M.Sc.

Botany	
Program Outcome	Students who complete the master of science in botany degree will have the advanced knowledge, general competence, and analytical abilities required for careers in academia, business, government, and research. -Acquire the capacity to apply your knowledge of botany to practical problems. -To solve biodiversity and environmental challenges, use your creativity, critical thinking, analytical skills, and research abilities. -Through project work, gain some research experience in a particular area of botany.
Programme Specific Outcomes	-Show the capacity to apply knowledge of plant diversity in the context of several botanical fields. -The study of research at the doctoral level in the disciplines of mycology, plant pathology, taxonomy, plant physiology, and pharmacognosy. -Understand the fundamental concepts and ideas of botany. Biodiversity, Cryptogamic Botany, Plant Physiology and Biochemistry, Molecular Biology and Cell Biology, and Ecology are among the topics covered in these theses;

Course Out Come

Paper- 1001: Microbiology and Mycology

Unit-I Bacteria

1. General characteristics, Distribution and Classification of Bacteria
2. Cell structure (Gram positive and Gram negative) and Nutrition of Bacteria
3. Reproduction of Bacteria
   (a) Asexual (b) Sexual (Genetic recombination)
4. Economic and Industrial importance of Bacteria
5. Harmful activities of Bacteria

Unit- II Virus

1. General characteristics, History, Classification and Nomenclature of Virus
2. Chemistry and microstructure of Virus
3. Symptoms of viral infection on plants
4. Transmission of Viruses
5. Significance of Virus
6. Study of TMV, Bacteriophage and viroids

Unit- III Fungi -I

1. Introduction, General characters and Classification of Fungi
2. Fungal cell structure and composition
3. Fungi with absorptive Nutrition
4. Heterothallism in Fungi
5. General characters of following group
   a. Myxomycota
   b. Eumycota
   c. Mastigomycotina
   d. Oomycotes
6. Economic importance of fungi
   a. Negative aspect of Fungi
   b. Positive aspect of Fungi
7. Fungi and Biotechnology
   a. Fermentation technology
   b. Enzyme and Production technology
8. Mushroom cultivation

Unit- IV Fungi -II

1. Study of Classification, Occurrence, Cell structure and reproduction of following types.
   (a) Myxomycetes:
      - Plasmodiophora
   (b) Phycomycetes:
      - Synchitrium
      - Peronospora
      - Pilobolus

(c) Ascomycetes:
- Yeasts
- Claviceps

(d) Basidiomycetes:
- Ustiolago
- Polyporus

Reference Books:

1. Fungi, Bacteria and Viruses by H.C. Dube; Vikas publishing house
2. An Introduction to Mycology by R. S. Malhotra and K. P. Aneja; Wiley Eastern Ltd.
3. An Introduction to fungi by Pramod K Dublish; Kedar Nath, Ram NathPublishing
4. A test book of Fungi by G. L. Chopra; S. Nagin and Co.
5. Fungi by B. R. Vashishta; S. Chand and co
6. The fungi, bacteria and viruses by Lokendra Singh; Rastogi Publications
7. Text book of fungi by J.C. Gupta; Oxford and IBH publishing
8. Fungi, bacteria and viruses by H. C. Dube; Vikas publishing house

Paper 1002-Plant pathology

Unit I

1. Principle and history of plant pathology
2. General symptoms of plant disease
3. Classification of plant disease
4. Development of disease in plants

Unit II

1. Defense mechanisms of plants
2. Symptoms of bacterial diseases on plants
3. Symptoms of viral diseases on plants
4. Symptoms of fungal diseases on plants

Unit III

1. Biotic agents of infections and diseases
   (a) Bacteria
      - Bacterial blight of cotton
      - Bacterial wilt of solanaceous vegetable
      - Soft rots of fruits
      - Bacterial blight of paddy

   (b) Virus
      - Bunchy top of Banana
      - Leaf curl of papaya
      - Yellow vein moisac of bhendi
      - Leaf roll of potato

   (c) Fungi
      - White rust of crucifers
      - Stem galls of coriander
      - Rust of groundnut
      - Downy mildew of grapes

Unit-IV

1. Abiotic agents affected diseases
   (a) Symptoms of plants affected by abiotic factor
      - Air pollution
      - Mineral elements
      - Temperature
      - Toxic effects of improperly used chemicals.

   (b) Blossom rot of tomato
   (c) Mango black tip
   (d) Zinc deficiency of citrus
2. Control of plant diseases
3. Application of fungicides

Reference Books:

1. A text book of Modern plant pathology by Bilgrami K. S. ; VikasPublishing house
2. Plant Pathology by Horsfall J. G. and Diomond A. E. ; Academic press,London
3. Plant Diseases by Singh R. S.; Oxford and IBH Publishing Co.
4. Plant Patholgoy by R. K. Mehrotia, International pub. House, New Delhi, India
5. Essentials of Plant Pathology by V. N. Pathak, Prakash pub. House, Jaipur, India
6. Modern of Plant Pathology by H.S. Bilgrami and H. C. Dube, Vikas Publishing House, Delhi
7. Plant Pathology by Singh R. S. Oxford and IBH pub. New Delhi
8. Introductory plant pathology by Kamat M.N. Prakash Printing press, India.
9. Diseases of crop Plants in India by Rangaswami G. New Delhi, India
10. K S Bilgrami, H C Dube. A text book of modern plant pathology.
11. Gareth Johnes. Plant pathology: principles and practice.
12. R S Mehrotra. Plant Pathology.
13. M N Kamat. Practical plant pathology.
14. V K Gupta, T S Paul. Fungi and Plant disease.
15. Malhotra, Aggarwal Ashok. PlantPathology.
16. Rangaswamy, A Mahadevan. Diseases of crop plants in India.

Paper-1003: Phycology and Lichen

Unit-I Algae-I

1. Application of Algology
2. Classification of Algae
   (a) Fritsch's system
   (b) G. M. Smith system
3. General characters of Algae
4. Similarities and diversities
5. History and development of Algae
6. Occurrence of Algae
7. Cytology of Algae

Unit-II Algae-II

1. Principal characteristics of major algal classes
   a. Cyanophyceae
   b. Chlorophyceae
   c. Xanthophyceae
   d. Chrysophyceae
   e. Bacillariophyceae
   f. Cryptophyceae
   g. Dinophyceae
   h. Euglenophyceae
   i. Phaeophyceae
   j. Rhodophyceae
2. Range of thallus structure
3. Reproduction in algae
4. Origin and evolution of sex in algae
5. Life cycle in algae
6. Nitrogen fixation by blue green algae
7. Methods of algal study
8. Economic importance of algae

Unit-III Algae-III

1. General characters, thallus structure and reproduction of following groups

(a) Cyanophyceae :
- Gloeotrichia
- Lyngbya

(b) Chlorophyceae:
- Chlamydomonas
- Cladophora
- Zygnema

(c) Pheophyceae:
- Dictyota
- Fucus

(d) Rhodophyceae:
- Gracilaria
- Porphyra

Unit-IV Lichen

1. Classification, Habit and Habitat and distribution of Lichen
2. Thallus organization and internal characters of Lichen
3. Reproduction and Economic importance
4. Ecology and Physiology of Lichen
5. Study of following types
   (a) Usnea (b) Parmelia (c) Anaptychia

Reference Books:

1. Phycology by Annie Ragland; Saras publication
2. An introduction to Algae by V.K. Gupta and Y. P. Varshneya; Kendarnath Ram Nath Publishers
3. An Introduction to Algae by Suresh Kumar; Campus books.
4. An Introduction to Algae by Ian Morris; Hutchinson University Library
5. A text book of Algae by S.K. Sarkar; Central book depot
6. A text book of Botany: The Algae by Brahma Prakash Pandey; Jai Prakash Nath and Co.
7. A class book of Algae by G.L. Chopra; S. Hagin and Co.
8. A text book on Algae by H.D. Kumar and H.S. Singh; East-west press.

