 (PLANT PHYSIOLOGY)

BOTANY (Major) Practical – 502

| | |
|---|---|
| Course code | BOP – MJ – 502 |
| Course title | Practical in Plant Physiology |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 30 hrs. = 60 hrs. |
| Teaching per week | 04 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The Plant physiology Practical course in Botany aims to provide students with hands-on experience in analyzing the biochemical composition and metabolic processes in plants, focusing on techniques used in plant physiology. |
| Course outcome | • Demonstrate practical knowledge of physiological processes such as photosynthesis, respiration, transpiration, and osmosis in plants through hands-on experiments.<br>• Use laboratory instruments and techniques to study plant functions, including chromatography.<br>• Analyze and interpret experimental data to understand the impact of environmental conditions on plant physiological processes.<br>• Develop scientific observation, recording, and reporting skills relevant to plant physiology experiments. |

| BOTP-MJ-502 | PLANT PHYSIOLOGY | (2 Credits)<br>60 hours |
|---|---|---|
| 1. | To find out rate of photosynthesis by bubble counting method. | |
| 2. | To find out effect of $CO_2$ concentration on rate of Photosynthesis. | |
| 3. | To find out effect of light intensity on the rate of Photosynthesis. | |
| 4. | Separation of chlorophyll pigments by paper chromatography. | |
| 5. | Extraction, Isolation and estimation of Chlorophyll pigments. | |
| 6. | Study types of stomata from different plants (Dicotyledons & Monocotyledons) | |
| 7. | Study the opening and closing of stomata under different conditions (light, dark, and hormone treatments like ABA). | |

| | | |
|---|---|---|
| 8. | Study the rate of plasmolysis in different conditions using onion peel. | |
| 9. | Estimation of protein by burette method. | |
| 10. | To find out the isoelectric point of protein. | |
| 11. | To determine the water potential of plant tissue using potato tuber | |
| 12. | To determine the osmotic potential of vacuolar sap by the plasmolytic method. | |
| 13. | Demonstration of the stomatal and cuticular transpiration by four leaves method. | |
| 14. | To demonstrate anaerobic respiration. | |
| 15. | To demonstrate the process of fermentation using Kuhne's vessel. | |
| 16. | To demonstrate aerobic respiration. | |
| 17. | Demonstration of *Avena* or moong straight growth test. | |
| 18. | Demonstration of gibberellin activity by bioassay. | |
| 19. | Demonstration of cytokinin activity by bioassay. | |

**References:**


1. Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2018). Plant Physiology and Development (6th Edition) Publisher: Sinauer Associates.
2. Salisbury, F. B., & Ross, C. W. (1992). Plant Physiology (4th Edition). Publisher: Wadsworth Publishing.
3. Hopkins, W. G., & Hüner, N. P. A. (2008). Introduction to Plant Physiology (4th Edition). Publisher: John Wiley & Sons.
4. Bidwell, R. G. S. (1979). Plant Physiology. Publisher: Macmillan Publishing.
5. Devlin, R. M., & Witham, F. H. (1983). Plant Physiology. Publisher: CBS Publishers.
6. Noggle, G. R., & Fritz, G. J. (1976). Introductory Plant Physiology. Publisher: Prentice Hall.
7. Moore, T. C. (1989). Biochemistry and Physiology of Plant Hormones (2nd Edition), Publisher: Springer
8. Pandey, S. N., & Sinha, B. K. (2009). Plant Physiology (5th Edition). Publisher: Vikas Publishing House
9. Jain, V. K., (2017). Fundamentals of Plant Physiology. Publisher: S. Chand
10. A Text Book of Practical Botany Vol. II by Dr. Ashok Bendre Dr. Ashok Kumar

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - V

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-MJ-503 (PLANT BIOCHEMISTRY)

BOTANY (Major) PAPER – 503

| | |
|---|---|
| Course code | BO – MJ – 503 |
| Course title | Plant Biochemistry |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The Biochemistry course in Botany aims to provide students with an understanding of the molecular and biochemical processes in plants, focusing on metabolic pathways, and the role of biomolecules in physiological functions. |
| Course outcomes | CO1: Apply knowledge of carbohydrate and protein metabolism to understand energy flow in plants.<br>CO2: Understand the structure, properties and function of Carbohydrates and Protein.<br>CO3: Explain biosynthetic pathways and ecological roles of secondary metabolites in plant defense and communication.<br>CO4: Evaluate the pharmacological and industrial applications of plant secondary metabolites. |
| Mapping between COs with PSOs | |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO1** | ✓ | ✓ | ✓ | | | ✓ |
| **CO2** | ✓ | ✓ | ✓ | | | |
| **CO3** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **CO4** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| | |
|---|---|
| Pre-requisite | Biology, Basic Botany, Basic Biochemistry |

| **BOT-MJ-503** | PLANT BIOCHEMISTRY | **(2 Credits) 30 hours** |
|---|---|---|
| Unit-1 | **Macromolecules in Plants** | 15 hours |
| | ➢ Importance of biochemistry in plant life | 2 hours |
| | **Carbohydrates:** | 3 hours |

| | | |
|---|---|---|
| | ➢ Structure and classification (monosaccharides, disaccharides, polysaccharides);<br>➢ Role in energy storage (starch, cellulose) and structural functions | |
| | **Proteins:**<br>➢ Amino acid structure and protein synthesis<br>➢ Enzymes and their role in catalysis and regulation<br>➢ Enzyme kinetics and regulation (allosteric modulation, feedback inhibition)<br>➢ Role of coenzymes (NAD(P)H, ATP) in metabolic processes | 10 hours |
| Unit-II | **Secondary Metabolism and Macromolecular Interactions** | 15 hours |
| | **Secondary Metabolites and Plant Defense**<br>➢ Types of secondary metabolites (alkaloids, terpenoids, phenolic) and their biosynthetic pathways<br>➢ Function of secondary metabolites in defense, pigmentation, and signaling<br>➢ Interaction of primary and secondary metabolism in stress responses | |
| | **Macromolecular Interactions and Cellular Organization –**<br>➢ Structural organization of membranes: role of lipids and proteins in compartmentalization<br>➢ Protein-protein and protein-nucleic acid interactions in cellular regulation<br>➢ Integration of macromolecular synthesis with overall plant development and environmental adaptation | |

| | |
|---|---|
| | **VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**<br>SYLLABUS FOR B.Sc. SEMESTER - V<br>**FRAMED ACCORDING TO**<br>**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)<br>BOTP-MJ-504 (PLANT BIOCHEMISTRY)<br>BOTANY (Major) Practical – 504 |
| Course code | BOP – MJ – 504 |
| Course title | Practical in Plant Biochemistry |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 30 hrs. = 60 hrs. |
| Teaching per week | 04 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The purpose of the **Plant Biochemistry Practical Course** is to equip students with **hands-on laboratory skills** and a deep understanding of the **chemical processes and molecules** essential for plant life. This course complements theoretical knowledge with experimental work. |
| Course objective | • Demonstrate the ability to prepare and handle biochemical reagents and solutions used in plant biochemistry experiments.<br>• Apply various biochemical techniques to analyze plant metabolites such as carbohydrates, proteins, lipids, and pigments.<br>• Perform qualitative and quantitative estimation of key biomolecules in plant tissues.<br>• Develop skills in data collection, interpretation, and presentation of biochemical results.<br>• Relate practical findings to theoretical concepts in plant biochemistry for better understanding of metabolic processes. |

| BOTP – MJ 504 | PLANT BIOCHEMISTRY | (2 Credits) 60 hours |
|---|---|---|
| 1 | Quantitative Estimation of Total Carbohydrates (Reducing & non-reducing sugars) from plant samples. | |
| 2 | Extract and quantify total proteins from plant samples. | |
| 3 | Isolation and estimation of total lipid content using gravimetric analysis or colorimetric assay. | |
| 4 | Quantify total phenolic compounds in plant extracts by the Folin-Ciocalteu reagent assay and spectrophotometric measurement. | |
| 5 | Estimation of Amino Acids by Colorimetric Method. | |
| 6 | Separation of amino acids by paper chromatography. | |

