# SAURASHTRA UNIVERSITY- RAJKOT (Guj.)

**Botany Syllabus on the bases of Choice Based Credit System (CBCS)**

**For**

# Semester I & II (F.Y.B.Sc.)

# BOTANY

**SEMESTER – I**

**Paper No. B – 101: Plant Diversity**

**SEMESTER – II**

**Paper No. B – 201: Angiosperms, Biochemistry, Genetics and Techniques**

**INFORCE FROM JUNE – 2019**

# Conceptual Framework of the Syllabus of Botany-Semester I & II

| Sr. No | Level UG or PG | Semester | Course Group Core Elective -1 Elective -2etc | Course (Paper) Title | Paper No. | Credit ( Theory - 4 and practical -2 ) | Internal Marks for Theory | External Marks for Theory | Internal Marks for Practical | External Marks for Practical | Total Marks | Course (Paper) Unique Code |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | UG | 1 | 1 | Cryptogamic Botany | B-101 | 06 | 30 | 70 | 15 | 35 | 150 | |
| 2 | UG | 2 | 1 | Angiosperms , Biochemistry, Genetics and Techniques | B- 201 | 06 | 30 | 70 | 15 | 35 | 150 | |

## Total Scheme of evaluation

| Semester No. | Theory Mark | | | | | Practical Mark | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Internal Theory Mark | Internal Theory Passing Mark (40%) | External Theory Mark | External Theory Passing Mark (40%) | Total Theory Mark | Internal practical Mark | Internal practical Passing Mark (40%) | External practical Mark | External practical Passing Mark (40%) | Total Marks of practical |
| **I** | **30** | **12** | **70** | **28** | **100** | **15** | **6** | **35** | **14** | **50** |
| **II** | **30** | **12** | **70** | **28** | **100** | **15** | **6** | **35** | **14** | **50** |

## *Semester I& II (First Year B.Sc.)*

## SKELETON OF QUESTION PAPER FOR THEORY PAPERS (EXTERNAL EXAMS)

| | | |
|---|---|---|
| **Question 1A ,1B,1C and 1D From Unit -1 (14 Marks)** | | |
| Q – 1 (A) | Objective type four questions | 4 Marks |
| Q – 1 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 1 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 1 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 2A ,2B, 2C and 2D From Unit -2 (14 Marks)** | | |
| Q – 2 (A) | Objective type four questions | 4 Marks |
| Q – 2 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 2 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 2 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 3A , 3B, 3C and 3D From Unit -3 (14 Marks)** | | |
| Q – 3 (A) | Objective type four questions | 4 Marks |
| Q – 3 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 3 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 3 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 4A , 4B, 4C and 4D From Unit -4 (14 Marks)** | | |
| Q – 4 (A) | Objective type four questions | 4 Marks |
| Q – 4 (B) | Answer in brief(Any 1 out of 2) | 2 Marks |
| Q – 4 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 4 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 5A , 5B, 5C and 5D From Unit -5 (14 Marks)** | | |
| Q – 5 (A) | Objective type four questions | 4 Marks |
| Q – 5 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 5 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 5 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| | **Total Marks** | **70 Marks** |
| **Total Time Of Paper : 2½ HOURS** | | |

# Semester - I

## Paper – B-101: Plant Diversity

### Unit-1: Introductory Botany and Algae 0.8 Credit (12 Lectures)

1.1 Branches of Botany

1.2 Classification: Whittaker (Five Kingdom)

1.3 General characters, Smith's classification and Algae in human welfare.

1.4 Life history of *Spirogyra* (Chlorophyceae), *Sargassum* (Phaeophyceae) (Excluding development)

**List of Reference Books:**


1) *Smith, G. M. (1955). Cryptogamic Botany Vol. I Algae and Fungi. Tata McGraw hill Publishing Company Ltd., New Delhi. 2nd edition.*

2) *Singh, V., Pande, P. C., Jain, D. K.. (2014). A Text Book of Botany. Rastogi Publications, Meerut, New Delhi. 5th revised edition.*

3) *Singh, V., Pande, P. C., and Jain. D. K. (2015). A Text book of botany. Rastogi publications, Meerut, New Delhi. 4th edition.*

4) *Vashishta, B.R. (1987). Botany for degree students - Algae. S. Chand and company (Pvt.) Ltd Ram Nagar-New Delhi. 7th edition.*

5) *Anne. Regaed. , Kumaresan, V., Arumugam, N. (2014) Algae. Saras publication, Kattar P.O. Nagercoil, Tamilnadu. 1st edition.*

6) Gangulee, H. C., Das, K. S., Dutta, C. (2005). College Botany Volume – 1. New Central Book Agency, India 1st edition.


### Unit –2: Fungi 0.8 Credit (12 Lectures)

2.1 General characters, Alexopolus' classification and fungi in human welfare.

2.2 Life history of *Mucor* (Zygomycotina), *Agaricus* (Bacidiomycotina) (Excluding development)

**List of Reference Books:**


1) *Smith, G. M. (1955). Cryptogamic Botany Vol. I Algae and Fungi. Tata McGrawhill Publishing Company Ltd., New Delhi. 2nd edition.*

2) *Singh, V., Pande, P. C., Jain, D. K... (2014). A Text Book of Botany. Rastogi Publications, Meerut, New Delhi. 5th revised edition.*

3) *Singh, V., Pande, P. C., and Jain. D. K. (2015). A Text book of botany. Rastogi publications, Meerut, New Delhi. 4th edition.*

4) *Vashishta, B.R., Sinha, A.K. (2002). Botany for degree students. Fungi- S.Chand.*

5) *Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.*

## Unit – 3: Bryophyte 0.8 Credit (12 Lectures)

3.1 General account and outline of classification of bryophytes by Rothmaller up to class

3.2 Life history of *Riccia* (Excluding development)

**List of Reference Books:**

1) *Smith, G. M. (1955). Cryptogamic Botany Vol. I Bryophytes and Pteridophytes. Tata McGraw hill Publishing Company Ltd., New Delhi. 2nd edition.*

2) *Singh, V., Pande, P. C., Jain, D. K... (2014). A Text Book of Botany. Rastogi Publication, Meerut, New Delhi. 5th revised edition.*

3) *Singh, V., Pande, P. C., and Jain. D. K. (2015). A Text book of botany. Rastogi publication, Meerut, New Delhi. 4th edition.*

4) Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

## Unit – 4: Pteridophyte 0.8 Credit (12 Lectures)

4.1 General accounts and outline of classification of Pteridophytes by G.M. Smith up to class

4.2 Life history of *Nephrolepis* (Excluding development)

**List of Reference Books:**

1) *Smith, G. M. (1955). Cryptogamic Botany Vol. I Bryophytes and Pteridophytes. Tata McGraw hill Publishing Company Ltd., New Delhi. 2nd edition.*

2) *Singh, V., Pande, P. C., Jain, D. K... (2014). A Text Book of Botany. Rastogi Publications, Meerut, New Delhi. 5th revised edition.*

3) *Singh, V., Pande, P. C., and Jain. D. K. (2015). A Text book of botany. Rastogi publications, Meerut, New Delhi. 4th edition.*

4) Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.

5) Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Pteridophyta. Central Book Depot, Allahabad.

## Unit – 5: Gymnosperm 0.8 Credit (12 Lectures)

5.1 General characters, outline of classification by GM Smith and characters of gymnosperms classes

5.2 Life history of *Cycas* (Excluding development)

**List of Reference Books:**

*1) Singh, V., Pande, P. C., Jain, D. K... (2014). A Text Book of Botany. Rastogi Publications, Meerut, New Delhi. 5th revised edition.*

*2) Singh, V., Pande, P. C., and Jain. D. K. (2015). A Text book of Botany. Rastogi publications, meerut, New Delhi. 4th edition.*

## Practical based on Paper B-101

1) Study of morphology, anatomy and reproductive structures in *Spirogyra* algae
2) Study of morphology, anatomy and reproductive structures in *Sargassum* algae
3) Study of morphology, anatomy and reproductive structures in Fungi : *Mucor*
4) Study of morphology, anatomy and reproductive structures in Fungi :*Agaricus*
5) Study of morphology, anatomy and reproductive structures in *Riccia*
6) Study of morphology, anatomy and reproductive structures in *Nephrolepis*
7) Study of morphology, anatomy and reproductive structures in *Cycas*
8) To study the Medicinal plants: *Vitex negundo; Cassia fistula; Terminalia belerica; Emblica officinalis; Pongamia pinnata*
9) Field study

**List of Reference Books:**

*1) Bendre, A. M. and Ashok Kumar, (2009) A Text book of Practical Botany Vol. I & II. Rastogi Publications, Meerut. 9th edition.*