Paper-1004: Plant Anatomy, Embryology and Paleobotany

Unit-I Anatomy-I

1. Tissue system
   (a) Epidermal tissue system
   (b) Ground tissue system
   (c) Vascular tissue system
2. The Mechanical tissue
   (a) Collenchyma
   (b) Sclerenchyma
   (c) Xylem
   (d) Phloem
3. Apical meristems
   (a) Shoot apex
   (b) Root apex

Unit-II Anatomy-II

1. The root-Primary and Secondary Structure
2. The stem-Primary and Secondary Structure
3. Anatomy of the Leaf and the petiole
4. Nodal anatomy
5. Root-Stem transition
6. Secondary growth in Dicotyledonous stem and root

Unit-III Embryology

1. Micro sporangium
2. Male gametophytes
3. Mega sporangium
4. Female gametophytes
5. Fertilization
6. Double fertilization
7. Polyembryony

Unit-IV Paleobotany

1. Geological time table
2. Types of fossils and their significance
3. Useful techniques for fossil study
4. Detail study of the following fossils
   (a) Psilophytopsida:
   - Asteroxylon
   - Horneophyton

(b) Lycopsida:

- Protolepidodendron
- Miadesmia
- Stigmaria

(c) Filicopsida:

- Zygopteris
- Cladoxylon

(d) Cycadopsida:

- Lyginopteris
- Heterangium

Reference Books:

1. Comparative plant anatomy by Carlquist S. ; Hol Rinchart and Winston
2. Apical meristems by Clowers F.A. L.; Blackwell Co. Oxford
3. An introduction to plant Anatomy by Eames A.J. and l.H. Mac Deniels; MacGraw Hill Book Co
4. Plant Anatomy by Esau K. John wiley and sons Inc.
5. Anatomy of seed plants Esau K.; Jphn wiley and sonc Inc.
6. Plant Anatomy by Fahn A. Pergmno Press, Oxford
7. Secretory Tissues in Plants by Fahn A. Acedamic press London
8. Plant Anatomy by Pande B.P.; S. Chand and Co.
9. The embryology of Angiosperm by Bojwani S.S. and Bhatnagar S.P. ; Vikas publishing house Pvt ltd.
10. Gymnosperms and Palaeobotany by S. K Singh; Campus books
11. Pteridophytes, Gymnosperms and Palaeobotany by Kumarsan and Annie; Saras Publication
12. Systematic embryology of the Angiosperm by Devis G.L. ;John Willey and sons
13. An Introduction to the embryology of Angiosperms by Maheshwari P.; MacGraw Hill Book.
14. Fossil plants by Seward A. C.; New York

Practical: BOT-1005
(Mycology, Plant Pathology and Microbiology)

- The candidates should study the typical vegetation in natural condition and should record their observation in journals. Excursion should be arranged during the year to local places.
- Every candidate shall complete laboratory course in accordance with the regulations issued from time to time by Academic Council on the recommendation of the Board of Studies.
- Every candidate shall record observation directly in the laboratory journal. Every journal shall be signed periodically. At the end of the semester candidate shall produce certified journal during the practical examination.

- To study symbiotic Rhizobium (N_2 fixing) by gram staining
- Differential staining of bacteria using Gram stain.
- To study the presence of Microorganism in Pond water
- To Study some common bacteria with the help of permanent slides.
- To study different types of virus by Slides/ Charts
- To measure the dimensions of common micro organism by calibration and standardization of microscope with the help of stage and ocular micrometers
- Critical study of diagnostic features and identification of the following genera based on morphological, anatomical and reproductive parts.
  1. Peronospora
  2. Pilobolus
  3. Saproleginia Vegetative and Sexual
  4. Synchytrium
  5. Yeast cell and Budding
  6. Morchella
  7. Ustilago
  8. Puccinia
  9. Colletotrichum

- Collection and identification of common field Fungi and prepare and submit a report of collection (Minimum 5 Specimen).

- Causal organisms, symptoms and control measures of the following plant diseases

1. Diseases Caused by Bacteria
  a. Bacterial blight of cotton
  b. Bacterial wilt of solanaceous vegetable
  c. Soft rot of apple
  d. Bacterial blight of paddy

2. Diseases Caused by Virus

a. Bunchy top of Banana
b. Leaf curl of papaya
c. Yellow vein moisac of bhendi
d. Leaf roll of potato

3. **Diseases Caused by Fungi**
   a. White rust of crucifers
   b. Stem galls of coriander
   c. Rust of groundnut
   d. Downy mildew of grapes

➢ Collection and preservation of specimens from infected plants. Submit 5 herbarium sheets/live specimens along with a report.

Practical : BOT-1006

(Phycology, Lichen, Paleobotany, Anatomy and Embryology)

- Critical study of diagnostic features and identification of the following genera based on morphological, anatomical and reproductive parts;

1. Myxophyceae
   a. Anabena
   b. Gloeocapsa
   c. Lynbya

2. Chlorophyceae
   a. Chlamydomonas
   b. Enteromorpha
   c. Nitella - fertile and Vegetative
   d. Pithophora
   e. Ulva thallus
   f. Zygnema-Vegetative, Scal. And Lat. Conjugation

3. Phaeophyceae
   a. Dictyota - Vegetative, Anheridial, oogonial and Tetrasporic
   b. Padina

4. Rhodophyceae
   a. Gracillaria-Vegetative and Reproductive

- **Lichen:** To study external features and internal structures of following
  1. Usnea
  2. Parmalia
  3. Cladonia
  4. Graphis

  (Permanent slides of Lichen thallus T.S., Lichen apothecium V.S., Lichen soridia)
- Students are to collect and identify algae from different habitat or visit an Algal research station (If necessary). Prepare and submit a report of the field work/research station visit.
- To study specimens of paleobotany
- To prepare permanent slides from given stems by double staining methods
- To study Nodal Anatomy
  1. Uni-locular
  2. Tri-locular
  3. Multi-locular
- Maceration
- To study embryological stage from given specimen
- To study permanent slides of embryological stages
  1. T. S. of young anther
  2. T. S. of mature anther
  3. Mature dehiscing anther
  4. Pollen tetrads
  5. Pollen grain
  6. Binucleate embryo-sac
  7. 4-nucleate embryo-sac
  8. Endosperm
  9. Monocot embryo
  10. Dicot embryo

Paper-2001: Bryophytes, Pteridophytes and Gymnosperm

Unit-I Bryophytes

1. General characters of Bryophytes
2. Origin of Bryophytes
3. Classification of Bryophytes
4. Thallus structure and reproduction of Bryophytes
5. Affinities of Bryophytes
6. Evolution sporophytes in Bryophytes
7. Alternation of generation in Bryophytes
8. Comparison of Liverworts and Mosses
9. Economic importance of Bryophytes
10. Principal characters of following classes
    (a)Hepaticopsida (b) Anthocerotopsida (c) Bryopsida

Unit-II Pteridophytes

1. General characters of Pteridophytes
2. Classification of Pteridophytes
3. Affinities of Pteridophytes
4. Principal characters of following subdivision
   (a) Psilophytopsida (b) Psilotopsida (c) Lycopsida (d) Sphenopsida (e)Pteropsida
5. Heterospory and seed Habit
6. Telome theory
7. Stelar system and evolution of stele in Pteridophytes
8. Apospory and Apogamy

