



પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે સાયન્સ વિદ્યાશાખા હેઠળનો લાઈફ સાયન્સ (બોટની) વિષયનો (એમ.એસસી. બોટની) પ્રોગ્રામનો સેમેસ્ટર-૩ અને સેમેસ્ટર-૪ નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજૂરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન, ૨૦૨૪ થી અમલવારી કરવાની રહે છે. સાયન્સ વિદ્યાશાખાનાં લાઈફ સાયન્સ વિષયનાં પી.જી.નો અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં પી.જી.સેન્ટર ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.



[Signature]
04/07/2024
ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/એકેડેમિક/૮૮૦/૨૦૨૪

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,

સરકારી પોલીટેકનિક કેમ્પસ,

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,

ખડીયા, જૂનાગઢ-૩૬૨૨૬૩

તા.૦૪/૦૭/૨૦૨૪

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન સાયન્સ વિદ્યાશાખાનાં પી.જી.(લાઈફ સાયન્સ)નાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તેમજ સંલગ્ન ભવનનોનાં અધ્યક્ષશ્રીઓ 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 **LIFE SCIENCE** STUDIES
FACULTY OF **SCIENCE**
SYLLABUS FOR
M.Sc. BOTANY PROGRAMME
(SEMESTER- III & IV)
EFFECTIVE FROM JUNE, 2024

BHAKTA KAVI NARSINH MEHTA UNIVERSITY

Syllabus of M.Sc. BOTANY

Faculty of SCIENCE

Effective from June 2024

SEMESTER-III & IV

1. The Course

- The course is full time course comprising of four semesters. There will be four theory papers (three core papers and one interdisciplinary / multidisciplinary paper) and one combined practicals in first two semesters. The last two semesters offer choice of courses to the students where two core courses and one elective (to be chosen from three available) courses will be taught. Any elective course will be taught only when prerequisite number of the student is met for that course. Students shall be required to submit at the time of practical examination at the end of each semester.
 - The laboratory Journal and diary of field work (Tour report) duly signed by the teachers concerned from time to time.
 - A set of assignments, submissions, preparations or materials illustrating the subject – matter as per syllabus for each semester.

2. Eligibility

- The candidate with B.Sc. degree in Botany with minimum 45% is eligible for admission to M.Sc. Botany course.
- Students, who have cleared B.Sc. with Botany as the second subject in S.Y. B.Sc. will also be considered for admission, provided the seats are available. A total of 20 seats are available in the Botany.
- Students will be admitted as per the reservation policy in effect from time to time, as directed by the University.

3. Educational tour

- The study/ educational tour is compulsory and part of Curriculum to study different ecosystems, botanical, zoological and microbiological places of interest anywhere in the country. Since the tour or tours are part of the curriculum, these can be conducted during any or all of the four semesters. However, in special cases, alternative of the educational tour will be decided and assigned to the student concerned, by the Staff Council of the Department.

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4. Seminars / Assignments / Submission

- Regular seminars will be organized on I and II Semesters and it is compulsory. Presentation on relevant topics, mostly from syllabus (oral and / or poster), is mandatory for the enrolled student. For each seminar, a student will be given marks, which will be added in the III Semester marksheet.

5. Attendance

- Admitted students have to attend all the Lectures, Practicals and Seminars. A minimum prescribed attendance as per University rules is required to sanction a term grant. Students whose term is not granted will not be allowed to appear in the examination, and will have to join the same semester in the following year.

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Semester wise distribution of marks

- SEMESTER-I: 4 Papers (100 Marks each*) : 400
1 Combined Practical : 200
Total : 600

- SEMESTER-II:
4 Papers (100 Marks each*) : 400
1 Combined Practical : 200
Total : 600

*** 70 external + 30 internal ●**

SEMESTER-III:

4 Papers (100 Marks each*) : 400
1 Combined Practical : 200
Total : 600

- SEMESTER-IV:

Dissertation / Project : 500 (400 + 100 viva)
Seminar Course (Intermediate : 50
Semester Presentation)
Submission: Research proposal and : 50
Review Article
Total : 600

6. The M.Sc. courses run by this Department are full time studies and as such, a student admitted to the Department is not allowed to join any other courses or study, or take up any paid service.
7. The candidate should bring all original mark sheets, certificates etc. At the time of the interview.