| | | |
|---|---|---|
| 7 | To study the activity of the enzyme Urease and the factors affecting the activity. (Concentration and Time) | |
| 8 | Experiments on enzyme action:<br>Estimate the enzyme activity by the colorimetric method for Amylase | |
| 9 | Estimate the enzyme activity by the colorimetric method for Invertase | |
| 10 | Estimate the enzyme activity by the colorimetric method for Protease | |
| 11 | Determine the activity of Rubisco, the key enzyme in the Calvin cycle activity using spectrophotometric methods. | |
| 12 | Qualitative analysis from plant extracts for macromolecules.<br>a) Reducing sugar (Fehling's test, Benedict's test, Barfoed's test, Trommer's test, Moore's test)<br>b) Non-reducing sugar (Fehling's test, Benedict's test)<br>c) Proteins (Biuret test)<br>Amino acids (Ninhydrin test, Test for Tyrosine, Test for Tryptophan, Test for Cysteine) | |
| 13 | Qualitative test from plant extracts for secondary metabolites<br>a) Alkaloids, Saponins<br>b) Glycosides/cardiac glycoside<br>Flavonoids, Phenols, Tannins | |
| 14 | Separations of secondary metabolites from medicinal plant extract by paper chromatography / thin layer chromatography and visualizing bands under UV light or after staining. | |
| 15 | Quantitative estimation of alkaloids from plant extract. | |
| 16 | Quantitative estimation of Saponins from different plant extracts. | |
| 17 | Isolate genomic DNA from plant samples and assess purity and yield by quantification using spectrophotometry (A260/A280 ratios). | |
| 18 | Demonstration of separating and visualizing proteins based on their molecular weight using SDS-PAGE Analysis. | |
| 19 | HPLC analysis of flavonoids, alkaloids, or phenolic compounds (demonstration or hands-on). | |

**References:**


1. Taiz, L., Zeiger, E., Moller, I. M., & Murphy, A. Plant Physiology and Development (6th Edition)
2. Lichtenthaler, H.K. & Buschmann, C. (2001) Growth and Physiological Attributes of Tomato (Lycopersicon esculentum Mill.) Genotypes as Affected by NaCl Stress Plant Biochemistry.

3. H. Hans-Walter., B. Piechulla., (2010), Plant Biochemistry (4th Edition), Elsevier Science
4. S. K. Verma., M. Verma., (1995), A Textbook Of Plant Physiology & Biochemistry (4th Edition), S Chand.
5. R. Katoch., Fundamentals Of Plant Biochemistry And Biotechnology., Kalyani Publishers
6. S. J. Guleria. Fundamentals of Plant Biochemistry and Biotechnology. Atlantic Publishers & Distributors (P) Ltd

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - V

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-MJ-505 (TRADITIONAL KNOWLEDGE IN ANCIENT INDIA WITH REFERENCE TO ETHNOBOTANY)

BOTANY (Major) PAPER – 505

| | |
|---|---|
| Course code | BO – MJ – 505 |
| Course title | TRADITIONAL KNOWLEDGE IN ANCIENT INDIA WITH REFERENCE TO ETHNOBOTANY |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The purpose of this course is to introduce students to the rich legacy of traditional knowledge systems in ancient India, with a special focus on ethnobotany—the study of the relationship between people and plants. |
| Course outcomes | CO1: Explain the fundamental concepts of ethnobotany and its significance in ancient Indian knowledge systems.<br>CO2: Identify key medicinal, agricultural, and ritualistic plants mentioned in ancient Indian texts and their uses<br>CO3: Analyze the scientific basis of traditional plant-based remedies and compare them with modern botanical studies.<br>CO4: Discuss the socio-cultural and ecological importance of ethnobotanical practices in ancient India. |

Mapping between COs with PSOs

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO1** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **CO2** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **CO3** | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **CO4** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| | |
|---|---|
| Pre-requisite | Biology, Basic Botany, Basic Ethno-Botany and Basic Ayurved |

| | | |
|---|---|---|
| BOT-MJ--505 | TRADITIONAL KNOWLEDGE IN ANCIENT INDIA WITH REFERENCE TO ETHNOBOTANY | (2 Credits)<br>30 hours |
| | | |
| UNIT I | **Foundations of Ethno-Botany and Traditional Knowledge in India**<br><br>**1. Introduction to Ethno-Botany**<br><br>• Definition, scope, and interdisciplinary importance. | 15 Hours |

| | | |
|---|---|---|
| | • Relationship between plants, culture, and indigenous knowledge systems.<br><br>**2. Traditional Medicine Systems of India**<br><br>• **Ayurveda & Siddha:** Principles, historical context, and key texts.<br>• Concept of **Oushadhi** (Medicinal Plants) in Ayurveda.<br><br>**3. Ancient Scholars and Their Contributions**<br><br>• **Charaka, Sushruta, Vagbhata, Dhanwantari:** Works on plant-based medicine. | |
| | | |
| UNIT II | **<u>Sacred Plant parts in Rituals and indigenous wisdom</u>**<br><br>• **1. Sacred Flowers**:<br>  ○ Aparajita (Shankhpushpi), Lotus, Marigold, Hibiscus.<br>• **2. Sacred Leaves**:<br>  ○ Tulsi, Belpatra, Banana, Durva, Kusha (Darbha), Ashoka and Asopalav.<br>• **3. Indigenous Communities**<br><br>  • Role of tribal/rural communities in preserving plant knowledge.<br>  • Case studies of traditional healing practices.<br>  • Erosion of indigenous knowledge systems<br><br>**4. Basic Herbal drug preparation**<br><br>  • Definition, Method, Uses, comparison Table of Herbal Preparations<br><br>1. Swarasa (Fresh Juice), 2.Kalka (Paste), 3.Kwatha (Decoction,4. Churna (Powder), 5.Avaleha/Leha (Herbal Jam- Chyawanprash), 6.Vati/Gutika (Tablets/Pills), 7.Asava-Arishta (Fermented Liquids). | 15 Hours |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - VI

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOTP-MJ-506 (TRADITIONAL KNOWLEDGE IN ANCIENT INDIA WITH REFERENCE TO ETHNOBOTANY)

BOTANY (Major) PRACTICAL – 506

| | |
|---|---|
| Course code | BOP – MJ – 506 |
| Course title | Practical in TRADITIONAL KNOWLEDGE IN ANCIENT INDIA WITH REFERENCE TO ETHNOBOTANY |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 30 hrs. = 60 hrs. |
| Teaching per week | 04 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The purpose of this practical course is to provide undergraduate students with hands-on exposure to the traditional knowledge systems of ancient India, specifically in relation to ethnobotany—the study of how plants are used in various cultural, medicinal, and ecological contexts. Through field visits, specimen collection, documentation, and interaction with local communities |
| Course objective | **CO:1** Students will recall and list the names of ethnobotanical plants, sacred plants, and kitchen spices along with their traditional uses.<br>**CO:2** They will explain the ecological and cultural significance of sacred plants, as well as the medicinal properties of herbs and spices in both traditional and modern contexts.<br>**CO:3** Learners will prepare herbarium specimens, herbal formulations (malam, juice, decoctions, oils, etc.), and document traditional remedies by interacting with healers.<br>**CO:4** They will compare traditional remedies with modern scientific knowledge and examine plant anatomical structures under a microscope. |

| | | |
|---|---|---|
| BOTP-MJ-506 | TRADITIONAL KNOWLEDGE IN ANCIENT INDIA WITH REFERENCE TO ETHNOBOTANY | (2 Credits) 30 hours |
| | | |
| | **1. Field Surveys & Plant Collection**<br>• **Activity:** Visit local forests, tribal areas, or home gardens to document ethnobotanical plants.<br>• **Task:** Prepare a herbarium of 20 medicinal plants with their uses.<br>**2. Sacred Plant Documentation** | |

- **Activity:** Visit temples/sacred groves and document ritually significant plants.
- **Task:** Prepare a report on their ecological and cultural importance

**3. Microscopic Study of Medicinal Plants**

- **Activity:** Observe leaf/stem sections under a microscope (Tulsi, Aloe vera, Adulsa).
- **Task:** Draw and label anatomical features.

**4. Kitchen Ethnobotany**

- **Activity:** Identify common kitchen spices with medicinal value
- **Task:** Prepare a chart of their uses in traditional and modern medicine.

1.(Turmeric (Haldi) – *Curcuma longa,*Cumin ,2.Jeera – *Cuminum cyminum,* 3. Coriander Seeds (Dhaniya) – *Coriandrum sativu,* 4.Mustard Seeds (Rai/Sarson) – *Brassica nigra,* 5.Fenugreek Seeds (Methi) – *Trigonella foenum-graecum,* 6. Fennel Seeds (Saunf) – *Foeniculum vulgare,*

**5. Kitchen Ethnobotany**

- **Activity:** Identify common kitchen spices with medicinal value
- **Task:** Prepare a chart of their uses in traditional and modern medicine.