Unit-III Gymnosperm

1. General characters of Gymnosperms
2. Classification of Gymnosperms
3. Evolutionary trends and origin of Gymnosperms
4. Affinities and relationship of Gymnosperms
5. Important characters of various orders of Gymnosperms
   (a) Cyacadofilicales (b) Cycadeoideales (c) Cycadales (d) Cordaitales (e) Coniferales
6. Economic importance of Gymnosperms

Unit-IV

1. Study of life history of the following types
   (a) Bryophytes
   - Pellia
   - Plagiochasna
   - Pogonatum

(b) Pteridophytes
- Lycopodium
- Isoetes
- Angiopteris

(c) Gymnosperms
- Cupressus
- Taxus
- Ginkgo

Reference Books:

1. Brayophyta and Pteridophyta by Proff. R.C. Mathur; Vardhman Pustak Bhandar
2. Bryophyta, A treatiese by O.P. Sharma and S.A. Siddiqui; K.K. Mittal for Pragati Prakashan
3. A text book of Bryophyta by G.N. Chaudhuri; Vivekanand Kuity for the student friends and co.
4. A class book of Bryophyta by G.L. Chopra; Hari Singh and Bros.
5. Bryophyta – A broad prespective by Dr. (Mrs.) Prem Puri; Atma Ram and Sons
6. The structure and life of Bryophytes by E.V. Watson; Hutchinson and co.
7. Botany [for degree students] Bryophyta by B.R. vashishta; S.Chand and Co.
8. Introduction to Bryophyta by P.D. Sharma; Ramesh book depot
9. Biology and morphology of Pteridophyta by N. S. Parihar; Central book depot
10. Botany for degree students: Pteridophyta by P. C. Vasishta; S. Chand and Co (Pvt.) Ltd.
11. The morphology of pteridophytes by K. R. Sporne; Hutchinson and Co (Publisher) Ltd.
12. Botany for degree students: Pteridophyta by B. R. Vasishta; S. Chand and company Ltd.
13. Gymnosperms Structure and Evolution by Charls joseph Chamberlain; Dover publications
14. Gymnosperms by G.L. Chopra; S. Nagin and Co.
15. The Gymnosperms by M. N. Gupta; Shivalal Agrawala and Co.
16. Botany for degree students: Gymnosperms by P. C. Vasishta; S. Chand Publication
17. Gymnosperms and Palaeobotany by S. K Singh; Campus books
18. Pteridophytes, Gymnosperms and Palaeobotany by Kumarsan and Annie; Saras Publication

Paper-2002: Cell Biology

Unit-I Cell Organization

1. Introduction
2. General account of cell
3. Cell theory
4. Types of cell
5. Comparison between prokaryotic and Eukaryotic cell
6. Comparison between plant and animal cell

Unit-II

1. Plasma membrane
   - (a) Molecular organization, current model and functions
   - (b) Cell wall architecture
   - (c) Biosynthesis
   - (d) Growth and cell expansion
2. Nucleus
   - (a) Nuclear Envelope
   - (b) Nucleolus
   - (c) Function

Unit-III

1. Ultra structure and function of following organelles
   - (a) Endoplasmic reticulum
   - (b) Mitochondria
   - (c) Golgicomplex
   - (d) Ribosome
   - (e) Peroxisomes
   - (f) Lysosome
   - (g) Chloroplast
   - (h) Centrioles

Unit-IV

1. Chromosome :
   - (a) Structure
   - (b) Types of chromosome
   - (c) Packing of DNA
   - (d) Molecular organization of Centromere and Telomere
   - (e) Giant chromosome
2. Cell Cycle
   - (a) Introduction
   - (b) Phase G_1, S and G_2
3. Cell division
   - (a) Mitosis and control of cell division

(b) Meiosis

Reference Books:

1. Cell Biology by C. B. Powar; Himalaya publication house
2. Cell Biology by Vishwanath ; S. Chand and company
3. Cell Biology by S. P. Singh and B. S. Tomar; Rastogi Publications
4. Cell Biology- Fundamentals and applications by M. L. Jangir; Student edition
5. Cell Biology- organelle structure and function by Devid ; Jones and Bartlett publishers
6. Cell Biology by Anju Bhasin; Discovery Publishing house
7. Fundamental concept of Cell Biology by K. G. Purohit; Pragati Prakashan
8. Cell Biology by R. M. Shulka; Dominant Publishers and distributors
9. Cell Biology by Neal O. Thorpe; John Willey and sons publication

Paper-2003: Biostatistics, Botanical technique and computer application

Unit- I Biostatistics –I

1. Principle, scope and definitions of Biostatistics
2. Data types, Collection of data, Processing of data and Presentation of data
3. Measures of central tendency
   (a) Mean
   (b) Median
   (c) Mode
4. Measures of dispersion
   (a) Standard Deviation
   (b) Standard Error

Unit- II Biostatistics –II

1. Test of statistical significance
   (a) Chi-Square test
   (b) T-test
2. Probability:
   Definition, Basic concepts and Theorems of probability
3. Correlation analysis:
   Definition, Types of correlation, Degree of correlation and uses, methods of studying and calculation of Co-efficient of correlation
4. Regression analysis:
   Definition, Types and uses of regression analysis and methods of studying
5. Comparison of correlation and regression

Unit- III Botanical technique

1. Anatomical Technique
   (a) Microtome sectioning
   Fixation, Dehydration, Infiltration, Embedding, Sectioning and Staining
   (b) Camera Lucida
2. Ecological technique
   (a) Methods of floristic survey
   (b) Quadrates and transect methods
3. Physiological technique
   (a) Spectrophotometry and colorimetry
   (b) Paper Chromatography
   (c) Centrifugation
   (d) Electrophoresis

Unit-IV Computer Application

1. Introduction to computer
    (a) History of computer
    (b) Characteristics of computer
    (c) Use of computer
2. Generation of computer
3. Classification of computer
4. Processor
5. Part of computer
6. Hardware and software of computer
7. Internet
    (a) Introduction
    (b) Types of network
    (c) Resources for internet
    (d) World Wide Web (www.)

Reference Books:

1. Biostatistics in theory and practice by T. K. Saha, Emkat publications, Delhi
2. Biostatistics by P. Ramakrishnan, Saras publication, Kanyakumari
3. Biostatistics by P. N. Arora and P. K. Malhan, Himalaya Publishing House, Mumbai
4. Botanical micro technique by J. E. Sass
5. Plant micro technique by Johansen D. A.
6. Basic Statistics: A Primer for the Biomedical Sciences by Dunn and Clark., 3rd Ed. John Wiley & Sons, Inc, New York

Paper-2004: Taxonomy of Angiosperm

Unit I:

1. Objective and principles of plant taxonomy
2. Salient and characteristics features of Angiosperms
3. Classification of Angiosperms
   (a) Objective and types of classification
   (b) Engler and prantl's system
   © Hutchinson's system
   (d) Takhtajan's system
   (e) Ahur cronquist's system
4. Comparison between Bentham and Hooker, Engler and Prantl and Hutchinson's classification
5. Plant collection and preparation of herbarium
6. Botanical survey of India

Unit II:

1. Taxonomy in India
2. Origin and evolution of Angiosperms
3. Botanical museum
4. Taxonomic literature
5. Fossil Angiosperms

Unit III:

1. Phylogeny and floral variation of the following:
   (a) Parietals
   (b) Rosales
   (c) Geraminales
   (d) Myrtales

Unit IV

1. Study of the following families giving importance to morphological peculiarities if any, and economic importance, interrelationship and evolutionary lines.
   a. Dilleniaceae
   b. Guttiferae
   c. Malpigniaceae
   d. Oxalidaceae
   e. Balnitaceae
   f. Celastraceae
   g. Turneraceae
   h. Cactaceae
   i. Plumbaginaceae
   j. Santalaceae
   k. Orchidaceae
   l. Commelinaceae

Reference Books:

1. Manual of Cultivated plants by Bailey, L. H; The Macmillan Comp.
2. Plant Classification by Benson, L. B; D. C. Health Comp.
3. Plant Taxonomy by Benson L. B. ; Ronald Press
4. Plant taxonomy by Core E. L.; Prentice-hall Engle-wood Cliff .
5. Evolution and classification of Flowering plants by Cronquist A.; Nelson New York
6. Principles of Angiosperm Taxonomy by Devis P. H. And V. M. Heywood; Oliver and Boyd, Edinburgh
7. Families of flowering plants by Gunderson A.; ELBS series
8. The families of flowering plants Vol-I Dicotyledon and Vol-II Monocotyledon by Hutchinson J, Oxford University Press
9. College Botany Vol-III by Mukerjee S.K. ; New central Book Agency
10. Morphology of Angiosperm by Coutter J. M. And Chamberlin;

Practical: BOT-2005

(Bryophytes, Pteridophytes, Gymnosperms, Cell Biology and techniques)

- The candidates should study the typical vegetation in natural condition and should record their observation in journals. Excursion should be arranged during the year to local places.
- Every candidate shall complete laboratory course in accordance with the regulations issued from time to time by Academic Council on the recommendation of the Board of Studies.
- Every candidate shall record observation directly in the laboratory journal. Every journal shall be signed periodically. At the end of the semester candidate shall produce certified journal during the practical examination.

- Study of morphology and anatomy of vegetative and reproductive organs using clear whole mounts/sections of the following genera:

1. Bryophytes
   a. Marchentia
   b. Pellia
   c. Lunularia
   d. Targionia
   e. Notothylas
   f. Pogonatum
   g. Funaria
2. Pteridophytes
   a. Azolla
   b. Salvinia
   c. Lycopodium
   d. Isoetes
   e. Botrychium
   f. Gleichenia
   g. Pteris
   i. Lygodium
3. Gymnosperms
   a. Thuja
   b. Podocarpus
   c. Zamia
   d. Taxus
   e. Zinkgo
   f. Cupressus

- To study different stages of Mitosis from onion root tip
- To study different stages of Meiosis from flower buds
- Determine the frequency, density and abundance of the different species by quadrate methods

Practical: BOT-2006
(Taxonomy; Biostatistics and Computer application)

- Statistical Problems (Probability, Chi-Square test and Correlation analysis)
- To study different parts of computer and there functions (CPU, Monitor, Key board, Mouse, Pen drive, CD, DVD, Printer, RAM, Card Reader and different types of cable)
- To study placentation from given material (Marginal, Free central, Axile, Parietal, Super ficial and Basal)
- Study Camera Lucida
- Classification, general and distinguishing characters of the families and examples. Classification according to Bantham and Hooker system (Family as per theory paper)
  1. Dilleniaceae
  2. Guttiferae
  3. Malpigniaceae
  4. Oxalidaceae
  5. Balanitaceae
  6. Celastraceae
  7. Turneraceae
  8. Cactaceae
  9. Plumbaginaceae
  10. Santalaceae
  11. Orchidaceae
  12. Commelinaceae

M.Sc. Botany SEM-III

- 3001- **Plant Physiology**
- 3002- **Biochemistry**
- 3003- **Plant Ecology And Conservations**
- 3004- **Phytogeography, Plant For Human Welfare And Plant Breeding**
- **Practical -3005**
- **Practical-3006**

M. Sc. Botany SEM-IV

- 4001- **Economic Botany, Horticulture And Applied Botany**
- 4002- **Plant Biotechnology And Bioinformatics**
- 4003- **Genetics**
- 4004- **Angiosperm Systematic Botany**
- **Practical-4005**
- **Dissertation-4006**

Veer Narmad South Gujarat University, Surat
Syllabus for M.Sc. Semester-III
BOTANY PAPER -3001 (Plant Physiology)
(Effective from June-2019)

==========

Unit-I Plant water relations

- Water: 1. Sources and Functions
  2. Physicochemical properties of water
- Absorption of water and mineral
  1. Water uptake by root
  2. Xylem and phloem transport
  3. Passive and active transport
  4. The cohesion theory
- Transpiration and stomatal movements
- Role of mycorrhizaein in nutrient uptake

Unit-II Photosynthesis

- History
- Photosynthetic pigments
- Mechanism of photosynthesis
  1. Light reaction
     a. PS-I and PS-II
     b. Photo-oxidation of water
     c. Production of assimilatory powers
  2. Dark reaction
  3. C_4 Cycle
  4. CAM Cycle
- Factor affecting the rate of photosynthesis

Unit-III Respiration

- History and types
- Mechanism
  1. Glycolysis
  2. Krebs cycle
  3. ETS
- Factors affecting respiration
- Photorespiration
- Lipid metabolism in oil seeds- Glyoxylate cycle and gluconeogenesis

Unit-IV Assimilation of Inorganic nutrients

- Nitrogen metabolism
  1. Introduction
  2. Source of nitrogen
  3. Nitrogen fixation
     a. Physical
     b. Biological
     c. Biochemistry of Nitrogen fixation
- Assimilation of Sulphate
- Assimilation of Phosphate
- Assimilation of Cations
- Scope and importance of plant physiology in agriculture

Reference Books

- Lincoln Taiz, Eduardo Zeiger (2002). Plant physiology (II Edn). Sinaeur Associates, Inc. Publishers.
- Frank B Salisbury, Cleon W Ross (1992). Plant Physiology (IV Edn). Wadsworth Publishing Company.
- Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2002). Molecular biology of the cell (IV Edn). Garland Science, Taylor and Francis group.
- Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Anthony Bretscher,
- Hidde Ploegh, Paul Matsudaira (2007). Molecular cell biology (VI Edn). W H Freeman & Company.
- An Introduction to Plant physiology by A.K. Ganguly and N. C. Kumar; Emkay Publications
- Plant physiology by Robert M Devlin; Affiliated East–west Press Pvt Ltd.
- Text book of Plant Physiology by P. L. Kochhar and A.C. Joshi; Atma Ram and Sons
- Pant Physiology by R.C. Grewal; Campus books international
- An Introduction to Plant Physiology by W. O. James; Oxford university press.
- Plant Physiology by S. N. Pandey and B. K. Sinha; Vikas publishing house Pvt Ltd. 22
- Fundamentals of Plant Physiology by V. K. Jain; S. Chand and company ltd.
- Advance in Plant Physiology Vol I, II and III by A. Hemantaranjan; Scientific Publishers
- Plant Physiology by Salisbury and Ross; Prentice/Hall of India Pvt. Ltd.
- Physiology of plant growth and development by M. B. Wilkins; Tata McGrew-Hill
- Bewley, J.D. and Black. M. 1994 Seeds : Physiology of development and germination. Plenum Press, New Yor.
- Bendre, A. and Kumar, 2004 A. Rastogi pub. Meerut, India.
- Crocker, W. and Barton V.1953 Physiology of seeds. Waltham, Mass, U.S.A