## Semester II

## Paper – B-201: Angiosperms, Biochemistry, Genetics and Techniques

### Unit – 1: Vegetative Morphology 0.6 Credit (11 Lectures)

1.1 Habit, Habitat of plants
1.2 Root and Stem (Excluding modification)

1.3 Parts of leaf; phyllotaxis; types of leaves; venation.

1.4 Leaf shapes; leaf margin; leaf apex.

### Unit – 2: Reproductive Morphology 0.8 Credit (14 Lectures)

2.1 Inflorescences: Racemose and Cymose and special types –*Cyathium, Verticillaste, Hypanthodium*

2.2 Typical Flowers

2.2.1 Definition; bract; pedicel; symmetry; sexuality; hypogynous; epigynous; perigynous.

2.2.2 Calyx: function and types.

2.2.3 Corolla: function forms and aestivation.

2.2.4 Perianth

2.2.5 Androecium: Parts of a Stamen, Attachment

2.2.6 Gynoecium: Parts of carpels; function; placentation, Structure of stigma style and ovary

2.2.7 Floral formula and Floral diagram

### Unit – 3: Systematic Botany 0.5 Credit (10 Lectures)

3.1 Systems of classification – Bentham & Hooker with merits and demerits

3.2 Taxonomic studies of plants from each following angiosperm's families

3.2.1 Rosaceae

3.2.2 Apocynaceae

3.2.3 Amaryllidaceae

**List of Reference Books for Unit 1, 2 and 3**


1) *Sundara Rajan, S., (1996). Introductory Taxonomy of Angiosperms. Himalaya Publishing House, Bombay/Delhi/Nagpur. 1st edition.*

2) *Datta, S. C. (1988). Systematic botany. Wiley eastern limited- New Delhi.4th edition.*

3) *Pandey, B.P. (1999). Taxonomy of Angiosperms. For university student. S. Chand and Com. Ltd, New Delhi 1st edition reprints.*

4) *Kumavesan Annie. (2010.) Taxonomy of Angiosprems. Saras publication, Nagercoil, Tamilnadu. 3rd edition.*

5) *Sutariya, R. N. (1958). A text book of Systematic Botany. Khadayata Book Depot, Ahmedabad. 2nd edition.*

6) *Singh, V. and Jain, D. K. (1996). Taxonomy of Angiosperms. Rastogi Publications, Meerut, India. 2nd edition.*

## Unit – 4: Tools and Techniques in Botany 0.5 Credit (09 Lectures)

4.1 Principle and applications of paper chromatography techniques

4.2 Tissue culture (Applications, Brief introduction)

4.3 Principle and function of pH meter

4.4 Principles and function of Spectrophotometer

**List of Reference Books:**

1) Rana, S. V. S. (2009). Biotechniques Theory & Practice. Rastogi Publications, Meerut. 2nd edition.

## Unit – 5: Biochemistry and Genetics 1.6 Credit (16 Lectures)

5.1 Characters and classification (Reaction base and polarity base) of amino acids

5.2 Classification and action mechanisms of enzymes

5.3 Principles of Mendelian genetics

5.4 Structure of DNA

5.5 DNA replication

5.6 Protein synthesis

**List of Reference Books:**

1) *Gupta, P. K. (2007). Genetics, cytology and evolution .Rastogi Publications, Meerut, New Delhi. 1st edition.*

2) *Gupta, P.K. (2007). Genetics-classical to modern Rastogi Publication-Meerut. 1st edition.*

3) *Gupta, P.K. (2007). Genetics Rastogi Publication-Meerut. 3rd edition.*

4) *Arumugam, N., Meyyan, R.P., Kumarsen, V., Sundaralingam, R. (2014) Genetics, Bio- metrics and Bioinformatics. Saras publication, Nagercoil, Tamilnadu. 1st edition.*

5) *Anne. Regaed. , Kumaresan, V., Arumugam, N. (2014) Algae. Saras publication, Kattar P.O. Nagercoil, Tamilnadu. 1st edition.*

6) *Gupta, P.K. (2010). Cell and molecular biology. Rastogi publications - Meerut 3rd edition.*

7) *Kochae, P. L. (1970). Genetics and Evolution. S. Nagin & Co., Delhi. 6th edition.*

## Practical based on Paper B-201

1) Morphological studies of different plants parts – leaf
2) Morphological studies of different plants parts – Inflorescences
3) Morphological studies of different plants parts – Flowers (Calyx, Corolla, Perianth)
4) Morphological studies of different plants parts – Flowers (Androcium, and Gynoecium).
5) Taxonomic study of Rosaceae family with its economical and medicinal values.
6) Taxonomic study of Apocynaceae family with its economical and medicinal values.
7) Taxonomic study of Amaryllidaceae family with its economical and medicinal values.
8) Enzyme activity of catalase, invertase, amylase
9) To extract and separate chloroplast pigments by paper chromatographic technique
10) Visit of the research laboratories / Universities / Forest etc according to conveniences of colleges.

**List of Reference Books:**

1) *Bendre, A. M. and Ashok Kumar, (2009) A Text book of Practical Botany Vol. I & II. Rastogi Publications, Meerut. 9th edition.*

# SAURASHTRA UNIVERSITY RAJKOT

## Semester – I CBCS, Subject: - Botany
## Practical Examination

## Practical Skeleton Based on Paper: B-101

**Time: - 3 hours** **Date: ----------** **Total Marks: - 35**

**Q – 1** Identify and classify the given specimen "A" and "B" with reasons---------- (06)

| **X** | **Y** |
|---|---|
| *A* – | *A* – |
| *B* – | *B* – |

**Q – 2** Identify and describe the specimen "C" and "D" with diagrams ---------- (06)

| **X** | **Y** |
|---|---|
| *C* – | *C* – |
| *D* – | *D* – |

**Q – 3** Identify and describe the specimen "E" and "F" ---------- (06)

| **X** | **Y** |
|---|---|
| *E*– | *E* – |
| *F*– | *F* – |

**Q – 4** Identify and describe the specimen "G" ---------- (04)

| **X** | **Y** |
|---|---|
| *G*– | *G* – |

**Q – 5** Rotation H, I, J, K ---------- (08)

| | |
|---|---|
| *H* – | *I* – |
| *J* – | *K* – |

**Q – 6** Journal ---------- (05)

# SAURASHTRA UNIVERSITY RAJKOT

## Semester – II CBCS, Subject: - Botany

## Practical Examination

## Practical Skeleton Based on Paper: B-201

**Time: - 3 hours** **Date: ----------** **Total Marks: - 35**

**Q – 1** Identify and classify the given families "A" and "B" by giving proper reasons, floral Diagram and floral formula ---------- (06)

| **X** | **Y** |
|---|---|
| *A* – | *A* – |
| *B* – | *B*– |

**Q – 2** Identify and describe the specimen "C" and "D" (Morphology base) ---------- (06)

| **X** | **Y** |
|---|---|
| *C*– | *C*– |
| *D* – | *D* – |

**Q – 3** Submission of study report of the field visit ---------- (04)

**Q – 4** Perform the enzyme activity of given enzyme sample ---------- (08)

OR

Separation of plant extract by paper chromatography ---------- (08)

**Q – 5** Rotation ***E, F. G*** ---------- (06)

**Q – 6** Journal ---------- (05)

# SAURASHTRA UNIVERSITY

**Accredited Grade 'A' by NAAC (CGPA 3.05)**

**Syllabus on the bases of Choice Based Credit System (CBCS)**

For

## Semester III & IV (S.Y.B.Sc.)

## BOTANY

**SEMESTER – III**

**Paper No. B – 301: Plant Diversity - 2**

**SEMESTER – IV**

**Paper No. B – 401: Fundamental and Advance Botany**

**INFORCE FROM JUNE – 2020**


# FOREWORD

Renewing and updating of the curriculum is an essential part of any vibrant university academic system. Revising the curriculum should be continues process to provide an updated education to the students at large. To meet the need and requirement of the society and in order to enhance the quality and standards of education, updating and restructuring of the curriculum must continue as a perpetual process. As a part of duty of study board, we the member of botany study board designed the new curriculum for Second year (i.e. semester III & IV) Botany students. For designing of the curriculum we followed the UGC guideline for model curriculum. The exercise would not have been possible without the support of our respected faculties of botany. We hope that the results will fulfill expectations of the society. This syllabus/curriculum designed by following members of Saurashtra University; held at 14-09-2019, Syndicate hall, Saurashtra University.

| No. | Name | Designation |
|---|---|---|
| 1 | **Dr Mehul Rupani** | **Dean of Science faculty, Saurashtra University** |
| 2 | **Dr Vrunda Thaker** | **Member, Study Board of Botany, Saurashtra University** |
| 3 | **Dr R D Raviya** | **Member, Study Board of Botany, Saurashtra University** |
| 4 | **Dr Anila Patel** | **Member, Co-committee of Botany** |
| 5 | **Dr Ilza Mor** | **Member, Co-committee of Botany** |
| 6 | **Dr Jignasha Joshi** | **Member, Co-committee of Botany** |
| 7 | **Dr Rutva Dave** | **Member, Co-committee of Botany** |
| 8 | **Dr Manisha Sharma** | **Member, Co-committee of Botany** |
| 9 | **Dr Parth Bhatt** | **Member, Co-committee of Botany** |

# SAURASHTRA UNIVERSITY, RAJKOT

## Syllabus of Semester – III & IV (S.Y. B.Sc.) Botany

## Effective from June 2020

This curriculum consists of two theory papers and two practical. Syllabus has been divided in to two semesters (i.e. semester – III and IV). Students have to study one paper in each semester and two practical based on theory papers. The course is to be completed by assigning six periods for each theory and six periods for each practical per week. Practical periods are inclusive of field study.