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Semester – III

Course code	Paper title	Hours / week	Credits	Marks		
				Int.	Ext.	Total
BOT 313	Plant Ecology (Core)	04	04	30	70	100
BOT 314	Plant Physiology (Core)	04	04	30	70	100
BOT 315	Plant Anatomy, Embryology & Histological Techniques (Core)	04	04	30	70	100
^{\$} BOT 316 A	Plant Diversity And Resources (Elective)	04	04	30	70	100
^{\$} BOT 316 B	Plant Biotechnology (Elective)					
BOTPRAC 317	Combined Practicals	12	12	-	200	200
*BOT 418	Dissertation / Project	09	00	-		
	Total	37	24	-		600

^{\$} Out of two elective papers 316 A and 316 B **any one is to be selected**

* **Dissertation / Project** commences in III Semester but evaluated and Grade Points are to be added in 4th Semester.

Semester - IV

Course code	Paper title	Hours / week	Credits	Marks		
				Int.	Ext.	Total
BOT 418	*Dissertation / Project	16	16	-	500	500
BOT 419	#Seminar Course (Presentation)	04	04	50	-	50
BOT 420	@ Assignments (Research Proposal & Review Article)	-	04	50	-	50
	Total	20	24	-		600

Seminar / Presentation Courses are carried out in the intermediate of the Fourth Semesters.

* **Dissertation / Project** commences in III Semester but evaluated and Grade Points are to be added in 4th Semester.

@ **Assignments** of Research Proposal and Review Article are submitted during the Fourth semester

Semester – III

BOT 313: PLANT ECOLOGY

Unit – 1. Plant Community and Biodiversity

- 1.1 Vegetation Organization: Composition and Structure of Plant Community, Qualitative and Quantitative Characteristics, Phytosociological Methods, Ecological Niche.
- 1.2 Vegetation Development: Process of Ecological Succession, Models and Climax Stage, Hydrosere, Xerosere and causes of succession, Vegetation analysis.
- 1.3 Biological Diversity: Concepts and levels; role of biodiversity in ecosystem functions and stability; speciation and extinction; IUCN categories of threat; biodiversity hot spots; ecology of plant invasion ; Invasive species-case studies.
- 1.4 Mapping biodiversity, methods of estimating population density of plants and documenting biodiversity by PBR, Role of GSBB, NBA.

Unit – 2. Edaphic factors and Ecosystem organization

- 2.1 Definition and composition of soils, origin and formation of soil, soil profile, soil classification, properties of soils, soil erosion.
- 2.2 Biosphere, biotic and abiotic components, ecological balance, food chain, ecological pyramids, energy flow.
- 2.3 Types, terrestrial and freshwater ecosystems. Fragile ecosystems.
- 2.4 Biogeochemical cycles: Types of biogeochemical cycles : water cycle, gaseous cycles — the oxygen cycle, the carbon cycle, the nitrogen cycle, sedimentary cycles — sulphur cycle, phosphorus cycle, biogeochemical cycle of micronutrient.