1.Cardamom (Elaichi) – *Elettaria cardamomum,* 2.Cloves (Laung) – *Syzygium aromaticum,* 3.Cinnamon (Dalchini) – *Cinnamomum verum,* 4.Black Pepper (Kali Mirch) – *Piper nigrum,* 5.Asafoetida (Hing) – *Ferula assa-foetida,*6. Nigella Seeds (Kalonji) – *Nigella sativa,*7.Bay Leaf (Tej Patta) – *Cinnamomum tamala*

**6.Preparation of Traditional Herbal Malam**

- Nirgundi Leaf & Castor Oil Malam

**7. Preparation of Herbal Giloy Juice**

**8. Basic Ayurvedic herbal preparations**

- Swarasa (Fresh Juice), Kalka (Paste), Kwatha (Decoction)

**9. Basic Ayurvedic herbal preparations**

- Hima (Cold Infusion), Phanta (Hot Infusion), Churna (Powder)

**10. Basic Ayurvedic herbal preparations of Brahmi Taila (Medicated Oil).**

**11. Basic Ayurvedic herbal preparations of Ghrita (Medicated Ghee),**

**12. Basic Ayurvedic herbal preparations Avaleha/Leha Chyawanprash - (Herbal Jam)**

| | | |
|---|---|---|
| | **13.Preparation of traditional herbal Vati/(Tablet).**<br><br>**14.Preparation of traditional herbal Gutika( Pills).**<br><br>**15. Making traditional Asava-Arishta (Fermented Liquids).**<br><br>**16. Interviews with Traditional Healers**<br><br>• **Activity:** Interact with local *Vaidya's* (Ayurvedic practitioners) or tribal healers.<br>• **Task:** Record 10 traditional remedies and compare them with modern science, and submit document file with photos at department.<br><br>**17.Preparation of Herbal traditional medicine.**<br><br>**Activity: Write preparation method and its medicinal important in jornal.**<br><br>**Task:** Prepare and submit a anyone traditional herbal medicine to a properly labelled medicine name, ingredients, date, in small bottle/zip lock pouch. | |

**References:**


1. Jain, S.K. (1991). *Dictionary of Indian Folk Medicine and Ethno-Botany*. Deep Publications.
2. Cotton, C.M. (1996). *Ethno-Botany: Principles and Applications*. Wiley.
3. Schultes, R.E., & von Reis, S. (Eds.). (1995). *Ethno-Botany: Evolution of a Discipline*. Timber Press.
4. Sharma, P.V. (1992). *History of Medicine in India*. Indian National Science Academy.
5. Valiathan, M.S. (2003). *The Legacy of Caraka*. Orient Longman.
6. Kiritikar, K.R., & Basu, B.D. (1935). *Indian Medicinal Plants* (4 Vols.). Bishen Singh Mahendra Pal Singh.
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8. Bhishagratna, K.L. (Trans.). (2005). *Sushruta Samhita*. Chowkhamba Sanskrit Series.
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12. Gadgil, M., & Berkes, F. (1991). *Traditional Resource Management Systems*. Resource Management and Optimization.
13. Sinha, R.K. (1996). *Ethno-Botany: The Renaissance of Traditional Herbal Medicine*. INA Shree Publishers
14. Shiva, V. (1996). *Biopiracy: The Plunder of Nature and Knowledge*. South End Press.

15. Berkes, F. (2012). *Sacred Ecology* (3rd Ed.). Routledge.
16. Mukherjee, P.K. (2002). *Quality Control of Herbal Drugs*. Business Horizons.
17. Kokate, C.K., Purohit, A.P., & Gokhale, S.B. (2017). *Pharmacognosy* (57th Ed.). Nirali Prakashan.
18. Government of India Publications:
19. *The Ayurvedic Pharmacopoeia of India* (API).
20. *Indian Herbal Pharmacopoeia* (IHPA).

Additional Resources:

21. Journal of Ethno-Pharmacology (Elsevier).
22. Indian Journal of Traditional Knowledge (IJTK) (CSIR-NIScPR).
23. Ministry of AYUSH (Govt. of India) – Official guidelines on herbal formulations.

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - V

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-ME-501 (PLANT PHYSIOLOGY)

BOTANY (Minor) PAPER – 501

| | |
|---|---|
| Course code | BO – ME – 501 |
| Course title | Plant Physiology |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The Plant Physiology course in Botany aims to provide students with an understanding and knowledge of fundamental and advanced concepts in physiological process in plant like photosynthesis, respiration, plant water relation, plant metabolism etc. |
| Course outcomes | CO1: Helps students prepare for research in plant physiology, crop improvement, and stress physiology.<br>CO2: Provides essential knowledge for higher studies in botany, agriculture, biotechnology, and environmental science.<br>CO3: Knowledge of plant hormones aids in plant tissue culture, growth regulation, and disease management.<br>CO4: Knowledge of photosynthesis and respiration is crucial for industries related to biofuels, pharmaceuticals, and herbal medicine. |
| Mapping between COs with PSOs | |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | | |
| CO2 | ✓ | ✓ | ✓ | | | |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| | |
|---|---|
| Pre-requisite | Biology, Basic Botany, Basic Plant Physiology |

| BOT-ME- 501 | PLANT PHYSIOLOGY | (2 Credits) 30 hours |
|---|---|---|
| Unit-1 | **Plant Water Relations and Mineral Nutrition** | 15 hours |
| | **Water Relations in Plants**<br>➢ Properties of water and its role in plant life<br>➢ Diffusion, osmosis, and water potential | 6 hours |

| | | |
|---|---|---|
| | ➢ Absorption of water: Mechanisms of water uptake (active & passive)<br>➢ (Passive- Osmosis theory, Apoplastic, Symplastic & Transmembrane pathways; Active – Ion pump theory using energy-dependent transport proteins)<br>➢ Transpiration: Types, significance, and factors affecting transpiration<br>➢ Mechanism of stomatal movement (Theories: Starch-sugar conversion theory, K+-Malate ion pump) | |
| | **Ascent of Sap and Translocation of Solutes**<br>➢ Theories of ascent of sap (Cohesion-Tension Theory, Root Pressure)<br>➢ Mechanism of phloem transport: Pressure Flow Hypothesis | 3 hours |
| | **Mineral Nutrition in Plants**<br>➢ Essential elements: Macro and micronutrients<br>➢ Functions and deficiency symptoms of essential nutrients<br>➢ Role of mycorrhiza in nutrient absorption | 6 hours |
| Unit-II | **Plant Metabolism and Growth Regulators** | 15 hours |
| | **Photosynthesis**<br>➢ Structure of chloroplast and photosynthetic pigments (Chlorophyll-a & b, carotene, xanthophyll)<br>➢ Light reaction (Z-scheme, photophosphorylation)<br>➢ Dark reaction (C3, C4, and CAM pathways)<br>➢ Photorespiration and its significance<br>➢ Factors affecting photosynthesis | 5 hours |
| | **Respiration in Plants**<br>➢ Aerobic and anaerobic respiration<br>➢ Glycolysis, TCA cycle, and Electron Transport Chain<br>➢ ATP synthesis (Chemiosmosis hypothesis) | 3 hours |
| | **Plant Growth and Development**<br>➢ Phases of growth and factors affecting growth<br>➢ Plant growth regulators (Auxins, Gibberellins, Cytokinins, Ethylene, ABA)<br>➢ Seed dormancy and germination<br>➢ Photoperiodism and Vernalization | 7 hours |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - V

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOTP-ME-502 (PLANT PHYSIOLOGY)