## GENERAL DETAILS OF TEACHING HOURS AND COURSE CREDIT

| Paper no. | Title of the papers | Lectures | Theory Credit | Practical Credit | Total Credit |
|---|---|---|---|---|---|
| I | Plant Diversity – 2 | 60 | 04 | 02 | 06 |
| II | Fundamental & Advance Botany | 60 | 04 | 02 | 06 |

## Pattern of Examination:

Students will have to attend theory and practical both during the semester and at the end of semester, University exams will be conducted. Examination contains 70% external and 30% internal marks. A student's performance during every practical session is assessed and marks for a maximum of 15 is recorded. External practical evaluation will carry 35 marks, so total 50 marks for each practical per paper examination will be counted. Internal assessment for theory can be following latest formula provided by Higher Education Department, Government of Gujarat.

## Semester III & IV (Second Year B.Sc.)

## SKELETON OF QUESTION PAPER FOR THEORY PAPERS

## (EXTERNAL EXAMS)

| | | |
|---|---|---|
| **Question 1 Based on UNIT 1** | | |
| Q – 1 (A) | Objective type questions | 4 Marks |
| Q – 1 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 1 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 1 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 2 Based on UNIT 2** | | |
| Q – 2 (A) | Objective type questions | 4 Marks |
| Q – 2 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 2 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 2 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 3 Based on UNIT 3** | | |
| Q – 3 (A) | Objective type questions | 4 Marks |
| Q – 3 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 3 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 3 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 4 Based on UNIT 4** | | |
| Q – 4 (A) | Objective type questions | 4 Marks |
| Q – 4 (B) | Answer in brief(Any 1 out of 2) | 2 Marks |
| Q – 4 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 4 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 5 Based on UNIT 5** | | |
| Q – 5 (A) | Objective type questions | 4 Marks |
| Q – 5 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 5 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q 1 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| TOTAL MARKS : **70;** TOTAL TIME : **2½** HOURS | | |

**Total Scheme of evaluation**

| Semester | Theory | | | Practical | | |
|---|---|---|---|---|---|---|
| | Internal | External | Total | Internal | External | Total |
| III | 30 | 70 | 100 | 15 | 35 | 50 |
| IV | 30 | 70 | 100 | 15 | 35 | 50 |

## Minimum requirements of plant material and Instruments for Botany Practical based on Paper B-301 and Paper B-401

- Use of one micro scope for two students in practical batch
- Fresh plant material as well preserve material as per syllabus
- Different types of stain for slide preparation
- Charts for life cycles
- Original plant / Photographs / charts for Medicinal plants.
- Different types of stain for slide preparation
- Twig of plant and charts for Families

# SAURASHTRA UNIVERSITY, RAJKOT

## Faculty of Science

## Course structure and Unique Code

## Syllabus of Semester – III & IV (S.Y. B.Sc.) Botany

## Effective from June 2020

| No | Course | Sem. | Paper name | Paper No. | Credit | Unique Code No of Paper | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Year | Faculty | Subject | Level | Sem | Paper NO. | Option |
| 01 | UG | III | **Plant Diversity - 2** | B - 301 | 06 | 20 | 03 | 03 | 01 | 03 | 01 | 00 |
| 02 | UG | IV | **Fundamental & Advance Botany** | B - 401 | 06 | 20 | 03 | 03 | 01 | 04 | 02 | 00 |

# New Theory Syllabus (CBCS) for Semester - III

# In forced from June – 2020

# BOTANY PAPER – 301

# (PLANT DIVERSITY – 2)

## UNIT – I: ALGAE

I.1 Cell structure of Eukaryotic algae.

I.2 Ranges of Thallus Structure

I.3 Life history of the following genus (Excluding development)

(a) *Nostoc* (b) *Batrachospermum*

I.4 Algae causing biological disturbances

## UNIT – II: FUNGI

II.1 Cell structure of fungi.

II.2 Life history of the following genus (Excluding development)

(Classification according to Ainsworth)

(a) *Aspergillus* (b) *Saccharomyces* with haploid-diplontic life cycle

II.3 Industrial applications of above mention species.

## UNIT – III: BRYOPHYTA

III.1 Vegetative reproduction in Bryophytes

III.2 Life history of the following genus (Excluding organ development)

(a) *Anthoceros* (b) *Funaria*

III.3 Economic importance of Bryophytes

## UNIT – IV: PTERIDOPHYTA

IV.1 Life history of the following genus (Excluding organ development)

(a) *Adiantum*

IV.2 Types of stele and stellar evolution.

IV.3 Economic importance of Pteridophyta

## UNIT – V: GYMNOSPERM AND ANGIOSPERMS

V.1 Life cycle of *Pinus* (Excluding organ development)

V.2 Classification of the following plants families as per Bentham & Hooker's system including examples of economic importance

(A) Dicotyledons

(1) Combretaceae (2) Verbenaceae (3) Euphorbiaceae

(B) Monocotyledons

(1) Commelinaceae

# Semester – 3 (S.Y.B.Sc.) – BOTANY

# PRACTICAL: P - 301

# (Based on paper – 301)

1. Study of morphology, anatomy and reproductive structures in *Nostoc*
2. Study of morphology, anatomy and reproductive structures in *Batrachospermum*
3. Study of morphology, anatomy and reproductive structures in *Aspergillus*
4. Study of morphology, anatomy and reproductive structures in *Saccharomyces*
5. Study of morphology, anatomy and reproductive structures in *Anthoceros*
6. Study of morphology, anatomy and reproductive structures in *Funaria*
7. Study of morphology, anatomy and reproductive structures in *Adiantum*
8. Study of morphology, anatomy and reproductive structures in *Pinus*
9. Taxonomic study of Combretaceae family
10. Taxonomic study of Verbenaceae family
11. Taxonomic study of Euphorbiaceae family
12. Taxonomic study of Commelinaceae family
13. To study of steles by permanent
14. Field study / tour

# New Theory Syllabus (CBCS) for Semester - IV

# In forced from June – 2020

# BOTANY PAPER – 401

# (Fundamental & Advance Botany)

## UNIT – I PLANT ANATOMY

I.1 Types of Simple tissue: Parenchyma, Collenchyma & Sclerenchyma

I.2 Types of Complex tissue: Xylem & Phloem

I.3 Anatomical studies of Monocot plant: Root, stem and leaf

I.4 Anatomical studies of Dicot plant: Root, stem and leaf

## UNIT – II PLANT EMBRYOLOGY

II.1 Structure and germination of pollen grain

II.2 Types of Pollination

II.3 Structure and types of Ovule

II.4 Double Fertilization

## UNIT – III PLANT PHYSIOLOGY AND ECOLOGY

III.1 Diffusion, Osmosis and Imbibition

III.2 Physiology of seed dormancy and dormancy breaking treatments

III.3. Soil composition and soil profile

III.4 Soil erosion and conservation

## UNIT – IV BASIC TECHNIQUES IN BOTANY

IV.1 Herbarium: Tools and Technique

IV.2 Nursery technique: Grafting (Whip & Cleft) and Layering (Simple & Air)

IV.3 Kitchen gardening: Sowing/rising of seeds and seedlings,
Study of cultivation of different vegetables (Chilly, Tomato & fenugreek)

## UNIT – V ADVANCE TECHNIQUES IN BOTANY

V.1 Hydroponics: Introduction, techniques and media

V.2 Intellectual Property Rights (IPR): Patent, Geographical Indication, Trademarks and Copyrights

V.3 Remote sensing as a tool for vegetational analysis

# Semester -4 (S.Y.B.Sc.) – BOTANY

# PRACTICAL: P – 401

# (Based on paper – 401)

1. Study of different simple tissue system of plants through permanent slides
2. Study xylem components by maceration
3. Anatomical study of monocot plant: Root, stem and leaf
4. Anatomical study of dicot plant: Root, stem and leaf
5. Germination of pollen grain
6. Study of different types of ovule through permanent slides
7. Demonstration/Perform experiments: Diffusion, Osmosis and Imbibition
8. To study selected soil properties by spot test:

    (a) pH (b) Carbonate (c) Nitrate

9. Preparation of classical and e-Herbarium
10. To demonstrate different nursery technique through chart
11. Cultivation of vegetables (Chilly, Tomato & fenugreek) through kitchen garden techniques with using house hold things
12. To demonstrate/perform Hydroponics techniques
13. Field study / tour

## S.Y.B.Sc. – BOTANY

## SEMESTER – III PRACTICAL SKELETON

## (BASED ON PAPER – 301)

**TIME: - 3 HOURS** **TOTAL MARKS:-35**

Q – 1 Identify & describe with labelled diagram **specimen A & B** **[06]**

Q – 2 Identify & describe **specimen C & D** **[06]**

Q – 3 Identified & draw labelled diagrams of **specimen E** **[03]**

Q – 4 Identify & describe the family & Show it to examiner **specimen F** **[05]**

Q – 5 Expose & show the preparation of **specimen G** to the examiner **[04]**

Q – 6 Rotation: Identify & Describe **specimen H, I, J** **[06]**

Q – 7 Certified Journal **[05]**

## S.Y.B.Sc. BOTANY

## SEMISTER – IV PRACTICAL SKELETON

## (BASED ON PAPER – 401)

**TIME: - 3 HOURS** **TOTAL MARKS:-35**

Q – 1 Perform the experiment & show the results / show preparation to the examiner of **specimen A** **[06]**

Q – 2 Perform the experiment & show the results / show preparation of the **specimen B** to the examiner **[06]**

Q – 3 Perform the experiment & show the results / preparation of **specimen C** to the examiner **[06]**

Q – 4 Rotation: Identify & Describe **specimen D, E, F** **[09]**

Q – 5 (a) Viva-Voce **[03]**

(b) Certified journal **[05]**

## List of Reference Books:


1. Bendre, A. M. and Ashok Kumar, (2009) A Text book of Practical Botany Vol. I & II. Rastogi Publications, Meerut. 9th edition.
2. Sundara Rajan, S., (1996). Introductory Taxonomy of Angiosperms. Himalaya Publishing House, Bombay/Delhi/Nagpur. 1st edition.
3. Datta, S. C. (1988). Systematic botany. Wiley eastern limited- New Delhi.4th edition.
4. Pandey, B.P. (1999). Taxonomy of Angiosperms. For university student. S. Chand and Com. Ltd, New Delhi 1st edition reprints.
5. Kumavesan Annie. (2010.) Taxonomy of Angiosprems. Saras publication, Nagercoil, Tamilnadu. 3rd edition.
6. Sutariya, R. N. (1958). A text book of Systematic Botany. Khadayata Book Depot, Ahmedabad. 2nd edition.
7. Singh, V. and Jain, D. K. (1996). Taxonomy of Angiosperms. Rastogi Publications, Meerut, India. 2nd edition.
8. Rana, S. V. S. (2009). Biotechniques Theory & Practice. Rastogi Publications, Meerut. 2nd edition.
9. Gupta, P. K. (2007). Genetics, cytology and evolution .Rastogi Publications, Meerut, New Delhi. 1st edition.
10. Gupta, P.K. (2007). Genetics-classical to modern Rastogi Publication-Meerut. 1st edition.
11. Gupta, P.K. (2007). Genetics Rastogi Publication-Meerut. 3rd edition.
12. Arumugam, N., Meyyan, R.P., Kumarsen, V., Sundaralingam, R. (2014) Genetics, Bio-metrics and Bioinformatics. Saras publication, Nagercoil, Tamilnadu. 1st edition.
13. Anne. Regaed. , Kumaresan, V., Arumugam, N. (2014) Algae. Saras publication, Kattar P.O. Nagercoil, Tamilnadu. 1st edition.
14. Gupta, P.K. (2010). Cell and molecular biology. Rastogi publications - Meerut 3rd edition.
15. Kochae, P. L. (1970). Genetics and Evolution. S. Nagin & Co., Delhi. 6th edition.
16. Bendre, A. M. and Ashok Kumar, (2009) A Text book of Practical Botany Vol. I & II. Rastogi Publications, Meerut. 9th edition.

Accredited Grade "A" by NAAC
(3rd Cycle)

**SAURASHTRA UNIVERSITY**
**Academic Section**
University Campus, University Road, Rajkot – 360005
Phone No.: (0281) 2578501 Ext. No. 202 & 304 / FAX No.: (0281) 2576347
E-mail Id: academic@sauuni.ac.in, cmkanabar@sauuni.ac.in

નં.એકે/બીએસ/ ૪૮૮ /૨૦૨૧ તા ૨૯ -૬-૨૦૨૧

બોટની

પરિપત્ર:-

આથી સૌરાષ્ટ્ર યુનિવર્સિટીની **વિજ્ઞાન વિદ્યાશાખા** હેઠળની સર્વે સંલગ્ન કોલેજોના આચાર્યશ્રીઓને સવિનય જણાવવાનું કે, ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખાએ અધિકાર મંડળોની બહાલીની અપેક્ષાએ **બી.એસ.સી. બોટનીનો સેમેસ્ટર '૫ અને ૬'નો** સુધારેલ અભ્યાસક્રમ જુન-૨૦૨૧થી અમલમાં આવે તે રીતે મંજુર કરવા માન. કુલપતિશ્રીને ભલામણ કરેલ. તદ્અન્વયે ઉક્ત **બી.એસ.સી. બોટની વિષયનો સેમેસ્ટર '૫ અને ૬'નો** સુધારેલ અભ્યાસક્રમ અધિકાર મંડળોની બહાલીની અપેક્ષાએ જુન-૨૦૨૧થી અમલમાં આવે તે રીતે માન.કુલપતિશ્રીએ મંજુર કરેલ છે. જેથી સર્વે સંબંધિતોને તેનો તે મુજબ અમલ કરવા વિનંતી.

**(ઉક્ત અભ્યાસક્રમ સૌરાષ્ટ્ર યુનિવર્સિટીની website:- saurashtrauniversity.edu ⟶ student ⟶ ug syllabusપર ઉપલબ્ધ છે.)**

સહી/-
(ડૉ. જે. એચ. સોની)
I/C. કુલસચિવ

બિડાણ :- ઉક્ત અભ્યાસક્રમ (સોફ્ટ કોપી)

પ્રતિ,

(૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સર્વે સંલગ્ન કોલેજોના આચાર્યશ્રીઓ તરફ...

<u>નકલ જાણ અર્થે સાદર રવાના:-</u>

૧. માન. કુલપતિશ્રી/ માન. ઉપકુલપતિશ્રી/કુલસચિવશ્રીના અંગત સચિવશ્રી

<u>નકલ રવાના (યોગ્ય કાર્યવાહી અર્થે) :-</u>

૧. ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા
૨. પરીક્ષા નિયામકશ્રી (ઈ-મેઈલનાં માધ્યમથી)
૩. પી.જી.ટી.આર.વિભાગ
૪. ડાયરેક્ટરશ્રી, કોમ્પ્યુટર સેન્ટર(વેબસાઈટ ઉપર પ્રસિધ્ધ કરવા અર્થે)

# SAURASHTRA UNIVERSITY

## Accredited Grade 'A' by NAAC (3rd Cycle)

**Syllabus on the bases of Choice Based Credit System (CBCS)**

For

## Semester V & VI (T.Y.B.Sc.)

# BOTANY

| Semester – V | | Semester – VI | |
|---|---|---|---|
| **Paper No.** | **Title of the papers** | **Paper No.** | **Title of the papers** |
| **B-501** | Cryptogamic Botany and Plant Pathology | **B-601** | Cytology, Genetics, Molecular Biology, Biotechnology and Anatomy |
| **B-502** | Biology of Seed Plants | **B-602** | Plant Physiology, Biochemistry, Biostatistics, Microbiology and Biodiversity |
| **B-503** | Ecology | **B-603** | Instrumentation, Advance Techniques in Biology, Forest – Forestry, Medicinal Plants and Economic Botany |

## INFORCE FROM JUNE – 2021

# FOREWORD

Renewing and updating of the curriculum is an essential part of any vibrant university academic system. Revising the curriculum should be continues process to provide an updated education to the students at large. To meet the need and requirement of the society and in order to enhance the quality and standards of education, updating and restructuring of the curriculum must continue as a perpetual process. As a part of duty of study board, we the member of botany study board designed the new curriculum for Second year (i.e. semester V & VI) Botany students. For designing of the curriculum we followed the UGC guideline for model curriculum. The exercise would not have been possible without the support of our respected faculties of botany. We hope that the results will fulfill expectations of the society. This syllabus/curriculum designed by following members of Saurashtra University; held at 22-10-2020, Online Mode.