Veer Narmad South Gujarat University, Surat
Syllabus for M.Sc. Semester-III
BOTANY PAPER -3002 (BIOCHEMISTRY)
(Effective from June-2019)

Unit I

- Carbohydrates
  1. Introduction
  2. Monosaccharide: Chemistry, Properties, Classification and Function of Monosaccharide
  3. Oligosaccharide: Chemistry, Properties and types Oligosaccharide.
  4. Polysaccharide: Chemistry and properties of homopolysaccharide: Starch and cellulose. Chemistry and properties of heteropolysaccharide:
- Lipids
  1. Classification
     a. Simple lipids
     b. Compound lipids
     c. Derived lipids
  2. Synthesis of lipids
  3. Properties of fatty acid and fats
  4. Suberin and waxes

Unit II

- Amino Acids : Classification, Properties and Structure
- Protein: Classification, Structures (Primary, Secondary, Tertiary and Quaternary) and Biological functions
- Enzymes: Introduction, Nomenclature and Classification, Physico-chemical properties, Mechanism of enzyme action, Theories of enzyme action, Factors affecting enzyme activity
- Coenzymes

Unit III

- Vitamins
  1. Classification and Properties
  2. Source, functions and deficiency symptoms of vitamins (Fat and water soluble)
- Pigments: Structure and properties of Chlorophyll, Carotenoids, Phycobillin and Anthocyanin
- Nucleic Acids: Phosphodiester Bond, Nitrogenous Bases: Purines and Pyrimidines. Modified Nitrogenous Bases, Types of DNA and Types of RNA

Unit-IV

- Alkaloids
  1. History, classifications and properties
  2. Extraction and Biosynthesis
  3. Biological role and applications
- Flavonoids
  1. Introduction and definition
  2. Subgroups and Biosynthesis
  3. Functions of flavonoids in plants
- Antibiotics
  1. Introduction and History
  2. Study of Constitution, production, synthesis and clinical properties of following antibiotics
     a. Penicillin
     b. Streptomycin
     c. Tetracycline

Reference books:

- Lea,P.U. and Leegood,R.C. 2001. Plant Biochemistry and Molecular Biology. John Wiley and Sons, New York.
- Lehninger,A.L. 2008. Principles of Biochemistry, 5th Ed. W.H. Freeman.
- Salisbury, F.B and Ross, C.W. 1992. Plant Physiology (4th Edition) Wadsworth Publishing co, USA
- Vasantha Pattabhi and Gautham,N. 2002. Biophysics. Narosa publishing House, Chennai.
- Jayaraman,J. 1981. Laboratory Manual in Biochemistry. Wiley Eastern Limited, New Delhi.

- Conn, E.E, Stumpf, P. K, Bryening, G and Doi, R. H Outlines of Biochemistry 5/E. John Wiley & Sons, New York.
- Sadasivam. S and Manikam, A.1992. Biochemical Methods for Agricultural Sciences. Wiley Eastern Ltd. New Delhi
- Bob B Buchanan, Wilhelm Gruissem, Russel L Jones (2000). *Biochemistry and molecular biology of plants*. L K International Pvt. Ltd.
- Reginald H Garrett, Charles M Grisham (2005). *Biochemistry*. Thomson Brooks/Cole
- H Robert Horton, Laurence A Moran, Raymond S Ochr, J David Rawn, K Gray Scrimgeour (2002).*Principles of Biochemistry* (III Edn). Prentice Hall.
- William H Elliott, Daphne C Elliott (2001). *Biochemistry and molecular biology* (II Edn). Oxford
- Jeremy M Berg, John L Tymoczko, Lubert Stryer, Gregory J Gatto Jr. (2007). *Biochemistry*. W H Freeman and company.
- David E Sadava (2009). *Cell biology: Organelle structure and function*. CBS
- S Sadasivam, A Manickam (1996). *Biochemical methods* (II Edn). New age international Publishers.

Veer Narmad South Gujarat University, Surat
Syllabus for M.Sc. Semester-III
BOTANY PAPER - 3003 (PLANT ECOLOGY AND CONSERVATIONS)

(Effective from June-2019)

Unit – 1. Concepts of ecosystems

- Types–Fresh water, marine and terrestrial -ecosystem
- Components of Ecosystems
- Food chain and food web
- Ecological pyramids
- Energy Flow in Ecosystem
- Development and evolution of ecosystems
- Structure and functions of Ecosystem
- Primary production
- Litter fall and decomposition
- Global biogeochemical cycle C, N, P and S

Unit -2. Plant community

- Composition and Structure of Plant Community,
- Qualitative and Quantitative Characteristics,
- Classification of communities
- Methods of study of communities-Floristic, physiognomic and phyto-sociological methods
- Ecological Succession, Process, Models and Climax Stage, of Hydrosere, Xerosere and causes of succession,

Unit-3. Ecological level

- Population ecology,
- Ecological Niche
- Autecology
- Biological clock
- Mortality,
- Natality

Biological Diversity:

- Role of biodiversity in ecosystem functions and stability;
- IUCN categories of threat
- Biodiversity hot spots
- Ecology of plant invasion
- Mapping biodiversity,
- IUCN Red data books,
- Germ-plasm banks,
- In-situ and Ex-situ conservation

Unit – 4. Conservation

- What can we do for the conservation of Ecosystem?
- Environmental Issues Climate Change:
- Greenhouse gases (CFCs, CH_4, CO_2, N_20,; sources and role);

- Ozone depletion and climate change (Global warming, CO_2 fertilization, Sea level rise, UV radiation etc.).
- Sustainable development, Bioremediation, Phytoremediation, conservation and management strategies

Reference Books

- Ambhast, R. S. (1998) A Text Book Of Plant Ecology. (9th edition),
- Barbour, M.G., Pits, W.D., and Burk, J. H. (1967) Terrestrial Plant Ecology, Addison-Wesley Publisher.
- Chapman and Reiss (2000) Ecology Principals and Application, Cambrige Uni. Press, UK
- Friend and co.5. Canter L (1996) Environmental Impact Assessment, 2nd Edition, McGraw Hill PublishingCompany.
- Jakson M L (1973) Soil Chemical Analysis, Prentice Hall of India Pvt. Ltd. New Delhi
- Kershaw, K. A. (1978) Quantitative and dynamic plant ecology, 2nd edition, EdwardArnold publication.
- Kumar, H. D. (1981) Modern concepts of ecology, (8th edition), Vikas publication.
- Mishra, R. (1968) The Ecology Work Book, Oxford and IBH public. Co., Kolkata.
- Mukherjee, B. (1996) Environmental Biology, 1st edition, Tata Mcgraw Hill.
- Mukherjee, B. (2000) Environmental Mgmt.: Basic and applied aspects ofmanagement of ecological environmental system. 1st edition. Vikas Publication House.
- Odum, E. P. (2007) Fundamentals of Ecology , 5th edition, Thomson books.
- P.D. Sharma, Ecology and Environment: Rastogi Publication
- Pandya, Puri and Singh (1968) Research Methods in Plant Ecology, Asia publishing House, New Delhi.
- Subrahmanyam and Sambamurthy (2000) Ecology, Narosa Publising House, New Delhi
- Yadav, P. R., and Mishra, S. R. (2004) Environmental biology, Discovery publication, New Delhi

Veer Narmad South Gujarat University, Surat
Syllabus for M.Sc. Semester-III
BOTANY PAPER -3004 (Phytogeography, Plant for Human Welfare and plant breeding)

(Effective from June-2019)

Unit-I Phytogeography

- Main forest types of India and their floristic composition
- Different forest of Gujarat and their vegetation
- Social forestry and Agroforestry
- Major and minor forest products of India and Gujarat

Unit-II plant for human welfare – I

- Medicinal plants: Importance of medicinal plants- role in human health care
- Traditional knowledge and utility of some common medicinal plants – *Jatropha curcus, Mentha piperita, Michelia champaca, Mucuna prurens, Oroxylum indicum, Putranjiva roxburghii, Tecomella undulata, Buchanania lanzam, Dillenia indica, Dioscorea bulbifera and Euphorbia hirta*
- Common timber yielding plants
- Insecticides from plants

Unit-III plant for human welfare – II

- Nutritive and medicinal value of some fruits and vegetables (Guava, Sapota, Orange, Mango, Banana, Lemon, Pomegranate)
- Beverages (Coffee, Tea, Chocolate)
- Common ornamental plants
- Bonsai
- General account of dyes, tannins, gums and resins

Unit-IV Plant breeding

- History and Objective of plant breeding
- Application and methods and steps' of plant breeding
- Importance of plant breeding
- Self-pollinated and cross pollinated crops.