BOTANY (Minor) Practical – 502

| | |
|---|---|
| Course code | BOP – ME– 502 |
| Course title | Practical in Plant Physiology |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 30 hrs. = 60 hrs. |
| Teaching per week | 04 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The Plant physiology Practical course in Botany aims to provide students with hands-on experience in analyzing the biochemical composition and metabolic processes in plants, focusing on techniques used in plant physiology. |
| Course outcome | • Demonstrate practical knowledge of physiological processes such as photosynthesis, respiration, transpiration, and osmosis in plants through hands-on experiments.<br>• Use laboratory instruments and techniques to study plant functions, including chromatography.<br>• Analyze and interpret experimental data to understand the impact of environmental conditions on plant physiological processes.<br>• Develop scientific observation, recording, and reporting skills relevant to plant physiology experiments. |

| BOTP-ME-502 | PLANT PHYSIOLOGY | (2 Credits)<br>60 hours |
|---|---|---|
| | | |
| 1. | To find out rate of photosynthesis by bubble counting method. | |
| 2. | To find out effect of co2 concentration on rate of Photosynthesis. | |
| 3. | To find out effect of light intensity on the rate of Photosynthesis. | |
| 4. | Separation of chlorophyll pigments by paper chromatography. | |
| 5. | Extraction, Isolation and estimation of Chlorophyll pigments. | |
| 6. | Study types of stomata from different plants (Dicotyledons & Monocotyledons) | |

| | | |
|---|---|---|
| 7. | Study the opening and closing of stomata under different conditions (light, dark, and hormone treatments like ABA). | |
| 8. | Study the rate of plasmolysis in different conditions using onion peel. | |
| 9. | To determine the water potential of plant tissue using potato tuber | |
| 10. | To determine the osmotic potential of vacuolar sap by the plasmolytic method. | |
| 11. | Demonstration of the stomatal and cuticular transpiration by four leaves method. | |
| 12. | To demonstrate anaerobic respiration. | |
| 13. | To demonstrate the process of fermentation using Kuhne's vessel. | |
| 14. | To demonstrate aerobic respiration. | |
| 15. | Demonstration of *Avena* or moong straight growth test. | |
| 16. | Demonstration of gibberellin activity by bioassay. | |
| 17. | Demonstration of cytokinin activity by bioassay. | |

**References:**


1. Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2018). Plant Physiology and Development (6th Edition) Publisher: Sinauer Associates.
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9. Jain, V. K., (2017). Fundamentals Of Plant Physiology. Publisher: S. Chand
10. A Text Book of Practical Botany Vol. II by Dr. Ashok Bendre Dr. Ashok Kumar


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**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - V

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-ME-503 (PLANT BIOCHEMISTRY)

BOTANY (Minor) PAPER – 503

| | |
|---|---|
| Course code | BO – ME – 503 |
| Course title | Plant Biochemistry |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The Biochemistry course in Botany aims to provide students with an understanding of the molecular and biochemical processes in plants, focusing on metabolic pathways, enzymes, and the role of biomolecules in physiological functions. |
| Course outcomes | CO1: Apply knowledge of carbohydrate and protein metabolism to understand energy flow in plants.<br>CO2: Understand the structure, properties and function of Carbohydrates and Protein.<br>CO3: Explain biosynthetic pathways and ecological roles of secondary metabolites in plant defense and communication.<br>CO4: Evaluate the pharmacological and industrial applications of plant secondary metabolites. |
| Mapping between COs with PSOs | |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO1** | ✓ | ✓ | ✓ | | | ✓ |
| **CO2** | ✓ | ✓ | ✓ | | | |
| **CO3** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **CO4** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| | |
|---|---|
| Pre-requisite | Biology, Basic Botany, Basic Biochemistry |

| **BOT-ME-503** | PLANT BIOCHEMISTRY | **(2 Credits) 30 hours** |
|---|---|---|
| Unit-1 | **Macromolecules in Plants** | 15 hours |
| | ➢ Importance of biochemistry in plant life | 2 hours |
| | **Carbohydrates:** | 3 hours |

| | | |
|---|---|---|
| | ➢ Structure and classification (monosaccharides, disaccharides, polysaccharides);<br>➢ Role in energy storage (starch, cellulose) and structural functions | |
| | **Proteins:**<br>➢ Amino acid structure and protein synthesis<br>➢ Enzymes and their role in catalysis and regulation<br>➢ Enzyme kinetics and regulation (allosteric modulation, feedback inhibition)<br>➢ Role of coenzymes (NAD(P)H, ATP) in metabolic processes | 10 hours |
| Unit-II | **Secondary Metabolism and Macromolecular Interactions** | 15 hours |
| | **Secondary Metabolites and Plant Defense**<br>➢ Types of secondary metabolites (alkaloids, terpenoids, phenolics) and their biosynthetic pathways<br>➢ Function of secondary metabolites in defense, pigmentation, and signaling<br>➢ Interaction of primary and secondary metabolism in stress responses | |
| | **Macromolecular Interactions and Cellular Organization –**<br>➢ Structural organization of membranes: role of lipids and proteins in compartmentalization<br>➢ Protein-protein and protein-nucleic acid interactions in cellular regulation<br>➢ Integration of macromolecular synthesis with overall plant development and environmental adaptation | |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - V

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOTP-ME-504 (PLANT BIOCHEMISTRY)

BOTANY (Minor) Practical – 504

| | |
|---|---|
| Course code | BOP – ME – 504 |
| Course title | Practical in Plant Biochemistry |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 30 hrs. = 60 hrs. |
| Teaching per week | 04 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The purpose of the **Plant Biochemistry Practical Course** is to equip students with **hands-on laboratory skills** and a deep understanding of the **chemical processes and molecules** essential for plant life. This course complements theoretical knowledge with experimental work. |
| Course objective | • Demonstrate the ability to prepare and handle biochemical reagents and solutions used in plant biochemistry experiments.<br>• Apply various biochemical techniques to analyze plant metabolites such as carbohydrates, proteins, lipids, and pigments.<br>• Perform qualitative and quantitative estimation of key biomolecules in plant tissues.<br>• Develop skills in data collection, interpretation, and presentation of biochemical results.<br>• Relate practical findings to theoretical concepts in plant biochemistry for better understanding of metabolic processes. |

| BOTP – ME 504 | PLANT BIOCHEMISTRY | (2 Credits) 60 hours |
|---|---|---|
| 1 | Quantitative Estimation of Total Carbohydrates (Reducing & non-reducing sugars) from plant samples. | |
| 2 | Extract and quantify total proteins from plant samples. | |
| 3 | Isolation and estimation of total lipid content using gravimetric analysis or colorimetric assay. | |
| 4 | Quantify total phenolic compounds in plant extracts by the Folin-Ciocalteu reagent assay and spectrophotometric measurement. | |
| 5 | Estimation of Amino Acids by Colorimetric Method. | |
| 6 | Separation of amino acids by paper chromatography. | |

| | | |
|---|---|---|
| 7 | To study the activity of the enzyme Urease and the factors affecting the activity. (Concentration and Time) | |
| 8 | Experiments on enzyme action:<br>Estimate the enzyme activity by the colorimetric method for Amylase | |
| 9 | Estimate the enzyme activity by the colorimetric method for Invertase | |
| 10 | Estimate the enzyme activity by the colorimetric method for Protease | |
| 11 | Determine the activity of Rubisco, the key enzyme in the Calvin cycle activity using spectrophotometric methods. | |
| 12 | Qualitative analysis from plant extracts for macromolecules.<br>d) Reducing sugar (Fehling's test, Benedict's test, Barfoed's test, Trommer's test, Moore's test)<br>e) Non-reducing sugar (Fehling's test, Benedict's test)<br>f) Proteins (Biuret test)<br>Amino acids (Ninhydrin test, Test for Tyrosine, Test for Tryptophan, Test for Cysteine) | |
| 13 | Qualitative test from plant extracts for secondary metabolites<br>c) Alkaloids, Saponins<br>d) Glycosides/cardiac glycoside<br>Flavonoids, Phenols, Tannins | |
| 14 | Separations of secondary metabolites from medicinal plant extract by paper chromatography / thin layer chromatography and visualizing bands under UV light or after staining. | |
| 15 | Quantitative estimation of alkaloids from plant extract. | |
| 16 | Quantitative estimation of Saponins from different plant extracts. | |
| 17 | Isolate genomic DNA from plant samples and assess purity and yield by quantification using spectrophotometry (A260/A280 ratios). | |
| 18 | Demonstration of separating and visualizing proteins based on their molecular weight using SDS-PAGE Analysis. | |
| 19 | HPLC analysis of flavonoids, alkaloids, or phenolic compounds (demonstration or hands-on). | |

**References:**


1. Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. Plant Physiology and Development (6th Edition)
2. Lichtenthaler, H.K. & Buschmann, C. (2001) Growth and Physiological Attributes of Tomato (Lycopersicon esculentum Mill.) Genotypes as Affected by NaCl Stress Plant Biochemistry.
3. H. Hans-Walter., B. Piechulla., (2010). Plant Biochemistry (4th Edition). Elsevier Science