| No. | Name | Designation |
|---|---|---|
| 1 | **Dr Mehul Rupani** | **Dean of Science faculty, Saurashtra University** |
| 2 | **Dr Vrunda Thaker** | **Member, Study Board of Botany, Saurashtra University** |
| 3 | **Dr R D Raviya** | **Member, Study Board of Botany, Saurashtra University** |
| 4 | **Dr Manish Jani** | **Invited member** |
| 5 | **Dr Ilza Mor** | **Member, Co-committee of Botany** |
| 6 | **Dr Rutva Dave** | **Member, Co-committee of Botany** |
| 7 | **Dr Manisha Sharma** | **Member, Co-committee of Botany** |
| 8 | **Mr Parth Bhatt** | **Member, Co-committee of Botany** |
| 9 | **Ms Divya Detroja** | **Member, Co-committee of Botany** |

# SAURASHTRA UNIVERSITY, RAJKOT

## Syllabus of Semester – V & VI (T.Y. B.Sc.) Botany

## Effective from June 2021

This curriculum consists of two theory papers and two practical. Syllabus has been divided in to two semesters (i.e. semester – V and VI). Students have to study one paper in each semester and two practical based on theory papers. The course is to be completed by assigning six periods for each theory and six periods for each practical per week. Practical periods are inclusive of field study.

## GENERAL DETAILS OF TEACHING HOURS AND COURSE CREDIT

| Paper no. | Title of the papers | Lectures | Theory Credit | Practical Credit | Total Credit |
|---|---|---|---|---|---|
| **501** | **Cryptogamic Botany and Plant Pathology** | **60** | **04** | **02** | **06** |
| **502** | **Biology of Seed Plants** | **60** | **04** | **02** | **06** |
| **503** | **Ecology** | **60** | **04** | **02** | **06** |
| **601** | **Cytology, Genetics, Molecular Biology, Biotechnology and Anatomy** | **60** | **04** | **02** | **06** |
| **602** | **Plant Physiology, Biochemistry, Biostatistics, Microbiology and Biodiversity** | **60** | **04** | **02** | **06** |
| **603** | **Instrumentation, Advance Techniques in Biology, Forest – Forestry, Medicinal Plants and Economic Botany** | **60** | **04** | **02** | **06** |
| **Project** | **Project Work (work should be done during whole year)** | | | | |

## Pattern of Examination:

Students will have to attend theory and practical both during the semester and at the end of semester, University exams will be conducted. Examination contains 70% external and 30% internal marks. A student's performance during every practical session is assessed and marks for a maximum of 15 is recorded. External practical evaluation will carry 35 marks, so total 50 marks for each practical per paper examination will be counted. Internal assessment for theory can be following latest formula provided by Higher Education Department, Government of Gujarat.

# Semester V & VI (T.Y.B.Sc.)

## SKELETON OF QUESTION PAPER FOR THEORY PAPERS

## (EXTERNAL EXAMS)

| | | |
|---|---|---|
| **Question 1 Based on UNIT 1** | | |
| Q – 1 (A) | Objective type questions | 4 Marks |
| Q – 1 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 1 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 1 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 2 Based on UNIT 2** | | |
| Q – 2 (A) | Objective type questions | 4 Marks |
| Q – 2 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 2 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 2 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 3 Based on UNIT 3** | | |
| Q – 3 (A) | Objective type questions | 4 Marks |
| Q – 3 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 3 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 3 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 4 Based on UNIT 4** | | |
| Q – 4 (A) | Objective type questions | 4 Marks |
| Q – 4 (B) | Answer in brief(Any 1 out of 2) | 2 Marks |
| Q – 4 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 4 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| **Question 5 Based on UNIT 5** | | |
| Q – 5 (A) | Objective type questions | 4 Marks |
| Q – 5 (B) | Answer in brief (Any 1 out of 2) | 2 Marks |
| Q – 5 (C) | Answer in detail (Any 1 out of 2) | 3 Marks |
| Q – 5 (D) | Write a note on (Any 1 out of 2) | 5 Marks |
| TOTAL MARKS : **70;** TOTAL TIME : **2½** HOURS | | |

**Minimum requirements of plant material and Instruments for Botany Practical based on Paper B-501, 502 & 503 as well as Paper B-601, 602 & 603**

- Use of one micro scope for two students in practical batch
- Fresh plant material as well preserve material as per syllabus
- Different types of stain for slide preparation
- Charts for life cycles
- Original plant / Photographs / charts for Medicinal plants.
- Different types of stain for slide preparation
- Twig of plant and charts for Families

# SAURASHTRA UNIVERSITY, RAJKOT

## Faculty of Science

## Course structure and Unique Code

## Syllabus of Semester – V & VI (T.Y. B.Sc.) Botany

## Effective from June 2021

| No | Course | Sem. | Paper name | Paper No. | Credit | Unique Code No of Paper | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Year | Faculty | Subject | Level | Sem | Paper NO. | |
| 01 | UG | V | **Cryptogamic Botany and Plant Pathology** | B - 501 | 06 | 21 | 03 | 03 | 01 | 05 | 01 | |
| 02 | UG | V | **Biology of Seed Plants** | B - 502 | 06 | 21 | 03 | 03 | 01 | 05 | 02 | |
| 03 | UG | V | **Ecology** | B - 503 | 06 | 21 | 03 | 03 | 01 | 05 | 03 | |
| 04 | UG | VI | **Cytology, Genetics, Molecular Biology, Biotechnology and Anatomy** | B - 601 | 06 | 21 | 03 | 03 | 01 | 06 | 01 | |
| 05 | UG | VI | **Plant Physiology, Biochemistry, Biostatistics, Microbiology and Biodiversity** | B - 602 | 06 | 21 | 03 | 03 | 01 | 06 | 02 | |
| 06 | UG | VI | **Instrumentation, Advance Techniques in Biology, Forest – Forestry, Medicinal Plants and Economic Botany** | B - 603 | 06 | 21 | 03 | 03 | 01 | 06 | 03 | |

## Project work

Science is the field of experimental research and comprehensible reading. In order to fulfil these requirements our university has introduced the project work. So that students can have habit for reading research articles and able to understand the possible causes of current problems or can visualize the diverse nature of ecosystems and its organisms. Project work contains 100 marks. Project report should be submitted at the end of sixth semester and its viva voce can be arranged during practical exams of sixth semester.

## Submission work

1. Herbarium Sheets (minimum 10 in Semester V)
2. Permanent slides (minimum 6)

    Giant Chromosomes - 1, Mitosis -1, Meiosis-1, Double Stain- 2, Embryo- 1

3. Rolling chart / project with academic value
4. During the academic year compulsorily arrange one study tour of rich biodiversity region of the country outside the state and students have to submit tour report.
5. The students should visit to one of the following institution for study purpose
    - Agriculture University – Junagadh
    - National Research Centre for Ground nut (NRCG) – Junagadh
    - Aurvedic College
    - Pharmaceutical college or Institute
    - Field visit : Forest area / Rich biodiversity area / garden / dam site area
6. Students should start preparation of the submission work from Vth–Semester.

Submission work must be presented on third day of practical exam of semester – VIth.

# Semester – V

## BOTANY PAPER: B-501
## (CRYPTOGAMIC BOTANY AND PLANT PATHOLOGY)
## Theory Syllabus effective from June - 2021

**UNIT: - I ALGAE** **[14 marks]**

I.1 Life history of following genus (Excluding development)

I.1.1 *Coleochetae*

I.1.2 *Caulerpa*

I.1.3 *Chara*

I.1.4 *Ectocarpus*

**UNIT: - II FUNGI** **[14 marks]**

II.1 Life history of following genus (Excluding development)

II.1.1 *Phytophthora*

II.1.2 *Peziza*

II.1.3 *Alternaria*

II.2 Different types of spores in fungi

**UNIT: - III BRYOPHYTES** **[14 marks]**

III.1 Life history of following genus (Excluding development)

III.1.1 *Pellia*

III.1.2 *Sphagnum*

**UNIT: - IV PTERIDOPHYTES** **[14 marks]**

IV.1 Life history of following genus (Excluding development)

IV.1.1 *Ophioglossum*

IV.1.2 *Marsilea*

IV.2 Morphology and anatomy of *Rhynia*, *Lepidodendron*

IV.3 Morphology and anatomy of *Calamites*

**UNIT: - V PLANT PATHOLOGY** **[14 marks]**

V.1 Introduction and classification of plant diseases

V.2 General symptoms of diseases

V.3 Study of different diseases of plants

V.3.1 Tikka disease of ground nut

V.3.2 Red rot of sugarcane

V.3.3 Whip smut of sugarcane

V.3.4 Citrus canker

V.3.5 Leaf curl of papaya

V.4 Plant disease control

# Semester – V
# BOTANY PAPER: - 502
# (BIOLOGY OF SEED PLANTS)
# Theory Syllabus effective from June - 2021

**UNIT: - I GYMNOSPERMS** **[14 marks]**

I.1 Life history of following genus (Excluding development)