Reference Books

- Chopra, V.L. (2001) Plant Breeding: Field Crops. Oxford IBH Pvt.Ltd. New Delhi
- Chopra, V.L. (2001) Plant Breeding: Theory and Practice. Oxford IBH Pvt.Ltd. New Delhi.
- Ecology and Environment by P. D. Sharma; Rastogi publication
- Plant Ecology and Phytogeography by V. Kumaresan; Saaras publication
- Ecology of plants by Eug Warming; Biotech Books
- Text book of Plant Ecology by R. S. Ambasht; Student' friends and co
- A text book of Plant Geography of India by Bharuch; Oxford University Press Ltd.
- Plant Geography of flowering plants by Good R; Longmans , Green and Co
- Manual of Indian Forester by Bor N. L. ; Oxford University Press
- Indigenous drugs of India by Chopra R. N. ; Manager of Publications
- Glossary of Indian Medicinal plants by Chopra R. N. ; CSIR
- Useful plants of India Pakistan by Dastur J. F.; D. B. Taraporwala sons and co. Ltd
- Vegetable Fats and Oils by Eckey E.; Reinhold Publishing corporation

- Indian medicinal Plants 3 Vol by Kirtikar , K. R. And Basu B.D.
- Directory of Economic Plants in india by Maheshwari P. And Singh U. ; ICAR New Delhi
- Economic Botany by Bendre and Kumar ; Ratogi Publications

Practical -3005 (As per paper 3001 and 3003)

- Effects of different light on rate of photo synthesis.
- Determine ioselectric point of protein.
- Thin layer chromatography.
- Estimation of Curcumin content in a given plant sample.
- Estimation of Total Alkaloid content in Tobacco leaves.
- Determine the saponification value of an Oil.
- Water analysis
  1. Determine the COD from the given water sample.
  2. Determine the BOD from the given water sample.
  3. Determine TDS from the given water sample.
  4. Determine TSS from the given water sample.
  5. Determine Oil and Grease from the given water sample.
- Soil analysis
  1. Determine pH and conductivity from the given soil sample.
  2. Determine amount Nitrogen from the given soil sample
  3. Determine amount Potassium from the given soil sample
  4. Determine amount Phosphorous from the given soil sample
  5. Determine amount Sulphate from the given soil sample
- To study different Physiological instruments.
  1. Colorimeter 2. Spectrophotometer 3. pH meter 4. Flame photometer
- To study different Ecological instruments.
  1. Sling-psichrometer 2. Soil thermometer 3. Turbidity meter 4. Anemometer
  5. Rainguage 6. Hygro-Thermograph
- Demonstration experiment of Physiology.
  1. Fermentation experiment of Kohen's .
  2. CO_2 release during aerobic respiration
  3. Compare the process of photosynthesis and respiration.
  4. Simple demonstration of 'Ascent of sap'.
  5. Determination of suction pressure developed due to transpiration pull.
  6. Determination of the rate of transpiration by simple method (Conical flask method)
- To study different types of ecological pyramids.

Practical -3006 (As per paper 3002 and 3004)

- Preparation of different kind of solutions (Normal, Molar, Percentage and ppm).
- Determination of sugar from the given sample
- Protein estimation from the given sample
- Estimation of proline from the given sample
- Estimation of Ascorbic acid from the given sample
- Total chlorophyll estimation from the sample.
- Pharamacognocy – Clove, Fennel, Cardamon, Rauwolfia and Fenugreek
- To study Fruits and vegetables and its nutritive value.
  1. Fruits- Guava, Sapota, Orange, Mango, Banana, Lemon and Pomegranate.
  2. Vegetables- Brinjal, Pea, Cabbage, Fenugreek, Tomato, Lady's finger, Bottle gourd and Cucumber
- To study Beverages.- Coffee, Tea, Chocolate
- To study Medicinal plants.- *Jatropha curcus, Mentha piperita, Michelia champaca, Mucuna prurens, Oroxylum indicum, Putranjiva roxburghii, Tecomella undulata, Buchanania lanzam, Dillenia indica, Dioscorea bulbifera and Euphorbia hirta*
- To study different Timber yielding plants.- *Accacia nilotica, Anogessus latifolia, Dalbergia latifolia, Gmelina arborea, Tectona grandis and Terminalia chrenulata*
- To study Insecticides plants.- Neem, Garlic, Chile pepper, Tomato leaf, Calotropis, Derris and Tephrosia
- Bonsai –demonstration.
- To study Dyes yielding plants.- Teak leaf, Bixa, *Indigofera tinctoria*, *Beta vulgaris*, *Butea monosperma*, *Kirganelia reticulates* and *Lawsonia alba*
- To study Narcotic plants.- Opium, Salvia, Cannabis, Tobacco and Datura

Veer Narmad South Gujarat University, Surat
Syllabus for M.Sc. Semester-IV
BOTANY PAPER -4001 (Economic Botany, Horticulture and Applied Botany)

(Effective from June-2019)

Unit-1

- Paper-raw material, manufacture of paper, kinds of paper and paper products, paper industries in India.
- Natural Dyes and Narcotic Plants
- Edible mashrooms,
- Bio fertilizer
- Biodegradation
- Value of Botany in service of mankind

Unit-2

- Plant fibres- Difference between various plant fibres, structure and occurrence of fibres, economic classification of fibres, characters and their use
- Aromatic Plants and Essential oils- Fats and solvent extraction of essential oil, nature, function, uses, medicinal and industrial oils, fat and solvent extraction, camphor oil, peppermint oil, sandal wood, Jasmin, Rose, Khus, Lemon grass, Citrus oil, Clove oil.