Unit – 3. Ecological factors and Environment

- 3.1 Ecological Factors: Soil, light, water etc, Principles of limiting factors;
- 3.2 Productivity: Population ecology – concept, types, fluctuation, factors regulating size, mortality – natality
- 3.3 Climate Change: Greenhouse gases (CO₂, CH₄, N₂O, CFCs; sources, trends and role); ozone layer and ozone hole, consequences of climate change (CO₂ fertilization, global warming, sea level rise, UV radiation). Phytoremediation.
- 3.4 Carrying capacity and population regulation, Species interaction, Ecological Adaptations, Sustainable development, EIA

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Unit – 4. Desertification and Remote sensing

- 4.1 Principles, components and types of Remote sensing and GIS
- 4.2 Applications of remote sensing and GIS
- 4.3 Impacts of Desertification and Processes of Desertification
- 4.4 Major Factors Causing Desertification

Suggested Readings

- 1. Basic Ecology – Eugene P. Odum
- 2. Fundamentals of Ecology- P. Odum
- 3. Concept in Indian Ecology and Environmental Science – S. V. S. Rana
- 4. Ecology Theories and Application – Peter Stiling
- 5. Ecology & Environment – P. D. Sharma
- 6. Indian Manual of Plant Ecology – R .Misra & G. S. Puri
- 7. Responses of Plants to environmental stresses, Levitt, J. (1980) Academic Press.
- 8. Ecology, N.S. Subrahmanyam & A.V.S.S. Sambamurthy, Narosa Publishing House

BOT 314: PLANT PHYSIOLOGY

Unit – 1. Water and Mineral Nutrition

- 1.1 Water, water potential, soil water, water absorption and transport, transpiration, water deficit, hormonal and molecular responses to water control in plants.
- 1.2 Mineral nutrition, macronutrients, micronutrients, importance and deficiency symptoms, nutrient uptake by plants.
- 1.3 N-P-K in environment, Nitrogen-Phosphorus-Potassium metabolism, N-P-K assimilation.
- 1.4 Carbohydrates, Proteins, Lipids-biosynthesis, Structure and metabolism

Unit – 2. Major Pathways

- 2.1 Photosynthesis, photosynthetic apparatus, PS I & PS II, mechanism of electron – proton transport, carbon fixation (C₃/ C₄/ CAM), evolution of Photosynthesis, factors affecting photosynthesis, photorespiration – C oxidation cycle.
- 2.2 Respiration, Mitochondria, structure, glycolysis, TCA cycle, electron transport, ATP synthesis, different substrates, carbon respiration.
- 2.3 Measurement of Photosynthesis, Respiration and Transpiration.
- 2.4 Translocation of photosynthetic phloem, source – sink, partitioning and allocation.

Unit – 3. Growth and Development

- 3.1 Growth, development, concept, qualitative – quantitative changes, Seed germination, dormancy and method to break dormancy.
- 3.2 Growth regulators, biosynthesis, bioassay, mechanism of action, physiological effects, applications of auxin, cytokinin, gibberellins, ABA, ethylene.
- 3.3 Physiological effects and role of jasmonic acid, polyamines, brassinosteroids, salicylic acid.
- 3.4 Measurement of growth, growth indices-RGR, LWR and NAR, growth correlations.

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Unit – 4. Plant Responses

- 4.1 Phytochrome, Pr and Pfr structure, localization, plant responses, plant movement, cellular actions.
- 4.2 Flowering, shoot apex modification, floral meristem, photomorphogenesis, photoperiodism, biochemical signaling, vernalization.
- 4.3 Stress physiology, water status, deficit, drought, structural and biochemical features to overcome stress, chilling, Heat and salinity stress.
- 4.4 Climate resilience, vulnerability and Tolerance to stress