I.1.1 *Ephedra* I.1.2 *Gnetum*

I.2 Morphology and stem anatomy of *Lyginodendron, Cycadeoidea*

I.3 Morphology and stem anatomy of *Cordites, Pentoxylon*

**UNIT:-II ANGIOSPERMS** **[14 marks]**

II.1 Origin of Angiosperms

II.2 Concept of taxon and taxonomy

II.2.1 Taxonomic categories

II.2.2 Concept of genus and species

II.2.3 Concept of families

II.3 Classification systems of Bentham and Hooker

**UNIT: III & IV TAXONOMIC STUDIES OF FOLLOWING FAMILIES**

**(According to Bentham and Hooker System)** **[28 marks]**

III.1 Detailed studies of family of Polypetalae

III.1.1 Anonaceae

III.1.2 Capparidaceae

III.1.3 Malvaceae

III.1.4 Tiliaceae

III.1.5 Lythraceae

III.1.6 Leguminoceae (including sub families)

III.2 Detailed studies of family of Gamopetalae

III.2.1 Asteraceae

III.2.2 Asclepiadaceae

III.2.3 Convolvulaceae

III.2.4 Solanaceae

III.2.5Bignoneaceae

III.3 Detailed studies of family of Monochlamydeae

III.3.1 Amaranthaceae

III.3.2 Polygonaceae

III.3.3 Nyctagenaceae

III.4 Detailed studies of family of Monocotyledon

II.4.1 Canaceae

II.4.2 Cypraceae

**UNIT:- V EMBRYOLOGY** **[14 marks]**

V.1 Types and function of endosperm

V.2 Types of embryo

V.3 Embryo development in monocotyledons (sagittaria type)

V.4 Embryo development in dicotyledons (crucifer type)

V.5 Structure of pollen grain and abiotic factors affecting pollen germination

# Semester – V
# BOTANY PAPER: - 503
# (ECOLOGY)
# Theory Syllabus effective from June - 2021

**UNIT:- I ECOLOGY AND AUTECOLOGY** **[14 marks]**

I.1 Basic concept of ecology

I.2 Ecological factors

I.2.1 Climatic I.2.2 Biotic (Interaction among organisms)

I.3 Biological clocks.

I.4 Liebig's law of the minimum; Shelford's law of tolerance

**UNIT:- II COMMUNITIES STRUCTURE AND CLASSIFICATION [14 marks]**

II.1 Characters of community

II.2 Characters used in community structures

(Analytical and Synthetic characters)

II.3 Methods of ecological studies (Quadrate method and transect method)

**UNIT: - III ECOLOGICAL SUCCESSION, POPULATOION [14 marks]**

III.1 Plant succession: Causes, trends, types, process, examples of succession

III.2 Population characteristics

III.3 Ecological niche

**UNIT: - IV ECOSYSTEM [14 marks]**

IV.1 Structure of ecosystem

IV.2 Types of ecosystems

IV.3 Energy flow in ecosystem system

IV.4 Productivity of ecosystem

IV.5 Ecological Pyramid

**UNIT: - V ECOLOGICAL MANAGEMENTS [14 marks]**

V.1 Environmental education and organization

V.2 Environmental laws

V.3 GPS

## Semester – VI

## BOTANY PAPER: B-601

## (CYTOLOGY, GENETICS, MOLECULAR BIOLOGY, BIOTECHNOLOGY, AND ANATOMY)

## Theory Syllabus effective from June – 2021

**UNIT: - I CYTOLOGY (Ultra structure and function) [14 marks]**

I.1 Cell wall

I.2 Plasma membrane (fluid mosaic model)

I.3 Nucleus and Endoplasmic reticulum

I.4 Chloroplast and Mitochondria

I.5 Ribosomes

**UNIT: - II GENETICS [14 marks]**

II.1 Linkage

II.1.1 Bateson and Punnet's Coupling and repulsion hypothesis

II.2 Crossing over

II.2.1. Characteristics of crossing over

II.2.2. Kinds of crossing over

II.3 Gene mutations

II.3.1 Introduction about gene mutation

II.3.2 Kinds of mutation

II.3.2.1 According to type of cell.

II.3.2.2 According to size and quality

II.3.2.3 According to origin

II.4 Cytoplasmic inheritance or Extra nuclear inheritance

II.4.1 Cytoplasmic inheritance in *Mirabilis jalapa* plant

II.4.2 Cytoplasmic inheritance in yeast

**UNIT: - III MOLECULAR BIOLOGY** **[14 marks]**

III.1 Structure of tRNA

III.2 Restriction endonucleases

III.3 Cloning vectors (Bacteriophage, pbr322, Plasmid)

III.4 Techniques used in recombinant DNA technology

(Western, Northern, Southern blotting Techniques)

III.5 Gene expression in prokaryotes (Lac operon concept)

**UNIT: - IV BIOTECHNOLOGY** **[14 marks]**

IV.1 Transgenic plants (G M Papaya, B T Cotton))

IV.2 Tissue culture: media preparation technique and application, callus culture

IV.3 Cryopreservation of germplasm storage

**UNIT: - V ANATOMY** **[14 marks]**

V.1 Simple tissues

V.2 Complex tissues

V.3 Anomalous secondary growth in stem

V.3.1 Salvadora,

V.3.2 Bougainvillea,

V.3.4 Nyctanthes,

V.3.5 Bignonia

V.4 Histological techniques: Microtomy, Block preparation, Sectioning and double Staining.

## Semester – VI

## BOTANY PAPER: B-602

## (PLANT PHYSIOLOGY, BIOCHEMISTRY, BIOSTATISTIC, MICROBIOLOGY AND BIODIVERSITY)

## Theory Syllabus effective from June – 2021

**UNIT: - I PLANT PHYSIOLOGY** **[14 marks]**

I.1 Ascent of Sap

I.2 Photosynthesis : Introduction, Light reaction, C3 and C4 cycle and CAM pathway

I.3 Respiration: Pentose phosphate pathway (PPP)

I.4 Plant Growth Regulators : Introduction and functions (Auxins, Gibberellins, Cytokinins, Abscisic acid, Ethylene)

**UNIT: - II BIOCHEMISTRY [14 marks]**

II.1 Carbohydrates – classification, properties and functions, linear structure

II.2 Proteins – classification, Structure and functions

(Primary, secondary, tertiary and quaternary)

II.3 Lipids – classification and functions

II.4 Enzymes – classification and inhibition

**UNIT: - III BIOSTATISTIC [14 marks]**

III.1 Concept of population and Sample

III.2 Measures of central tendency: Mean, Mode and Median

III.3 Measures of dispersion: Standard deviation, Coefficient of variation

III.4 Student t Test

**UNIT: - IV MICROBIOLOGY [14 marks]**

IV.1 Ultra structure of *E.coli* and T4 Phage

IV.2 Gram Staining and sterilization methods

IV.3 Culture media and concept of pure culture

IV.4 Industrial application of microbes

IV.4.1 Alcohol production

IV.4.2 Vinegar production

IV.4.3. Citric acid production

**UNIT: - V BIODIVERSITY [14 marks]**

V.1 Concepts of biodiversity and it's level

V.2 Keystone species

V.3 Measuring biodiversity

V.4 Biogeographic regions of India

V.5 Conservation of Biodiversity

## Semester – VI
## BOTANY PAPER: B-603
## (INSTRUMENTATION, ADVANCE TECHNIQUES IN BIOLOGY, FOREST AND FORESTERY, MEDICINAL PLANTS, ECONOMIC BOTANY,)
## Theory Syllabus effective from June – 2021

**UNIT: - I INSTRUMENTATION** **[14 marks]**

Principle, design, function of following instruments

I.1 Laminar-flow

I.2 Autoclave

I.3 Incubator

I.4 Centrifuge

I.5 Oven

**UNIT: - II ADVANCE TECHNIQUES IN BIOLOGY** **[14 marks]**

V.1 Chromatography

- V.1.1 TLC
- V.1.2 GC
- V.1.3 HPLC

V.2 Electrophoresis

V.3 PCR

**UNIT: - III FOREST AND FORESTRY** **[14 marks]**

III.1 Classification of Indian forests

III.2 Social forestry and Agricultural Forestry

III.3 Physical properties, structural features and identification of wood

III.4 Deforestation

III.5 Wild life sanctuary and Biosphere reserves

**UNIT:-IV MEDICINAL PLANTS AND ECONOMIC BOTANY [14 marks]**

IV.1 Scientific name, family, distribution, parts used and uses of following medicinal plants:

IV.1.1 Tulsi

IV.1.2 Neem

IV.1.3 Ardusi

IV.1.4 Ashwagandha

IV.1.5 Bili

IV.1.6 Nagod

IV.1.7 Eucalyptus

IV.2 General account, methods of cultivation, botanical name, family and use of economic botany:

IV.2.1 Cereals (Wheat, Rice and Maize)

IV.2.2 Pulses (Gram, green gram and Pea)

IV.2 Beverages (Tea and coffee)

IV.24 Oils (Groundnut and sesamum)

*IV.2.5 Spices (Taj, Laving, cardamom)*

**UNIT: - V HORTICULTURE AND PLANT BREEDING [14 marks]**

V.1 Aims, objective and impacts of plant breeding

V.2 Techniques of hybridization (Emasculation, Bagging, Tagging)

V.4 Methods of hybridization: Pedigree method, Bulk method

V.5 Gardening :

V.5.1 Landscape gardening,

V.5.2 Indoor gardening,

V.5.3 Bonsai making

V.5.4 Terrace gardening

V.6 Lawn Making

V.7 Overview of Floriculture

## Semester – V

## Practical Syllabus effective from June - 2021

**(Based on paper – 501– P)**

1. Studies of *Coleochetae* algae with help of class work materials and permanent slides for their vegetative and reproductive structures.

2. Studies of *Caulerpa* algae with help of class work materials and permanent slides for their vegetative and reproductive structures.

3. Studies of *Chara* algae with help of class work materials and permanent slides for their vegetative and reproductive structures.

4. Studies of *Ectocarpus* algae with help of class work materials and permanent slides for their vegetative and reproductive structures.

5. Studies of *Phytophthora* fungi with help of class work materials and permanent slides for their vegetative and reproductive structures.

6. Studies of *Alternaria* fungi with help of class work materials and permanent slides for their vegetative and reproductive structures.

7. Studies of *Peziza* fungi with help of class work materials and permanent slides for their vegetative and reproductive structures.

8. Studies of morphology, anatomy and reproductive structure of *Pellia*.

9. Studies of morphology, anatomy and reproductive structure of *sphagnum*.

10 Studies of morphology, anatomy and reproductive structure of *Ophioglossum*.

11. Studies of morphology, anatomy and reproductive structure of *Marsilea*.

12 Studies of fossil genera through slides and specimens mentioned in theory papers.

13. Study of plant diseases: Tikka disease of ground nut; Red rot of sugarcane; Whip smut of sugarcane; Citrus canker

## Semester – V

## Practical Syllabus effective from June - 2021

**(Based on paper – 502– P)**

1. To study the anatomical structure of stem of *Ephedra* and *Gnetum by* section cuttings

2. To study the structure of leaf, leaf appendages, venation and stomata of *Ephedra* and *Gnetum*

3. To study the structure of the male and female cones of *Ephedra* and *Gnetum*

4. To study the different plant families mentioned in theory paper (minimum two plants should be studied in each family).

    4.1 Anonaceae
    4.2 Capparidaceae
    4.3 Malvaceae
    4..4 Tiliaceae
    4.5 Lythraceae
    4.6 Leguminoceae(including sub families)
    4.7 Asteraceae
    4.8 Asclepiadaceae
    4.9 Convolvulaceae
    4.10 Solanaceae
    4.11 Bignoneaceae
    4.12 Amaranthaceae
    4.13 Polygonaceae
    4.14 Nyctagenaceae
    4.15 Canaceae
    4.16 Cypraceae

5. Dissection and mounting of various types of embryo.

6. Studies of fossil genera through slides and specimens mentioned in theory papers.

## Semester – V

## Practical Syllabus effective from June - 2021

**(Based on paper – 503– P)**

1. To determine the minimum size of the quadrate by species area curve.
2. To determine the frequency of various species occurring in a given area.
3. To determine the density and abundance of various species occurring in given area.
4. To Estimate water holding capacity.
5. Test for the presence of carbonate, nitrate and deficiency of replaceable bases.
6. Test for the presence of inorganic salts in the soil samples.
7. Comparison of dissolved oxygen (DO) content of polluted and non-polluted water by iodometric titration method.
8. Estimation of water hardness.
9. Estimation of Biological oxygen demand (BOD)

# Semester – VI

## Practical Syllabus effective from June - 2021

**(Based on paper – 601– P)**

1. To study different cell organelle as per theory through chart/picture

2. Demonstration of salivary gland chromosomes from *Chironomous* larva by Aceto orcein technique.

2. To study the mitosis by Squash technique of onion root tip.

3. To study meiosis by smear technique

4. To understand the concept of gene expression through chart method.

5. To study the different plant tissues by using appropriate materials.

6. To study the anomalous secondary growth in stem (salvadora Nyctanthes, Bignonia and Bougainvillea )

7. To study the histological techniques : Microtome, Block preparation

8. Section cutting through microtomy (In practical exam readymade block will be provided to the student).

9. Staining (In practical exam readymade slide will be provided to the students for staining).

# Semester – VI

## Practical Syllabus effective from June - 2021

**(Based on paper – 602– P)**

1. To demonstrate the conduction of water through xylem. (Ringing experiment)

2. To extract and separate chloroplast pigments by solvent method and demonstrate fluorescence in chloroplast extracts.

3. To demonstrate that oxygen is evolved during photosynthesis by inverted funnel method.

4. To compare the rate of photosynthesis under different conditions. (Effect of $CO_2$, Effect of Light and shade, Effect of different wavelength of light)

5. To demonstrate liberation of carbon dioxide during aerobic respiration.

6. Preparation of solutions: Molar, Molal, Normal, Percent Concentrations

7. Qualitative analysis of carbohydrates (Fehling's test, Benedict's test, Barfoed's test, Molisch's test, Anthrone test)

8. Qualitative analysis of proteins (Xanthoproteic Reaction, Millon's test, Hopkin's test)

9. Biuret test for protein estimation.

10. Qualitative test for lipid (Sudan-III, Solubility test, Emulsification test)

11. Estimation of fatty acid by titration

12. Qualitative analysis of Amylase enzymes.

13. Calculation of central tendencies –mean, median and mode (minimum three exercise)

14. Calculation of standard deviation (minimum three exercise)

15. To study the bacterial cell morphology through Gram's staining.

## Semester – VI

## Practical Syllabus effective from June - 2021

**(Based on paper – 603– P)**

1. To study the principle, functions and applications of the instruments mentioned in the theory.

2. To prepare the TLC slides and separate the given biological mixtures.

3. Separation of protein through electrophoresis technique

4. To measure the height of the trees in college campus.

5. Find out the basal cover and canopy cover of the plants of college campus.

*6.* Identification and characteristics of wood samples: (a) *Tectona grandis* (b) *Eucalyptus sp*. (c) *Acacia arabica*

7. Extraction of phyto-pharmaceuticals:

    7.1 Extraction of calcium citrate from lemon

    7.2 Isolation of starch from potatoes

8. Separation of plant extraction and application of separated plant ingredients as source of medicines: Tulsi, Neem and Ardushi

9. Utilization of plants for human welfare: Cereals, Pulses, Beverages, Oils and Timber

10. To create a design of residential land scape garden (minimum three)

**BOTANY PRACTICAL SKELETON**

**Semester – V Practical – 1**

**(Based on paper – 501– P)**

**Times:- 3 hours** **Total Marks:- 35**

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**Question: 1** Identify, classify & describe with labeled diagram **Specimen A, B & C** **[15]**

**Question: 2** Identify & Describe **Specimen D & E** **[06]**

**Question: 3** Expose and show the preparation of **Specimen F** to the examiners **[03]**

**Question: 4** Rotation: Identify & Describe **Specimen G & H** **[06]**

**Question: 5** Certified Journal **[05]**

**BOTANY PRACTICAL SKELETON**

**Semester – V Practical – 2**

**(Based on paper B-502 – P)**

**Times: - 3 hours** **Total Marks: - 35**

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Q – 1 Identify & describe with labelled diagram **Specimen A & B** [08]

Q – 2 Identify the given family and dissect the flower and expose the floral parts show it to examiner **Specimen C** [04]

Q – 3 Classify with reasons & draw the floral diagram and floral formula of **Specimen D** [05]

Q – 4 Prepare the slides of given materials **Specimen E** [04]

Q – 5 Rotation: Identify & Describe **Specimen F, G** [04]

Q – 6 Submit 10 herbarium sheets [05]

Q – 7 Certified Journal [05]

**BOTANY PRACTICAL SKELETON**

**Semester – V Practical – 3**

**(Based on paper B-503 – P)**

**Times: - 3 hours** **Total Marks: - 35**

Q – 1 Find out the frequency / density of _____ plant species [05]