4. S. K. Verma., M. Verma., (1995), A Textbook Of Plant Physiology & Biochemistry (4th Edition), S Chand.
5. R. Katoch., Fundamentals Of Plant Biochemistry And Biotechnology., Kalyani Publishers
6. S. J. Guleria. Fundamentals of Plant Biochemistry and Biotechnology. Atlantic Publishers & Distributors (P) Ltd

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - VI

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-MJ-601 (PLANT ECOLOGY)

BOTANY (Major) PAPER – 601

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| | |
|---|---|
| Course code | BO – MJ – 601 |
| Course title | PLANT ECOLOGY |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The Plant Ecology course introduces undergraduates to the interactions between plants and their environments. It explores plant adaptations, ecosystem dynamics, and biodiversity conservation. The course aims to foster understanding of ecological principles and their application to real-world environmental challenges. |
| **Course Outcomes** | CO1: Understand the fundamental principles of plant ecology, including energy flow, nutrient cycling, and plant-environment interactions.<br>CO2: Analyze the structure and function of plant communities and ecosystems across different biomes.<br>CO3: Evaluate ecological processes such as succession, competition, and adaptation in plant populations.<br>CO4: Apply ecological methods to study vegetation, assess biodiversity, and measure environmental variables. |

Mapping between COs with PSOs

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO1** | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **CO2** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **CO3** | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **CO4** | ✓ | ✓ | ✓ | ✓ | | ✓ |

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|---|---|---|
| BOT-MJ-601 | **PLANT ECOLOGY** | (2 Credits)<br>30 hours |
| **UNIT I** | **Basic concepts of ecology** | 15 Hours |

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| | **Climatic and topographic factor (in relation to plants)**: Light, temperature, atmosphere, precipitation and humidity, Thermal and light stratification of lakes<br>**Edaphic factors**: Formation and composition of soil (soil texture, soil water, soil organic matter/ humus), Soil profile<br>**Biotic interactions**: Symbiosis, protocooperation, commensalism, ammensalism, parasitism, predation and competition<br>**Community ecology**: Concept of community, Characteristics of community (Analytical- qualitative and quantitative characters and Synthetic), Raunkier's life form (Phanerophytes, Chamaephytes, Hemicryptophytes, Cryptophytes and Therophytes), Methods of studying vegetation | |
| | | |
| **UNIT II** | **Ecosystem and vegetation ecology**<br>**Ecosystem concept**: Biotic and abiotic components of ecosystem, Energy flow models, Ecological pyramids (pyramid of number, pyramid of biomass, pyramid of energy), Food chain (grazing, detritus, parasitic) and Food web, Ecological niche<br>**Ecological succession**: Succession and its types, Process of succession, Hydrosere and Xerosere<br>**Biomes and Vegetation (with special reference to Gujarat)**:<br>Major biomes of the world, Phytogeographical zones of India, Desert vegetation of Gujarat, Coastal vegetation of Gujarat, Forest vegetation of Gujarat, Endangered plants of Gujarat<br>**Ecological adaptations in hydrophytes and xerophytes**: morphological and anatomical characters | 15 Hours |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - VI

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOTP-MJ-602 (PLANT ECOLOGY)

BOTANY (Major) PRACTICAL – 602

| | |
|---|---|
| Course code | BOP – MJ – 602 |
| Course title | PLANT ECOLOGY |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 30 hrs. = 60 hrs. |
| Teaching per week | 04 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | Understand plant interactions with environments for conservation and restoration<br>Apply ecological principles to sustainable agriculture and land management.<br>Analyze plant adaptations to address climate change and biodiversity loss. |
| **Course Outcomes** | CO:1 Explain how plant adaptations influence ecosystem dynamics for sustainable land use.<br>CO:2 Implement field techniques to assess plant biodiversity and monitor ecological health.<br>CO:3 Evaluate the impact of climate change on plant communities to propose mitigation strategies.<br>CO:4 Critique restoration plans based on ecological principles to ensure long-term viability.<br>CO:5 Design adaptive management plans integrating plant ecology to address environmental challenges. |

| BOTP-MJ-602 | PLANT ECOLOGY | (2 Credits) 30 hours |
|---|---|---|
| 1 | To determine frequency, density and abundance of various species using quadrat method. | |
| 2 | To study biotic components of pond ecosystem | |
| 3 | To determine soil texture of any given soil sample | |
| 4 | To determine moisture percentage of given soil sample | |
| 5 | To determine water holding capacity of given soil sample | |
| 6 | To determine the pH of given soil sample | |
| 7 | To determine organic carbon in soil by Walkley and Black rapid titration method | |

| | | |
|---|---|---|
| 8 | To determine total dissolved solids in given water sample | |
| 9 | To determine the amount of chloride in given water sample | |
| 10 | To determine total hardness of given water sample | |
| 11 | To determine the amount of calcium in given water sample | |
| 12 | To determine the amount of magnesium in given water sample | |
| 13 | To determine alkalinity of given water sample | |
| 14 | To determine dissolved oxygen in water sample | |
| 15 | To study of ecological instruments –<br>a) Maximum and minimum thermometer<br>b) Wet and dry bulb thermometer<br>c) Soil thermometer<br>d) Secchi disc<br>e) Lux meter<br>f) Psychometer<br>g) Rainguage<br>h) Anemometer<br>i) Hygrothermometer | |
| 16 | To study ecological adaptation of hydrophyte (a) stem of *Hydrilla* (b) petiole of *Eichornia* | |
| 17 | To study ecological adaptation of xerophyte (a) stem of *Capparis* (b) stem of *Casuarina* (c) leaf of *Nerium* | |

**References:**


1. "Marine Ecology: Processes, Systems, and Impacts" by Michel J. Kaiser, et al.
2. "Island Biogeography: Ecology, Evolution, and Conservation" by Robert J. Whittaker and José Jesús Fernández-Palacios
3. A text book of Plant Ecology R.S. Ambasht 1st Edi. 1969 Students friends & co., Varanasi
4. Fundamentals of Ecology by E P Odum and G W Barrett. Thompson Asia Pvt Ltd. Singapore
5. "Ecology: Concepts and Applications" by Manuel C. Molles
6. "Principles of Ecology" by Eugene P. Odum
7. "Fundamentals of Ecology" by Eugene P. Odum and Gary W. Barrett
8. Ecology: From Individuals to Ecosystems" by Michael Begon, Colin R. Townsend, and John L. Harper

9. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition

10. Shukla, R.S. and Chandel P.S. (2005) A text book of Plant Ecology. S. Chand and Company Ltd., Ram Nagar, New Delhi.

11. Odum, E.P. (2011) Fundamental of Ecology. 5th Edition. Saunders.

12. Odum, E.P. (1983) Basic Ecology Saunders, Philadelphia

13. Smith, R. and Smith, T.M. (2014) Elements of Ecology, 8th Edition. Pearson Education India

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - VI

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-MJ-603 (ECONOMIC BOTANY AND PHARMACOGNOSY)

BOTANY (Major) PAPER – 603

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|---|---|
| Course code | BO – MJ - 603 |
| Course title | ECONOMIC BOTANY AND PHARMACOGNOSY |
| Course level | 300 - 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | Economic botany studies plants' economic uses, like food, medicine, and materials. Pharmacognosy focuses on natural products, primarily from plants, for medicinal purposes. Their outcome aims to enhance resource utilization, drug discovery, and sustainable practices. |
| **Course Outcomes** | CO 1: Recognize the economic importance of plants used in food, fiber, beverages, oil, spices, and other industries.<br>CO 2: Explain the origin, cultivation, and uses of economically important plants and plant products.<br>CO 3: Understand the basic principles of pharmacognosy, including the study of crude drugs derived from plants.<br>CO 4: Apply standard techniques for the collection, processing, and evaluation of medicinal plant materials. |

Mapping between COs with PSOs

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO1** | ✓ | ✓ | ✓ | ✓ | | ✓ |
| **CO2** | ✓ | ✓ | | | | |
| **CO3** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **CO4** | ✓ | ✓ | | ✓ | ✓ | ✓ |

| BOT-MJ-603 | **ECONOMIC BOTANY AND PHARMACOGNOSY** | (2 Credits)<br>30 hours |
|---|---|---|
| | | |
| UNIT I | Botanical name, family, part used, morphology and uses of following:<br>a. Cereals – Wheat, Rice, Maize, Sorghum<br>b. Millets – Pearl millet (Bajra), Finger millet (Ragi/ Nagli)<br>c. Legumes – Pigeon pea (tur), Cluster bean (guar), Green gram (mung) | 15 Hours |