Unit–3

- Propagation by seeds and vegetative structures, harvesting, storage and viability, germination, dormancy (seed and bud), Pre-treatments Techniques,
- Rooting of cuttings, Grafting, Budding, Layering
- Important horticultural crops of India with emphasis on Gujarat fruit/ flowers cultivation, harvest and post –harvest handling.
- Hi tech Horticulture-Propagation, postharvest storage, protection

Unit-4

- Gardening and Landscape Cultivation under cover,
- Greenhouse: advantages, construction, types, maintenance.
- Organic farming, Mulching, Composting,
- Landscaping –principles, types, planning,
- Xeri-scaping,
- Garden –features / elements, styles,
- Indoor gardening,
- Gardens of India

References books

- Bendre and Kumar; Economic Botany: Ratogi Publications
- Bor N. L.; Manual of Indian Forester: Oxford University Press
- Callow, J.A., Ford-Lloyd, B.V. and Newbury, H.J. (1997) Biotechnology and Plant Genetic Resources: Conservation and Use. CAB International, Oxon, UK.
- Chopra R. N. Glossary of Indian Medicinal plants: CSIR

- Chopra R. N.; Indigenous drugs of India: Manager of Publications
- Dastur J. F. Useful plants of India Pakistan : Taraporwala sons and co. Ltd
- E. Blatter and Walter S. Millard,1997 Some beautiful Indian Trees, second edition : Oxford University Press.
- Eckey E.; Vegetable Fats and Oils : Reinhold Publishing corporation
- G.S.Randhawa and A.Mukhopdhyay, 1998, Floriculture in India: Allied Publishers Limited.
- Kirtikar , K. R. and Basu B.D. Indian medicinal Plants 3 Vol.
- L.H.Bailey1958. Manual of cultivated plants :The Macmillan Company,New York.
- Maheshwari P. And Singh U, Directory of Economic Plants in India; ICAR New Delhi
- N.L.Bor and M.B.Raizada, Some beatiful Indian Climbers and Shrubs, second edition: Oxford University Press.
- S. Prasad and U.Kumar,(1998) Commercial Floriculture, Agro-botanica.
- U. Banerjee (2001) Commercial flower Production Mangal Deep Publications, Jaipur.

Veer Narmad South Gujarat University, Surat
Syllabus for M.Sc. Semester-IV
BOTANY PAPER - 4002 (PLANT BIOTECHNOLOGY AND BIOINFORMATICS)

(Effective from June-2019)

Unit I: Biotechnology

- Basic concept, Definition, Scope and Importance of Biotechnology
- Application of Biotechnology and medical biotechnology
- Benefits of Biotechnology and types of Biotechnology
- Techniques of enzyme and cell immobilization and its application in industries

Unit-II Plant Tissue Culture

- Historical Perspective: (Haberlandt, Skoog and Miller, Maheshwari and Guha)
- Equipment in Tissue culture, Composition of Media (MS), Nutrient and Hormone Requirement (role of Vitamins and Hormones); Sterilization Methods, Totipotency, Callus culture, Organogenesis and Embryogenesis

Application of Plant tissue culture

- Methods of Plant tissue culture
- Tissue Culture Application: (Hybrids, Micropropagation, Androgenesis, Virus Elimination, Secondary Metabolite Production, Crop Improve ment-Haploids, Triploids and Hybrids; Cryopreservation, Germplasm Conservation)
- Somaclonal variations

Unit III Tools and Techniques of Genetic Engineering

- Recombinant-DNA technology methods, Restriction Endonucleases (History, Type and role in rDNA technology) and ligase.
- PCR and its Applications and DNA fingerprinting
- Blotting Techniques (Southern, Northern and Western)
- Gene Constructs-Marker genes, Reporter genes. Gene transfer methods –Ti plasmid, *Agrobacterium* mediated DNA transformation and Direct Gene transfer Methods: Gene Gun, Microinjection, Electroporation.

Unit IV: Introduction to Bioinformatics

- Bioinformatics: History and scope of Bioinformatics, Aim and Branches of Bioinformatics.
- Introduction to Biological databases, Classification of Biological databases based on Source and nature of data, International Nucleotide Sequence Database Collaboration (INSDC),
- National Centre for Biotechnology Information (NCBI). A brief note on NCBI Tools and Databases
- European Molecular Biology Laboratory (EMBL)- Introduction only
- DNA Data Bank of Japan (DDBJ)- Introduction only
- Protein Information Resource (PIR) Database-Introduction Only
- Concept of Sequence Alignment, Pairwise and Multiple Sequence Alignment (MSA),
- Scoring Matrices (PAM and BLOSUM),
- Global and Local Alignment

Reference books

- Nirmala,C.B.,G. Rajalakshmi and Chandra karthick. 2009. Plant Biotechnology. MJP publishers, Chennai
- Chawla,H.S. 2008. Introduction to plant Biotechnology. Oxford & IBH publishing co., Pvt. Ltd. New Delhi.
- Ramawat, K.G. 2000. Plant Biotechnology, Chand & Co. New Delhi
- Adrian Slater, Nigel Scott and Mark Fowler, 2004. Plant Biotechnology – The genetic manipulation of plants – Oxford University Press.
- Chawla, H.S. 2008. Introduction to plant Biotechnology Oxford & IBH publishing co. pvt. Ltd., New Delhi.
- Subha Rao,N.S. 2003. Soil Microbiology 4th ed. Oxford & IBH Publishing Co. Pvt Ltd. New Delhi

- Old, R. W. and S. B. Primrose. 2000. Principles of gene manipulation. An introduction to genetic engineering. 5th ed. Blackwell Science Ltd. oxford.
- Winnacker, E.N. 2003. From genes to clones. Panama publishing corporation. pvt.Ltd. New Delhi.
- Venkataraman, G.S. 1972. Algal biofertilizers and rice cultivation. Today & tomorrow's printers & publishers.
- Kannaiyaan, S. 2002. Biotechnology of Biofertilizers. Narosa publishing house, New Delhi.
- Biotechnology, 2009. V. Kumaresan. Saras Publication Pvt. Ltd.
- Advanced Biotechnology by R.C. Dubey,
- Elements of Biotechnology, 2000. P. K. Gupta
- Plant functions and biotechnology by V. Kumardan and Annie Ragland; Saras Publication
- Plat biotechnology by M. Sudhir ; Dominant publisher and distributor
- Trends in plant tissue culture and Biotechnology by L. K. Pareek; Updesh Purohit for Agrobios
- Tools and techniques of Biotechnology by Mousumi debnath; Pointer publisher
- Plant Biotechnology by S. S. Purohit; Updesh Purohit for Agrobios
- Plant Biotechnology- the genetic manipulation of Plants by Adrion slater, Nigel W. Scott and Mark R. Fowler; Oxford University Press.
- Bio-informatics by M. N. Ranga; Agrobios

Veer Narmad South Gujarat University, Surat
Syllabus for M.Sc. Semester-IV
BOTANY PAPER - 4003 (Genetics)

(Effective from June-2019)

Unit-I

- Mendel's work and laws of Heredity
  1. Law of dominant's (including Variation in dominance)
  2. Law of independent assortment
  3. Law of segregation
- Types of Genetic interaction
  1. 12:3:1- Dominant epsitasis
  2. 9:3:4- Recessive epistasis (Supplementary gene)
  3. 9:6:1- Duplicate gene with cumulative effects
  4. 9:7- Complimentary gene
  5. 1:1- Duplicate dominant gene
  6. 13:3- Dominant and recessive interactions
- Multiple alleles

Unit-II

- Genetic code
  Properties of the code, Codons, anticodons, Initiation codons and nonsense codons
- Cytoplasmic Inheritance
  1. Plastid inheritance in Mirabilis and Maize
  2. Kappa particles in paramecium
  3. Coiling of shells in snails
  4. Milk factor in mice
- Sex link inheritance

Unit-III

- Fine structure of gene and Expression of gene
- Protein synthesis:- Initiation, Elongation and Termination
- Types of regulation mechanisms
  1. Negative and positive control
  2. Catabolic repression and feedback inhibition
  3. The lac operon , the gal operon and tryptophan operon
- Genetic regulation in eukaryotes

Unit-IV

- Genetic mutation :
  A. Change in structure of chromosome
  1. Deletion 2. Duplication 3. Inversion 4. Translocation
  B. Change in chromosome number
  1. Monoploidy 2. Polyploidy 3. Aneuploidy
- Genetic Diseases
  Metabolic block, Phenyl ketonuria, Albinism and Sickle cell anemia

Reference books

- Albert B. Bray, D Lewis, J Raff, M. Robert, K. and Walter 1989, Molecular Biology of the Cell (Second Edition) Garland Publishing Inc, New York.
- Atherly, A.G., Girton, J.R. and McDonald, J.F 1999. The Science of Genetics Saunders College Publishing, Frot Worth, USA.
- Burnham, C.R 1962. Discussions in Cytogenetics. Burgess Publishing Co. Minnesota.
- Busch, H. and Rothblum. L 1982. Volume X. The Cell Nucleus rDNA part A. Academic Press.