Suggested Readings

1. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th edition). wadsworth Publishing Co. california, USA.
2. Singhal, G.S., Renger, G., Sopory, S.K., Irrgang, K.D. and Govindjee 1999. Concept in Photobiology: Photosynthesis and Photomorphogenesis. Narosa Publishing House, New Delhi.
3. Taiz, L. and Zeiger, E. 1998. Plant Physiology (2nd edition). Sinauer Associates, Inc., Publishers, Massachusetts, USA.
4. Thomas, B. and Vince-Prue, D. 1997. Photoperiodism in Plants (2nd edition). Academic Press, San Diego, USA.
5. Bewley, J.D. and Black, M. 1994. Seeds: Physiology of Development and Germination. Plenum Press, New York.
6. Bajracharya, D. 1999. Experiments in Plant Physiology: A Laboratory Manual. Narosa Publishing House, New Delhi.
7. Moore, T.C. 1974. Research Experiences in Plant Physiology: A Laboratory Manual. Springer -Verlag, Berlin.
8. Nilesen, E.T. and Orcutt D.M. (1996) The Physiology of Plants under Stress. John Wiley & Sons. Inc New York.
9. Advances in Plant Physiology, vol.10, by D.K.Arora and Seema Gupta, 1996. Anmol Publications Pvt Ltd.
10. Plant Physiology : Fundamentals and Applications, second edition, by Arvind Kumar and S.S.Purohit, 2001, Agrobios.

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BOT 315: PLANT ANATOMY, EMBRYOLOGY & HISTOLOGICAL TECHNIQUES

Unit-1 : Anatomy

- 1.1 Root anatomy, RAM, root hairs, root architecture
- 1.2 Stem anatomy, Vascular elements, functional differentiation, proteins. Role of cambium.
- 1.3 Leaf anatomy, Epidermis, stomata, trichomes, types, role, Secretory Ducts and Laticifers, types, development, function. Nodal Anatomy, Nodal types, leaf gaps, branch
- 1.4 Wood anatomy, Wood development and environmental factors, heartwood, softwood and bark, reaction wood

Unit-2 : Embryology

- 2.1 Floral meristem, Intrinsic and extrinsic factors controlling flowering, flower development, ABC model of flower development, flower architecture and mutations.
- 2.2 Structure and development of anther, ovule, male and female gametophytes; Embryo sac ultra structure and its types, nutrition of embryo sac.
- 2.3 Pollination, pollen-pistil interaction, fertilization, sexual incompatibility
- 2.4 Embryo development, types, polyembryony, endosperm, nutrition.

Unit-3 : Applied Embryology

- 3.1 Palynology : morphographic palynology, aeropalynology, melittopalynology, and Paleopalynology.
- 3.2 Apomixis, types and applications, Modern approaches- pollen allergy, forensic palynology and other applications, Embryology in relation to taxonomy.
- 3.3 Sterility –phenomenon and applications in hybrid seed production, male sterility-chemical induction, through recombinant DNA technology.
- 3.4 Pollen biotechnology in agriculture- optimizing yield, effective plant pollinator interactions through case studies, Research trends in Palynology, Research Journals in Palynology

Unit-4 : Histochemical Techniques

- 4.1 Whole mounts, sections, peels for study of fine surface and internal structures of plants, stains, mounting for temporary preparations.
- 4.2 Killing, fixing, sectioning and staining for permanent preparations.
- 4.3 Unstained preparations and study of live cells, photographing stained preparations, Pollen pistil interactions through temporary preparation.
- 4.4 Staining for callose, DNA, RNA, Proteins, insoluble polysaccharides

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Suggested Readings

1. Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms. [4th revised and enlarged Ed.]. ViKas Publishing House, New Delhi.
2. Fageri, K. and Van der Pijl, L. 1979. The Principles of Pollination Ecology. Pergamon Press, Oxford.
3. Fahn, A.1982. Plant Anatomy. [3th Ed.]. Pergamon Press, Oxford.
4. Proctor, M. and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons., London.
5. Raghavan, V.1997. Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
6. Shivanna, K.R. and Sawhney, V.K. [eds.] 1997. Pollen Biotechnology for Crop Production and Improvement. Cambridge University Press, Cambridge.
7. Shivanna, K.R. and Rangaswamy, N.S. 1992. Pollen Biology: A Laboratory Manual. Springer - Verlag, Berlin.
8. Shivanna, K.R. and Johri, B.M. 1985. The Angiosperm Pollen: Structure and function. Wiley Eastern Ltd., New York.
9. Shivanna, K.R. and Rangaswamy, N.S. 1992. Pollen Biology: A Laboratory Manual. Springer - Verlag, Berlin - Heidelberg (and references therein).

