VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Syllabus for the Semester System Examination for M.Sc. Part - I (Semester I & II) and for M.Sc. II (Semester III & IV)

1. A candidate who has obtained the degree of Bachelor of Science (Botany) of this University or of any other University recognized as equivalent there to, may after successful completion of the course work etc. prescribed for the M.Sc. degree examination, be admitted to the examination for the degree of M.Sc. in the respective subject as per the regulation prescribed in that behalf.
2. A candidate possessing a bachelor's degree in science with at least 40% marks in theory papers in external examinations will be held eligible for admission to the Master degree course in Botany offered by him/her at the Bachelors degree examination. However, if the number of eligible applications, as in above, is less than available seats, then a candidate possessing bachelor's degree in science with three subjects (optional-equal weightage) with at least 40% marks in theory papers in external examinations will be held eligible for admission to the Masters degree course in Botany. The degree of Master of Science will be taken by papers, practical and project work only.
3. M.Sc. examination in the subject of Botany shall consist of four semesters - (M.Sc. semester I to IV). For Sem-I to Sem-III there shall be 4 theory papers and 2 practical in each semester and in Sem-IV there will be 4 papers and 1 practical and students of Sem-IV will perform dissertations. Each theory paper shall be 70 marks and 3 hour duration and three practical of 140 marks, each of 5 hours duration. 30 marks are for Botanical excursions, records, submissions and Viva-Voce examination. Students have to attend the compulsory botanical excursions tour as and when scheduled by the department and have to submit the tour report (for final examination).
4. The examination for the various theory papers and laboratory work will be conducted under semester system. For this purpose each academic year will be divided into two semesters.
5. For deciding result of M.Sc. examination at each semester, the ratio between the internal assessment and external assessment will be 30:70. For the purpose of internal assessment, the Department concerned will conduct at least one test in each semester. The Department will also arrange Assignments, Quiz, Seminar etc. for internal assessment in theory course work and the Practical.
6. (i) The Head of the department, in consultation with other teachers of the department, will prepare in the beginning of the year a detailed scheme of Assignments, seminars, home work, quizzes, etc, and the programme for the test examinations and the same will be announced to the candidates.
   (ii) The records of the test examinations as well as Assignments, seminars, home work, quizzes etc. will be maintained by the department concerned.
   (ii) Every candidate shall maintain a regular record of his/her practical work that shall be duly certified by his/her teacher(s) from time to time.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. Botany (New Under Semester Scheme)
Teaching and Examination Scheme for Semester-I

Paper	Teaching Schedule Hrs/Wk	University Exam Duration	External Marks	Internal Marks	Total Marks
			Passing/Total	Passing/Total	Passing/Total
Theory					
BOT 1001:	3	3	28/70	12/30	40/100
BOT 1002:	3	3	28/70	12/30	40/100
BOT 1003:	3	3	28/70	12/30	40/100
BOT 1004:	3	3	28/70	12/30	40/100
Practical					
BOT 1005:	2×3=6	5	56/140	24/60	80/200
BOT 1006:	2×3=6	5			
Total	24		420	180	600

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. Botany (New Under Semester Scheme)
Teaching and Examination Scheme for Semester-II

Paper	Teaching Schedule Hrs/Wk	University Exam Duration	External Marks	Internal Marks	Total Marks
			Passing/Total	Passing/Total	Passing/Total
Theory					
BOT 2001:	3	3	28/70	12/30	40/100
BOT 2002:	3	3	28/70	12/30	40/100
BOT 2003:	3	3	28/70	12/30	40/100
BOT 2004:	3	3	28/70	12/30	40/100
Practical					
BOT 2005:	2×3=6	5	56/140	24/60	80/200
BOT 2006:	2×3=6	5			
Total	24		420	180	600

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. Botany (New Under Semester Scheme)
Teaching and Examination Scheme for Semester-III

Paper	Teaching Schedule Hrs/Wk	University Exam Duration	External Marks	Internal Marks	Total Marks
			Passing/Total	Passing/Total	Passing/Total
Theory					
BOT 3001:	3	3	28/70	12/30	40/100
BOT 3002:	3	3	28/70	12/30	40/100
BOT-3003:	3	3	28/70	12/30	40/100
BOT 3004:	3	3	28/70	12/30	40/100
Practical					
BOT 3005:	2×3=6	5	56/140	24/60	80/200
BOT 3006:	2×3=6	5			
Total	24		420	180	600

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. Botany (New Under Semester Scheme)
Teaching and Examination Scheme for Semester-IV

Paper	Teaching Schedule Hrs/Wk	University Exam Duration	External Marks	Internal Marks	Total Marks
			Passing/Total	Passing/Total	Passing/Total
Theory					
BOT 4001:	3	3	28/70	12/30	40/100
BOT 4002:	3	3	28/70	12/30	40/100
BOT 4003:	3	3	28/70	12/30	40/100
BOT 4004:	3	3	28/70	12/30	40/100
Practical					
BOT 4005:	2×3=6	5	32/80	24/60	80/200
BOT 4006: Dissertation			24/60	-	
Total	24		420	180	600

M.Sc. (BOTANY)

SEMESTER- I

BOT-1001: Microbiology and Mycology
BOT-1002: Plant Pathology
BOT-1003: Phycology and Lichen
BOT-1004: Plant Anatomy, Embryology and Paleobotany
BOT-1005: Practical of 1001 and 1002
BOT-1006: Practical of 1003 and 1004

SEMESTER- II

BOT-2001: Bryophytes, Pteridophytes and Gymnosperm
BOT-2002: Cell Biology
BOT-2003: Biostatistics, Botanical technique and computer application
BOT-2004: Taxonomy of Angiosperm
BOT-2005: Practical of 2001 and 2002
BOT-2006: Practical of 2003 and 2004

SEMESTER- III

BOT-3001: Biotechnology and Medical Botany
BOT-3002: Plant Ecology and Conservation
BOT-3003: Biochemistry and Bioinformatics
BOT-3004: Microscopy technique, Economic Botany and Pharmacognosy
BOT-3005: Practical of 3001 and 3002
BOT-3006: Practical of 3003 and 3004

SEMESTER- IV

BOT-4001: Plant Physiology and Applied Botany
BOT-4002: Cytology and Genetics
BOT-4003: Horticulture and Plant Breeding
BOT-4004: Angiosperm systematic
BOT-4005: Practical of 4001, 4002, 4003 and 4004
BOT-4006: Dissertation

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