- Hartk D.L and Jones, E.W 1998 Genetics: Principles and Analysis (Fourth Edition). Jones and Bartlett Publishers, Massachusetts, USA.
- Khush, G.S 1973. Cytogenetics of Aneuploids. Academic Press, New York, London.
- Karp, G. 1999. Cell and Molecular Biology : Concept and Experiments. John Wiley and Sons, Inc., USA.
- Lewin, B. 2000. Gene VII. Oxford University Press, New York, USA.
- Lewis, R. 1997. Human Genetics : Concepts and Application (Second Edition). WCB McGraw Hill, USA.
- Malacinski, G.M and Freifelder, D. 1998 : Essentials of Molecular Biology (Third Edition). Jones and B. Artlet Publisher, Inc., London.
- Russel, P.J. 1998. Genetics (Fifth Edition). The Benjamin/Cummings Publishing Company IND., USA.
- Snustad, D.P and Simmons, M.J 2000. Principles of Genetics (Second Edition). John Wiley and Sons Inc., USA.
- Gardner and Simmons Snustad 2005 (Eighth Edition). Principles of Genetics, John Wiley and Sons, Singapore.
- Sariu C 2004 (Sixth Edition) Genetics. TATA McGraw-Hill Publishing Company Ltd., New Delhi.
- Ahluwalia K.B 2005 (First Edition). Genetics. New Age International Private Ltd. Publishers, New Delhi.
- Burus and Bottino 1989. (Sixth Edition). The Science of Genetics. Macmillan Publishing Company, New York (USA).
- Pawar C.B 2003 (First Edition). Genetics Vol. I and II. Himalaya Publishing House, Mumbai.
- Strickberger 2005. (Third Edition). Genetics. Prentice Hall of India Pvt. Ltd.
- Molecular biology and genetic engineering by L. M. Naraya, A. Mani, A. M. Selva Raj, N. Arumugam and Padmalatha Singh; Saras Publication
- The science of genetics by William Hexter, Henry T. Yost; Prentice Hall of India.
- Genetics by A.M. Winchester; Oxford and IBH publishing Co.
- Genetics by Karvita B Ahluwalia; Wile Eastern Limited.
- Genetics by P.S. Verma and V.K. Agrawal; S. Chand and Co.
- Principles of Genetics by Sinnott, Dunn, Dobzhansky; TMH Edition
- An Introduction to Morden Genetics by C.H. Waddington; Mangal deep publications
- Fundamentals of Genetics by Mohan P. Arora; Himalay Publication House

Veer Narmad South Gujarat University, Surat
Syllabus for M.Sc. Semester-IV
BOTANY PAPER - 4004 (Angiosperm systematic Botany)

(Effective from June-2019)

Unit-I

- Principles of taxonomy and Phylogeny of Angiosperms
- Modern trends in taxonomy
- Alpha and Omega taxonomy
- General characters of the flora of India
- Theories of differentiation and Natural selection
- Plant Speciation and Isolation

Unit-II

- Plant identification
  1. Plant characters and methods of plant identification
  2. Artificial Key
- Special types of Angiosperms (1) Parasites (2) Saprophytes
- The new global taxonomy initiatives
  1. Systematic agenda-2000 and missions
  2. Systematic knowledge and value of biodiversity
  3. Taxonomy and conservation of biodiversity
- National Bureau of Plant Genetic Resources and its conservation efforts

Unit-III

- Numerical Taxonomy
- Taxonomy Relation to Embryology
- Taxonomy Relation to Anatomy
- Taxonomy Relation to Palynology
- Taxonomy Relation to Phyto-chemistry
- Remote Sensing- Principles, Components, Types and Applications.
- GIS, GPS and their importance.

Unit-IV

- Study of the following families with reference to their geographical distribution, systematic position, floral variations, uses and examples.

1. Flacourtiaceae	2. Polygalaceae	3. Burseraceae	4. Ochanaceae
5. Averrhoaceae	6. Phytolaceaceae	7. Piperraceae	8. Louraceae
9. Typhaceae	10. Utricaceae	11. Bombacaceae	12. Iridaceae
13. Moringaceae	14. Dioscoreaceae		

Reference Books

- Plant Classification by Benson, L. B.; D. C. Health Comp.
- Plant Taxonomy by Benson L. B. ; Ronald Press
- Plant taxonomy by Core E. L.; Prentice-hall Engle-wood Cliff .

- Evolution and classification of Flowering plants by Cronquist A.; Nelson New York
- Principles of Angiosperm Taxonomy by Devis P. H. And V. M. Heywood; Oliver and Boyd, Edinburgh
- Families of flowering plants by Gunderson A.; ELBS series
- The families of flowering plants Vol-I- Dicotyledon and Vol-IIMonocotyledon by Hutchinson J.; Oxford University Press
- College Botany Vol-III by Mukerjee S.K. ; New central Book Agency
- An Introduction to plant Taxonomy by Jeffrey C.; Oxford university press
- Plant Classification by Benson, L. B; D. C. Health Comp.
- Plant Taxonomy by Benson L. B. ; Ronald Press
- Plant taxonomy by Core E. L.; Prentice-hall Engle-wood Cliff .

- Evolution and classification of Flowering plants by Cronquist A.; Nelson New York
- Principles of Angiosperm Taxonomy by Devis P. H. And V. M. Heywood; Oliver and Boyd, Edinburgh
- Families of flowering plants by Gunderson A.; ELBS series
- The families of flowering plants Vol-I- Dicotyledon and Vol-IIMonocotyledon by Hutchinson J.; Oxford University Press
- College Botany Vol-III by Mukerjee S.K. ; New central Book Agency

Practical-4005 (All paper sem-IV)

- Genetic problems (Mendel's law and genetic interaction)
- To Study different Instruments and media use for plant tissue culture.
- To study different Methods of Layering, Budding and Grafting (plant propagation).
- To study different fibres yielding plants.- *Hibiscus sabdariffa, Corchorus sp., Cocos nucifera, Gossypium sp., Musa sp.*
- To study Aromatic plants. – *Elaeocarpus sphaericus, Citrus reticulate. Cedrus deodara, Mentha sp., Econitum heterophyllum* and *Jasminum ovalifolium*
- To study Essential oil plants.- Almonod oil, Palm oil, Soybean oil, Sunflower oil, Sesame oil, Peanut oil and Olive oil
- To study classification with reason, morphological characters, floral dissection, T.S. of ovary, floral formulae and floral diagram of the following families.

1. Flacourtiaceae	2. Polygalaceae	3. Burseraceae	4. Ochanaceae
5. Averrhoaceae	6. Phytolaceaceae	7. Piperraceae	8. Louraceae
9. Typhaceae	10. Utricaceae	11. Bombacaceae	12. Iridaceae
13. Moringaceae	14. Dioscoreaceae		

Dissertation-4006

I/C Registrar,
Veer Narmad South Gujarat University
SURAT