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|---|---|---|
| | d. Oil yielding plants - mustard, sunflower, groundnut, sesame<br>e. Beverages – tea and coffee<br>f. Fibre yielding plants – cotton, jute, coir<br>g. Timber yielding plants – *Dalbergia latifolia* (Rosewood), *Shorea robusta* (Sal), *Tectona grandis* (Teak), *Gmelina arborea, Anogeissus latifolia, Terminalia arjuna*<br>h. Dye yielding plants - *Bixa orellana* (Annato), *Indigofera tinctoria* (Indigo), *Lawsonia inermis* (Henna), *Butea monosperma* (Kesuda)<br>i. Gums and Resins<br>j. Alcoholic beverages | |
| UNIT II | **Introduction of Pharmacognocy**<br>**Classification of drugs**<br>➢ Classification of drug on the basis of Taxonomy<br>➢ Classification of drug on the basis of Chemical present<br>➢ Classification of drug on the basis of mode of action<br>**Plant drugs**<br>➢ Drugs obtained from root: Cochicum<br>➢ Drugs obtained from bark: Holarrhena<br>➢ Drugs obtained from leaves: Adhatoda<br>➢ Drugs obtained from fruits: Dill (Sowa) and Poppy<br>➢ Drugs obtained from seeds: Nux vomica<br>➢ - Underground drugs: Gum and Aloes<br>**Botanical name, family part used and uses of following medicinal and drug yielding plants** :<br>*Rauwolfia serpentina, Withania somnifera, Adhatoda vasica, Azadiracta indica, Tinospora cordifolia, Tylophora indica* (Dam vel), *Hemidesmus indicus* (Anant mool) *Achyranthes aspera* (Aghedo), *Mucuna pruriens* (Kavach), *Aloe barbedense* (Kuvarpathu), *Terminalia belerica* (Behda), *Embelica officinalis* (Ambla), *Centella asiatica* (Bhrami), *Helicteres isora* (Marda singh), *Colchicum autumnale, Holarrhena antidysenterica, Anethum graveolens* (Dill), *Papaver somniferum* (Poppy), *Cassia tora* (Kuwadiyu), *Trigonella foenum-graecum* (Fenugreek), *Andrographis paniculata* (Kalmegh) | 15 Hours |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - III

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOTP-MJ-604 (ECONOMIC BOTANY AND PHARMACOGNOSY)

BOTANY (Major) Practical – 604

| | |
|---|---|
| Course code | BO – MJ - 604 |
| Course title | ECONOMIC BOTANY AND PHARMACOGNOSY |
| Course level | 300 - 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | Teaches students to identify and use economically important plants for food, medicine, and industry. Provides knowledge of natural drug sources, their extraction, and applications in modern medicine. Encourages conservation and sustainable use of plant resources for future needs. |
| **Course Outcomes** | CO1: Identify and classify economically important plants based on their morphological and anatomical features.<br>CO2: Demonstrate practical knowledge of plant products used in food, medicine, fiber, oils, beverages, and spices.<br>CO3: Analyze the role of various plants in agriculture, industry, and traditional systems of medicine.<br>CO4: Evaluate the significance of economic plants in the context of sustainability and biodiversity conservation. |

| BOTP-MJ-604 | ECONOMIC BOTANY AND PHARMACOGNOSY | (Credits)<br>30 hours |
|---|---|---|
| 1. | To identify and study the morphology of major cereals: Wheat (*Triticum aestivum*), Rice (*Oryza sativa*), Maize (*Zea mays*), and Sorghum (*Sorghum bicolor*). | |
| 2. | To observe and compare the external morphology of millets: Pearl millet (*Pennisetum glaucum*) and Finger millet (*Eleusine coracana*). | |
| 3. | To study the morphology and identify the characteristic features of legumes: Pigeon pea (*Cajanus cajan*), Cluster bean (*Cyamopsis tetragonoloba*), and Green gram (*Vigna radiata*). | |

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|---|---|---|
| 4. | To observe and identify the morphological features of oil-yielding plants: Mustard (*Brassica juncea*), Sunflower (*Helianthus annuus*), Groundnut (*Arachis hypogaea*), and Sesame (*Sesamum indicum*). | |
| 5. | To identify and differentiate the fibers obtained from Cotton (*Gossypium* spp.), Jute (*Corchorus capsularis*), and Coir (*Cocos nucifera*) by observing their external characteristics. | |
| 6. | To identify and compare the wood characteristics of timber-yielding plants: Rosewood (*Dalbergia latifolia*), Sal (*Shorea robusta*), and Teak (*Tectona grandis*), Sevan (*Gmelina arborea*), (Dhavado) *Anogeissus latifolia*, and (Arjun Sadad) *Terminalia arjuna*. | |
| 7. | To identify and study the morphology of dye-yielding plants: Annatto (*Bixa orellana*), Indigo (*Indigofera tinctoria*), Henna (*Lawsonia inermis*), and Kesuda (*Butea monosperma*). | |
| 8. | To identify and study the morphological features of beverage plants: Tea (*Camellia sinensis*) and Coffee (*Coffea arabica*). | |
| 9. | To identify and study the morphology, part used, and uses of medicinal plants:<br>a. *Adhatoda vasica* – Vasaka/ Malabar Nut<br>b. *Azadirachta indica* – Neem<br>c. *Tinospora cordifolia* – Guduchi/ Giloy<br>d. *Aloe barbadensis* – Aloe vera<br>e. *Emblica officinalis* – Amla/ Indian Gooseberry<br>f. *Terminalia bellirica* –Baheda<br>g. *Mucuna pruriens* – Kawach/ Velvet Bean<br>h. *Hemidesmus indicus* – Anantmool/ Indian Sarsaparilla<br>i. *Tylophora indica* – Dam vel<br>j. *Holarrhena antidysenterica* – Kurchi | |
| 10. | To identify and study the morphology, part used, and uses of medicinal plants:<br>a. *Strychnos nux-vomica* – Nux vomica<br>b. *Rauwolfia serpentina* – Sarpgandha<br>c. *Withania somnifera* – Ashwagandha<br>d. *Colchicum autumnale* – Colchicum/ Autumn Crocus<br>e. *Papaver somniferum* – Poppy<br>f. *Cassia tora* – Kuwadiyu | |

| | | |
|---|---|---|
| | g. *Trigonella foenum-graecum* – Fenugreek<br>h. *Andrographis paniculata* – Kalmegh | |

**References:**


1. Economic Botany Albert F. Hill 2nd Edi. 1976 Tata McGRAW Hill, New Delhi
2. "Economic Botany: A Survey of Useful Plants and Plant Products" by A. D. J. B. White
3. "Plants and People: An Introduction to Ethnobotany" by John H. McNeil
4. "Handbook of Economic Botany" by Michael J. Balick and Paul Alan Cox
5. "Textbook of Pharmacognosy" by C. K. Kokate, A. P. Purohit, and S. B. Gokhale
6. "Pharmacognosy and Phytochemistry" by G. P. M. Bhatia and M. A. B. K. Mandal
7. "Pharmacognosy: A Textbook of Natural Products" by D. C. K. Sethi
8. "Pharmacognosy and Phytochemistry of Medicinal Plants" by M. S. S. A. M. Rahman
9. "Pharmacognosy: Fundamentals, Applications and Strategy" by S. S. Purohit#
10. "Economic Botany: A Textbook of Useful Plants and Plant Products" by S.K. Jain
11. "Economic Botany and Plant Morphology" by J. S. S. S. Sharma

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - VI

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-MJ-605 **(PRINCIPLES AND PRACTICES OF TRADITIONAL MEDICINE OF INDIA)**

BOTANY (Major) PAPER – 605

| | |
|---|---|
| Course code | BO – MJ - 605 |
| Course title | PRINCIPLES AND PRACTICES OF TRADITIONAL MEDICINE OF INDIA |
| Course level | 300 - 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | This course aims to provide a comprehensive understanding of India's traditional medical systems, including Ayurveda, Yoga, Unani, Siddha, and Homoeopathy, focusing on their foundational principles, historical context, and practical applications. It equips students with knowledge of holistic healthcare approaches, emphasizing preventive and curative practices |
| Course Outcomes | **CO1:** Explain the core principles of Ayurveda, including Panchamahabhuta, Tridosha theory, Agni-Ama-Ojas, and diagnostic methods like Nadi Pariksha.<br>**CO2:** Analyze the significance of medicinal plants in Ramayana and Mahabharata (e.g., Sanjeevani Booti, Ashwagandha) and their relevance in modern herbal pharmacology.<br>**CO3:** Classify herbs and formulations based on Rasa, Guna, Virya, Vipaka, and evaluate the preparation and use of Bhasmas and Rasayanas.<br>**CO4:** Discuss threats to traditional knowledge (e.g., biopiracy, biodiversity loss) and critique the role of AYUSH Ministry in preserving ethno-botanical heritage. |