Q – 2 Measure the water holding capacity of given soil sample [03]

Q – 3 Find out the presence of carbonate, nitrate / inorganic salts in a given samples [05]

Q – 4 Measure the DO/Hardness of given water sample. [12]

Q – 5 Viva voce [05]

Q – 6 Certified Journal [05]

**BOTANY PRACTICAL SKELETON**

**Semester – VI Practical – 1**

**(Based on paper B-601 – P)**

**Times:- 3 hours** **Total Marks:- 35**

Q – 1 Perform the exercise of mitosis / meiosis / giant chromosome [05]

Q – 2 Take the thin section of given **specimen A** and show the …….. tissues to the examiner [05]

Q – 3 Take the thin section of given **specimen B** (anomalous - secondary growth) and show to the examiner [06]

Q – 4 Prepare a slide of given **specimen** C with double staining method and show it to the examiner [08]

Q – 5 Identify and describe the organelles **Specimen D** & **Specimen E** [06]

Q – 6 Certified Journal [05]

**T.Y.B.Sc. – BOTANY PRACTICAL SKELETON**

**Semester – VI Practical – 2**

**(Based on paper B-602 – P)**

**Times: - 3 hours** **Total Marks: - 35**

Q – 1 Perform the qualitative test for Carbohydrate / Protein / Lipids and show it to the examiner [06]

Q – 2 Calculation of Central tendencies [04]

Q – 3 Calculation of standard deviation [06]

Q – 4 Gram Staining [05]

Q – 5 Perform the exercise given by the examiner (Physiological Chloroplast separation/ Fatty acid estimation) [09]

Q – 6 Certified Journal [05]

**T.Y.B.Sc. – BOTANY PRACTICAL SKELETON**

**Semester – VI Practical – 6**

**(Based on paper B-603 – P)**

**Times: - 3 hours** **Total Marks: - 35**

Q – 1 Perform the exercise given by the examiner …… (TLC / tree height) [04]

Q – 2 Rotation - **specimen A, B , C and Specimen D** [08]

Q – 3 Tour report [10]

Q – 4 Submission work (Permanent slide) [05]

Q – 5 Viva voce [05]

Q – 6 Certified Journal [03]

## List of e-Resources

1. Cell Biology: http://www.ignouhelp.in/ignou-lse-01-study-material/
2. Ecology: http://www.ignouhelp.in/ignou-lse-02-study-material/
3. Genetics: http://www.ignouhelp.in/ignou-lse-03-study-material/
4. Plant Diversity: http://www.ignouhelp.in/ignou-lse-12-study-material/
5. Plant Diversity: http://www.ignouhelp.in/ignou-lse-13-study-material/
6. Sakshat-'One Stop Education Portal' (MHRD) http://www.sakshat.ac.in/
7. Swayam prabha Ch-08 (For Science students) https://www.youtube.com/channel/UCBMvdXXJ7BcZcTKGPj9WxKg
8. Consortium for Educational Communication (CEC) http://cec.nic.in/Pages/Home.aspx
9. SWAYAM: https://swayam.gov.in/
10. epg pathshala: http://epgp.inflibnet.ac.in/index.php
11. eGyanKosh- a National Digital Repository: http://egyankosh.ac.in/
12. nptelhrd https://www.youtube.com/c/iit/playlists
13. SANDHAN BISAG Botany https://www.youtube.com/watch?v=_879Zv7ioN8&list=PLJ5BXuigbEU2kZiU2l8KY-qtRpHdav8GJ

# List of reference books


| | | |
|---|---|---|
| 1 | A text book of Algae | A.V.S.S.Sambamurty |
| 2 | A text book of Botany | Singh, Pande & Jain |
| 3 | A textbook of ecology | Vashistha & Gill |
| 4 | A textbook of economic Botany | V.Verma |
| 5 | A textbook of Practical Botany Vol.–I & Vol.–II | Bendra & Kumar |
| 6 | A textbook of Systematic Botany | R.N.Sutaria |
| 7 | A phytochemical approach to economic botany | Dr. S. D. Sabnis |
| 8 | Algae | B.R.Vashishta |
| 9 | Algae | G.L.Chopra |
| 10 | An Introduction to plant tissue culture | M.K.Razdan |
| 11 | An introduction to taxonomy of angiosperms | Shukla P. & S.P.Sharma |
| 12 | Anatomy and embryology | Singh, Pandey & Jain |
| 13 | Applied Plant Biotechnology | V.L.Chopra |
| 14 | Basic concept in biochemistry | H.F.Gilbert |
| 15 | Biochemistry | Lehninger |
| 16 | Biochemistry | S.K.Dasgupta |
| 17 | Biodiversity | S. Chakraborty |
| 18 | Biostatistics | P. Ramakrishnan |
| 19 | Biotechnology | M.D.Trevan & et.al |
| 20 | Bryophytes | B.R.Vashishta |
| 21 | Cell Biology, Genetics, Molecular Biology, Evolution and Ecology | P,S. Verma and V.K Agarwal |
| 22 | Cell bio. , mole. bio. , gen. , evo. & ecology | N.Arumugam |
| 23 | College Botany Vol. – I & Vol. – II | B.P.Pandey |
| 24 | Cryptogamic Botany Vol. – I & Vol. – II | G.M.Smith |
| 25 | Cytology, Genetics and Evolution | P.K.Gupta |
| 26 | Ecology and Environment | P.D.Sharma |
| 27 | Ecology and Soil Science | Shukla & Sharma |
| 28 | Ecology and sustainable development | S.Ramkrishnan |
| 29 | Economic Botany | B.P.Pandey |
| 30 | Embryology | P.Maheshwary |
| 31 | Environmental studies | N. Arumugam |
| 32 | Forest and Forestry | K.P.Sagariya |
| 33 | Fundamental of biochemistry | V.K.Jain |
| 34 | Fundamentals of Ecology | E.P.Odum |
| 35 | Gene IX | Benzamin & lewin |
| 36 | Genetics Today | Jagjit Singh |
| 37 | Genetics | A.M.Winchester |
| 38 | Genetic engineering | N.Arumugam |
| 39 | Gymnosperms | O.P.Sharma |

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| 40 | Gymnosperms | B.P.Pandey |
| 41 | Gymnosperms | P.C. Vashishtha |
| 42 | Horticulture | V. Kumaresan |
| 43 | Indian manual of plant ecology | Mishra & Puri |
| 44 | Instant Note in Ecology | Aulay. Mackenzie & et.al |
| 45 | Instant Notes : Biochemistry | B.D.Hames & N.M.Hooper |
| 46 | Instant Notes : Genetics (bioinformatics – p.no. 288) | P.C.Winter & et.al |
| 47 | Instant Notes : Genetics | P.C.Winter & et.al |
| 48 | Instant Notes : Molecular Biology | P.C.Turner & et.al |
| 49 | Introduction to bioinformatics | T.K.Attwood & D.J.Parry Smith |
| 50 | Introduction to fungi | Dayal & Raizada |
| 51 | Introductory Biostatistics | Chap.T.Le |
| 52 | Laboratory manual in Biochemistry | J.Jayraman |
| 53 | Medicinal Plants | S.K.Jain |
| 54 | Microbiology Vol. – I & Vol. - II | P.D.Sharma |
| 55 | Microbiology | Pelzar |
| 56 | Modern Phytomedicine | Iqbal Ahmad & et.al. |
| 57 | Plant Anatomy | B.P.Pandey |
| 58 | Plant Anatomy | P.J.Chandurkar |
| 59 | Plant breeding | V.Kumarsen |
| 60 | Plant Physiology | P.L.Kocchar |
| 61 | Plant Physiology | Pandey & Sinha |
| 62 | Plant Physiology | Salisbury & Ross |
| 63 | Plant Physiology | V.K.Jain |
| 64 | Plant Physiology | V.Verma |
| 65 | Plant tissue culture: Application and limitation | S.S.Bhojwani |
| 66 | Plant cell and tissue culture: Principles and Applications | M.S.Shekhawat |
| 67 | Plant Taxonomy | Saxena & Saxena |
| 68 | Practical Pharmacognosy | C.K.Kokate |
| 69 | Pteridophyta : New look | O.P.Sharma |
| 70 | Pteridophytes | P.C.Vashishta |
| 71 | Text book of Microbiology | R.C.Dubey |
| 72 | Taxonomy of angiosperms | B.P.Pandey |
| 73 | Taxonomy of angiosperms | V.H.Naik |
| 74 | The Embryology of Angiosperms | Bhojwani & Bhatnagar |
| 75 | The fungi | B.P.Pandey |
| 76 | Plant breeding : Principles and Methods, | B. D. Singh, Kalyani Publisher |