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SEMESTER-III & IV

BOT 316A: PLANT DIVERSITY AND RESOURCES (ELECTIVE)

Unit -1: Bryophyta & Pteridophyta

- 1.1 General characters, economic importance and classification of bryophyta and pteridophyta
- 1.2 Morphological patterns in leaf, stem and reproductive organ of bryophyta and pteridophyta
- 1.3 Anatomical patterns in leaf and of bryophyta and pteridophyta
- 1.4 Reproduction and Life-cycles of bryophyta and pteridophyte

Unit -2: Gymnosperms & Angiosperms

- 2.1 General characters, economic importance and classification of gymnosperms and angiosperms
- 2.2 Morphological and anatomical patterns in leaf, stem and reproductive organ of gymnosperms
- 2.3 Classification of family as per Bentham & Hooker classification including merits and demerits
- 2.4 Detailed study: Families of Polypetalae, Gamopetalae and Apetalae; Families of monocotyledons

Unit-3 : Agricultural and forest products of India

- 3.1 Major staple crops: rice, wheat, maize; Minor staple crops: millets, ragi, barley ; Major pulses: oil seeds, fibre crops
- 3.2 Classification of Indian Forests, Silviculture systems, Major and minor forest products of India
- 3.3 Major and minor forest products of India Importance of fodder grasses, forbs and legumes Grassland management
- 3.4 Basic methods and approaches to study traditional knowledge of ethnobotany

Unit 4 Intellectual Property Right

- 4.1 Overview of Intellectual Property Plant variety protection
- 4.2 Farmer's and Breeder's rights
- 4.3 Biodiversity act
- 4.4 Protection of traditional knowledge

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Suggested Readings

1. College Botany by Das, Datta and Gangulley
2. Bryophytes by Puri P.
3. Bryophyta by N. S. Parihar
4. The morphology of Pteridophyta by Sporne K.K.
5. Pteridophyta by N. S. Parihar
6. Cryptogamic Botany by Smith
7. Angiosperms by R. N. Sutaria
8. Bombay flora by Hook
9. Gymnosperms by Bhatnagar S. P. and Moitra
10. Numerical taxonomy by Cole A. J.
11. Principles of angiosperms taxonomy
12. Plant Biosystematics by Grant W. F.
13. Diversity and classification of flowering plants
14. Economic Botany - SampatNehra
15. Economic Botany - B. P. Pandey
16. Economic Botany: A Profile - AkhilBaruah
17. Economic Botany of Crop Plants - AVSS Sambamurty and NS Subrahmanyam
18. A textbook of Modern Economic Botany - AVSS Sambamurty and NS Subrahmanyam
19. Textbook of Economic Botany - V. Verma
20. Encyclopaedia of Forest Sciences - Evans, Youngguist and Burley
21. Forestry: Principles and Applications - AJ Raj, SB Lal
22. Forestry - Gyan Deep Singh
23. Indian Forestry - K. Manikandan, S. Prabhu
24. Tree and Forest Measurement - P.W. West
25. Forest and Forestry - K.P. Sagreya

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SEMESTER-III & IV

BOT – 316B: PLANT BIOTECHNOLOGY Unit - 1. Plant Tissue Culture

- 1.1 General technique, Laboratory and equipments, aseptic techniques, nutrient medium, plant growth regulators
- 1.2 Callus, induction, transfer – subcultures, growth kinetics, cell suspension, application
- 1.3 Morphogenesis, Plant regeneration, somatic embryogenesis, advantages, synthetic seeds, androgenesis and gynogenesis
- 1.4 Micropropagation, cloning, various stages, applications, pathogen indexing, meristem culture, virus free plants, therapy (chemo/ thermo), advantages