Mapping between COs with PSOs

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | | ✓ |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | | | |

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| BOT-MJ-605 | **PRINCIPLES AND PRACTICES OF TRADITIONAL MEDICINE OF INDIA** | (2 Credits)<br>30 hours |

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|---|---|---|
| UNIT I | 1. **Foundations of Indian Traditional Medicine**<br><br>• **Panchamahabhuta** (Five Elements) & **Tridosha** Theory (Vata, Pitta, Kapha).<br>• Concept of **Agni** (digestive fire), **Ama** (toxins), and **Ojas** (vitality)<br>• **Nadi Pariksha** (Pulse Diagnosis) & **Prakriti** (Body Constitution Analysis)<br>• **Preventive Healthcare in Ayurveda**: Dinacharya (daily regimen) & Ritucharya (seasonal regimen)<br><br>2. **Therapeutic Practices & Modern Integration**<br><br>• **Panchakarma** – Detoxification therapies (Vamana, Virechana, Basti, etc.)<br>• **Yoga & Pranayama** as adjunct therapies in traditional medicine.<br>• **Dietetics in Ayurveda** – Ahara Vidhi (dietary rules) and Satvik/Rajasic/Tamasic diets<br>• **Spiritual Healing** – Role of meditation, Mantra, and Ayurvedic psychology (Manas Roga)<br><br>**3. Ayurvedic Herbal Pharmacology**<br><br>• **Dravyaguna Shastra** – Principles of herb classification (Rasa, Guna, Virya, Vipaka, Prabhava)<br><br>**Bhasmas & Kupipakwa Rasayana** (metallic/mineral formulations) | 15 Hours |
| UNIT II | **Ethno-Botany in the Ramayana and Mahabharata**<br><br>**1. Sacred Forests and Their Sacred Ritualistic Plants**<br><br>• **Ramayana**: Dandakaranya, Panchavati, Ashoka Vatika, Chitrakoot.<br>• **Mahabharata**: Kamyaka Forest, Matsya Kingdom's flora.<br><br>**Sacred & Ritualistic Plants in the Epics**<br><br>• **Ramayana:** Sanjeevani Booti (Life -Restoring Herb) Tulsi, Ashoka, Bilva, Sandalwood. **Mahabharata:** Peepal, Banyan, | 15 Hours |

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|---|---|---|
| | Parijat, Kalpavriksha (Wish-fulfilling tree), Ashwagandha (strength), Arjuna Tree<br><br>**2. Conservation of Traditional Knowledge**<br><br>**Threats to Ethno-Botanical Heritage**<br><br>• Biopiracy cases (e.g., Neem, Turmeric patents)<br>• Biodiversity loss due to urbanization/climate change<br><br>**Role of AYUSH Ministry**<br><br>• Promoting cultivation of medicinal plants (National Medicinal Plants Board)<br>• Integrating Ayurveda/Siddha into modern healthcare | |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - VI

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOTP-MJ-606 (**PRINCIPLES AND PRACTICES OF TRADITIONAL MEDICINE OF INDIA**)

BOTANY (Major) PRACTICAL – 606

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|---|---|
| Course code | BO – MJ - 606 |
| Course title | PRINCIPLES AND PRACTICES OF TRADITIONAL MEDICINE OF INDIA |
| Course level | 300 - 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | Ayurveda, rooted in ancient Indian texts, emphasizes balance among body, mind, and spirit through personalized diet, herbal remedies, yoga, and lifestyle practices. It uses the concept of three doshas (Vata, Pitta, Kapha) to diagnose and treat imbalances, promoting holistic health. Practical purposes include disease prevention, stress management, and enhancing overall well-being. |

**Course Outcomes :**

- **CO1: Understanding Panchamahabhoota & Dosha Imbalance**

  - **Identify the dominance of** Panchamahabhoota (Five Elements) **in the body and correlate them with** Tridosha (Vata, Pitta, Kapha) **imbalances.**
  - **Apply** pulse diagnosis (Nadi Pariksha) **to assess Prakriti (constitution) and Vikriti (imbalance).**
  - **Classify substances** (Dravyas) **based on their** Samanya-Vishesha **principles and elemental dominance.**

  **CO:2 Guna-Karma & Dravya Analysis**

  - Analyze the **Guna (properties)** and **Karma (actions)** of medicinal substances.
  - Categorize **Dravyas** based on their dominant **Mahabhoota** composition.
  - Evaluate the role of **Shabda, Sparsha, Rupa, Rasa, Gandha** in substance identification.

  **CO:3 Preparation of Classical Ayurvedic Formulations**

  - Prepare **Mahabhoota Sitopaladi Churna** (respiratory & immunomodulator) and justify its therapeutic use.

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| | • Formulate **Avipattikar Churna** (for acidity) and **Ashwagandha Churna** (rejuvenative tonic) with correct methods.<br>• Demonstrate the preparation of **Tulsi Swaras, Nimb Kalk, Amla-Aloevera extracts, and Wheat Grass Juice** with their medicinal significance.<br><br>**CO:4 Phytochemical & Medicinal Plant Studies**<br><br>• Examine the **phytochemical constituents** of **Vitex negundo, Azadirachta indica, Cissus quadrangularis, Gymnema sylvestre, and Aegle marmelos**.<br>• Correlate their **bioactive compounds** with traditional Ayurvedic uses.<br>• Assess their pharmacological importance in modern and Ayurvedic medicine.<br><br>**CO:5 Application & Critical Analysis**<br><br>• Interpret diagnostic and therapeutic principles in real-case scenarios.<br>• Critically analyze the **efficacy of prepared formulations** based on Ayurvedic texts.<br>• Develop skills in **evidence-based Ayurvedic practice** integrating traditional and scientific knowledge. |

| BOTP-MJ-606 | **PRINCIPLES AND PRACTICES OF TRADITIONAL MEDICINE OF INDIA** | (2 Credits) 30 hours |
|---|---|---|
| | 1. Identifying Panchamahabhoota (Five Element) Dominance in the Body.<br><br>2. Pulse Diagnosis (Nadi Pariksha) -By Ayurvedic Method.<br><br>3. Identify Samanya-Vishesha in Dravyas (Substances).<br><br>4. Identification of Guna and Karma<br><br>5. Identify Dosha Imbalance (Vata, Pitta, Kapha).<br><br>6. Dravya- Categorization of Dravya by Dominant<br><br>7. Guna- Sartha Guna Identify concept of Shabda,Sparsha,<br><br>Rupa,Rasa,Gandha in Dravya.<br><br>8. Preparation of Mahabhoota Sitopaladi Churna, (Respiratory & Immunomodulator)<br><br>9. Preparation of Avipattikar Churna (Acidity & Hyperacidity)<br>Preparation of Ashwagandha Churna (Rejuvenative & Nervine Tonic)<br><br>10. Preparation of Amla, Aloevera, and its importantnce. Wheat Grass Juice.<br><br>11.Preparation of Tulsi Swaras Nirman.<br><br>12.Preparation of Nimb Kalk Nirman. | |

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|---|---|---|
| | 13. To study phytochemicals and medicinal importantance of *Vitex negundo.*<br><br>14. To study phytochemicals and medicinal importantance of *Azadirachta indica.*<br><br>15. To study phytochemicals and medicinal importantance of *Cissus quadrangularis.*<br>16. To study phytochemicals and medicinal importantance of *Gymnema sylvestre.*<br>17. To study phytochemicals and medicinal importantance of *Aegle marmelos.* | |

**References:**


1. Charaka Samhita & Sushruta Samhita – Classical Ayurvedic texts on Tridosha, Panchamahabhuta,and Nadi Pariksha.
2. Ashtanga Hridaya by Vagbhata – Covers Dinacharya, Ritucharya, and Agni-Ama-Ojas concepts.
3. Bhagvat Purana & Yoga Vasishta – Refereces to Prakriti (body constitution) and spiritual healing
4. Hatha Yoga Pradipika – Discusses Yoga & Pranayama as therapy.
5. Ayurvedic texts on Panchakarma – Details on Vamana, Virechana, and Basti therapies.
6. Manas Roga (Ayurvedic Psychology) – Described in Charaka Samhita (Chikitsa Sthana).
7. Dravyaguna Shastra – Classical texts on Rasa, Guna, Virya, Vipaka, Prabhava.
8. Rasa Shastra – Covers Bhasmas and Kupipakwa Rasayana preparations.
9. Valmiki Ramayana – References to Sanjeevani Booti (Hanuman's search in the Himalayas), Ashoka
10. Vatika, and Tulsi.
11. Mahabharata (Vanaparva) – Mentions of medicinal plants like Ashwagandha, Arjuna Tree, and
12. Kalpavriksha.
13. Ayurvedic texts like Nighantus (Dhanvantari Nighantu, Raja Nighantu) – Describe medicinal uses
14. of plants mentioned in epics.
15. Neem Patent Controversy (US Patent No. 5,124,349, later revoked).
16. Turmeric Patent Case (US Patent No. 5,401,504, overturned due to prior Indian knowledge)
17. YUSH Ministry – Policies on medicinal plant conservation (National Medicinal Plants Board).
18. Traditional Knowledge Digital Library (TKDL) – Prevents biopiracy by documenting Ayurvedic knowledge.
19. Ayurveda The Science of Self-Healing – Dr. Vasant Lad
20. Indian Medicinal Plants – P.K. Warrier
21. Ethnobotany of India – T. Pullaiah
22. Plants of Ramayana – Nanditha Krishna
23. Bhasmas in Ayurveda – Dr. C. K. Kokate

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - VI

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOT-ME-601 (PLANT ECOLOGY)

BOTANY (Minor) PAPER – 601

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|---|---|
| Course code | BO – ME – 601 |
| Course title | PLANT ECOLOGY |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 15 hrs. = 30 hrs. |
| Teaching per week | 02 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | The Plant Ecology course introduces undergraduates to the interactions between plants and their environments. It explores plant adaptations, ecosystem dynamics, and biodiversity conservation. The course aims to foster understanding of ecological principles and their application to real-world environmental challenges. |
| **Course Outcome** | CO1: Understand the fundamental principles of plant ecology, including energy flow, nutrient cycling, and plant-environment interactions.<br>CO2: Analyze the structure and function of plant communities and ecosystems across different biomes.<br>CO3: Evaluate ecological processes such as succession, competition, and adaptation in plant populations.<br>CO4: Apply ecological methods to study vegetation, assess biodiversity, and measure environmental variables. |

Mapping between COs with PSOs

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO1** | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **CO2** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **CO3** | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **CO4** | ✓ | ✓ | ✓ | ✓ | | ✓ |

| BOT-ME-601 | **PLANT ECOLOGY** | (2 Credits)<br>30 hours |
|---|---|---|
| **UNIT I** | **Basic concepts of ecology** | 15 Hours |

| | | |
|---|---|---|
| | **Climatic and topographic factor (in relation to plants)**: Light, temperature, atmosphere, precipitation and humidity, Thermal and light stratification of lakes<br>**Edaphic factors**: Formation and composition of soil (soil texture, soil water, soil organic matter/ humus), Soil profile<br>**Biotic interactions**: Symbiosis, protocooperation, commensalism, ammensalism, parasitism, predation and competition<br>**Community ecology**: Concept of community, Characteristics of community (Analytical- qualitative and quantitative characters and Synthetic), Raunkier's life form (Phanerophytes, Chamaephytes, Hemicryptophytes, Cryptophytes and Therophytes), Methods of studying vegetation | |
| | | |
| **UNIT II** | **Ecosystem and vegetation ecology**<br>**Ecosystem concept**: Biotic and abiotic components of ecosystem, Energy flow models, Ecological pyramids (pyramid of number, pyramid of biomass, pyramid of energy), Food chain (grazing, detritus, parasitic) and Food web, Ecological niche<br>**Ecological succession**: Succession and its types, Process of succession, Hydrosere and Xerosere<br>**Biomes and Vegetation (with special reference to Gujarat)**:<br>Major biomes of the world, Phytogeographical zones of India, Desert vegetation of Gujarat, Coastal vegetation of Gujarat, Forest vegetation of Gujarat, Endangered plants of Gujarat<br>**Ecological adaptations in hydrophytes and xerophytes**: morphological and anatomical characters | 15 Hours |

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

SYLLABUS FOR B.Sc. SEMESTER - VI

**FRAMED ACCORDING TO**

**NATIONAL EDUCATION POLICY (NEP) 2020** (Effective from June 2025)

BOTP-ME-602 (PLANT ECOLOGY)

BOTANY (Minor) PRACTICAL – 602

| | |
|---|---|
| Course code | BOP – ME – 602 |
| Course title | Practical in PLANT ECOLOGY |
| Course level | 300 – 399 |
| Credit | 02 |
| Total engagement | 2 credits x 30 hrs. = 60 hrs. |
| Teaching per week | 04 hrs |
| Minimum weeks per semester | 15 |
| Effective from | 2025-26 |
| Purpose of course | Understand plant interactions with environments for conservation and restoration Apply ecological principles to sustainable agriculture and land management. Analyze plant adaptations to address climate change and biodiversity loss. |

**Course Outcomes :**

CO:1 Explain how plant adaptations influence ecosystem dynamics for sustainable land use.

CO:2 Implement field techniques to assess plant biodiversity and monitor ecological health.

CO:3 Evaluate the impact of climate change on plant communities to propose mitigation strategies.

CO:4 Critique restoration plans based on ecological principles to ensure long-term viability.

CO:5 Design adaptive management plans integrating plant ecology to address environmental challenges.

| BOTP-ME-602 | PLANT ECOLOGY | (2 Credits) 30 hours |
|---|---|---|
| | | |
| 18 | To determine frequency, density and abundance of various species using quadrat method. | |
| 19 | To study biotic components of pond ecosystem | |
| 20 | To determine soil texture of any given soil sample | |
| 21 | To determine moisture percentage of given soil sample | |
| 22 | To determine water holding capacity of given soil sample | |
| 23 | To determine the pH of given soil sample | |

| | | |
|---|---|---|
| 24 | To determine organic carbon in soil by Walkley and Black rapid titration method | |
| 25 | To determine total dissolved solids in given water sample | |
| 26 | To determine the amount of chloride in given water sample | |
| 27 | To determine total hardness of given water sample | |
| 28 | To determine the amount of calcium in given water sample | |
| 29 | To determine the amount of magnesium in given water sample | |
| 30 | To determine alkalinity of given water sample | |
| 31 | To determine dissolved oxygen in water sample | |
| 32 | To study of ecological instruments –<br>j) Maximum and minimum thermometer<br>k) Wet and dry bulb thermometer<br>l) Soil thermometer<br>m) Secchi disc<br>n) Lux meter<br>o) Psychometer<br>p) Rainguage<br>q) Anemometer<br>r) Hygrothermometer | |
| 33 | To study ecological adaptation of hydrophyte (a) stem of *Hydrilla* (b) petiole of *Eichornia* | |
| 34 | To study ecological adaptation of xerophyte (a) stem of *Capparis* (b) stem of *Casuarina* (c) leaf of *Nerium* | |

**References:**


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2. "Island Biogeography: Ecology, Evolution, and Conservation" by Robert J. Whittaker and José Jesús Fernández-Palacios
3. A text book of Plant Ecology R.S. Ambasht 1st Edi. 1969 Students friends & co., Varanasi
4. Fundamentals of Ecology by E P Odum and G W Barrett. Thompson Asia Pvt Ltd. Singapore
5. "Ecology: Concepts and Applications" by Manuel C. Molles
6. "Principles of Ecology" by Eugene P. Odum
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8. Ecology: From Individuals to Ecosystems" by Michael Begon, Colin R. Townsend, and John L. Harper

9. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition

10. Shukla, R.S. and Chandel P.S. (2005) A text book of Plant Ecology. S. Chand and Company Ltd., Ram Nagar, New Delhi.

11. Odum, E.P. (2011) Fundamental of Ecology. 5th Edition. Saunders.

12. Odum, E.P. (1983) Basic Ecology Saunders, Philadelphia

13. Smith, R. and Smith, T.M. (2014) Elements of Ecology, 8th Edition. Pearson Education India

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