Unit – 2. Plant Improvement

- 2.1 Somatic hybridization, protoplast isolation, culture, fusion, selection of hybrids, advantages.
- 2.2 Somaclonal variation, origin, factors inducing variations, cell selection, advantages
- 2.3 Transgenic plant, gene construct, Ti plasmid, transformation, direct gene transfer methods, advantages
- 2.4 Phytochemicals, large scale cultures, bioreactors, improvement – elicitors, two phase systems, hairy root cultures, bio-transformation, applications

Unit – 3. Industrial Applications

- 3.1 Studies on Primary metabolites
- 3.2 Studies on secondary metabolites
- 3.3 Studies on fine chemicals produced by plants like Shikonine, berberine, geraniol, digoxin, rosmarinic acid and immunologically active polysaccharides from plants
- 3.4 Studies on Plant made Pharmaceuticals (PMP) for human use

Unit – 4. Complementary Techniques

- 4.1 Germplasm conservation, cryopreservation (freezing – thawing), cryoprotectants, applications
- 4.2 Distant hybridization, in vitro pollination/ fertilization, embryo culture, embryo – rescue, applications.
- 4.3 Commercial outlook, technology, important plants, International and Indian status, issues. Plant tissue culture in India
- 4.4 Molecular markers and DNA finger printing techniques and applications

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Suggested Readings

1. Bhojwani, S.S. 1990. Plant Tissue Culture: Theory and Practical (a revised edition). Elsevier Science Publishers, New York, USA.
2. Bhojwani, S.S. 1996. Plant Tissue Culture: Application and Limitations. Elsevier Science Publishers, New York, USA.
3. Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue Culture. Kluwer Academic Publishers, the Netherlands.
4. Shantharam, S. and Montgomery, J.F. 1999. Biotechnology, Biosafety and Biodiversity. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Glick, B.R. and Thomson, J. E. 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.
6. Glover, D. M. and Hames, B. D. (Eds.), 1995. DNA Cloning 1: A Practical Approach; Core Techniques, (2nd edition). PAS, IRL Press at Oxford University Press, Oxford.
7. Hackett, P.B., Fuchs, J.A. and Messing, J. W. 1988. An introduction to Recombinant DNA Techniques: Basic Experiments in Gene Manipulation. The Benjamin / Cummings Publishing Co., Inc Menio Park, California.
8. Shaw, C. H. (Ed.), 1988. Plant Molecular biology: A Practical Approach. IRL Press, Oxford.

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SEMESTER-III & IV

PAPER BOTPRAC – 317:

Practicals Based on Theory Papers BOT 313, 314, 315 and 316 A / B

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of M.Sc. BOTANY
Faculty of SCIENCE
Effective from June 2024
SEMESTER-III & IV

Semester – IV

BOT 418: Dissertation/Project

BOT 419: Seminar Course

BOT 420: Assignments (Research Proposal & Review Article)

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Question paper Skeleton

SECTION-I

1. Answer the following (Two short Questions)
- A. Write a short note..... 07
- B. Explain 07

OR

1. Answer the question (One long Question) 14
2. Answer the following (Two short Questions)
- C. Write a short note..... 07
- D. Explain 07

OR

2. Answer the question (One long Question) 14

Note: Question 1 and 2 from the unit-1 and 2 respectively.

3. Do as direct (any seven out of eight questions each of one mark) 07

Note: Question 3 from the unit-1 and 2.

SECTION-II

1. Answer the question (One long Question) 14 **OR**
1. Answer the following (Two short Questions)
- A. Write a short note..... 07
- B. Explain 07

2. Answer the question (One long Question) 14

OR

2. Answer the following (Two short Questions)
- A. Write a short note..... 07
- B. Explain 07

Note: Question 1 and 2 from the unit-3 and 4 respectively

3. Do as direct (any seven out of eight questions each of one marks) 07

Note: Question 3 from the unit-3 and 4.