
***Re-Accredited***
***Grade A by NAAC***

# *SAURASHTRA UNIVERSITY*

***Syllabus on the bases of Choice Based Credit System (CBCS)***
*For*
## *Semester V & VI (T.Y. B.Sc.)*

## *SUBJECT- 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** | Genetics, Molecular Biology, Biotechnology, Horticulture, Plant Breeding 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 |
| PROJECT | **Project Work should be done during whole year – 100 Mark** | | |

**INFORCE FROM JUNE - 2018**


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# *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 third 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.*

| | | | |
|---|---|---|---|
| ***Other than Chairman*** | ***Chairman*** | ***Other than Dean*** | ***Dean*** |
| ***Botany, Board of Studies*** | ***Botany, Board of Studies*** | ***Faculty of Science*** | ***Faculty of Science*** |
| ***Saurashtra University*** | ***Saurashtra University*** | ***Saurashtra University*** | ***Saurashtra University*** |
| ***Rajkot*** | ***Rajkot*** | ***Rajkot*** | ***Rajkot*** |

# *SAURASHTRA UNIVERSITY, RAJKOT*

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

## *Effective from June 2018*

*This curriculum consists of six theory papers and six practical. Syllabus has been divided in to two semesters (i.e. semester – V and VI). Students have to study three paper in each semester and three 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 COURSE CREDIT*

| ***Paper no.*** | ***Title of the papers*** | ***Theory Credit*** | ***Practical Credit*** | ***Total Credit*** |
|---|---|---|---|---|
| **B-501** | Cryptogamic Botany and Plant Pathology | ***04*** | ***02*** | ***06*** |
| **B-502** | Biology of Seed Plants | ***04*** | ***02*** | ***06*** |
| **B-503** | Ecology | ***04*** | ***02*** | ***06*** |
| **B-601** | Genetics, Molecular Biology, Biotechnology, Horticulture, Plant Breeding and Anatomy | ***04*** | ***02*** | ***06*** |
| **B-602** | Plant Physiology, Biochemistry, Biostatistics, Microbiology and Biodiversity | ***04*** | ***02*** | ***06*** |
| **B-603** | Instrumentation, Advance Techniques in Biology, Forest – Forestry, Medicinal Plants and Economic Botany | ***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 any one as mention below.*

| **Sr. No.** | **Pattern of Internal Exam** | **Marks** |
|---|---|---|
| A | Assignments | 10 |
| | MCQ Written Test | 10 |
| | Seminar/ presentation/ | 10 |
| **OR** | | |

| | | |
|---|---|---|
| B | MCQ Written Test | 30 |
| **OR** | | |
| C | Assignments | 10 |
| | MCQ Written Test | 20 |
| **OR** | | |
| D | Seminar/ presentation | 10 |
| | MCQ Written Test | 20 |

## *Semester V& VI (Third Year B.Sc.)*
## *SKELETON OF QUESTION PAPER FOR THEORY PAPERS*
## *(EXTERNAL EXAMS)*

| | | |
|---|---|---|
| *QUESTION 1 – 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 – 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– 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 – 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 – 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 no.*** | ***Theory mark*** | | | ***Practical mark*** | | |
|---|---|---|---|---|---|---|
| | ***Internal*** | ***External*** | ***Total*** | ***Internal*** | ***External*** | ***Total*** |
| ***V*** | ***30*** | ***70*** | ***100*** | ***15*** | ***35*** | ***50*** |
| ***VI*** | ***30*** | ***70*** | ***100*** | ***15*** | ***35*** | ***50*** |

## *Course structure and Unique Code*
## *Syllabus of Semester – V & VI (T.Y. B.Sc.) Botany*
## *Effective from June 2018*

| *No* | *Course* | *Sem.* | *Paper name* | *Paper No.* | *Credit* | *Unique Code No of Paper* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Year* | *Faculty* | *Subject* | *Level* | *Sem* | *Option* |
| *01* | *UG* | *V* | Cryptogamic Botany and Plant Pathology | *B-501* | *06* | *2018* | *03* | *001509* | *01* | *05* | *00* |
| *02* | *UG* | *V* | Biology of Seed Plants | *B-502* | *06* | *2018* | *03* | *001510* | *01* | *05* | *00* |
| *03* | *UG* | *V* | Ecology | *B-503* | *06* | *2018* | *03* | *001511* | *01* | *05* | *00* |
| *04* | *UG* | *VI* | Genetics, Molecular Biology, Biotechnology, Horticulture, Plant Breeding and Anatomy | *B-601* | *06* | *2018* | *03* | *001611* | *01* | *06* | *00* |
| *05* | *UG* | *VI* | Plant Physiology, Biochemistry, Biostatistics, Microbiology and Biodiversity | *B-602* | *06* | *2018* | *03* | *001612* | *01* | *06* | *00* |
| *06* | *UG* | *VI* | Instrumentation, Advance Techniques in Biology, Forest – Forestery, Medicinal Plants and Economic Botany | *B-603* | *06* | *2018* | *03* | *001613* | *01* | *06* | *00* |

**GENERAL DETAILS OF THEORY PAPERS**

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

# Practicals

| SEMESTER – V | | | |
|---|---|---|---|
| **Practical** | **Title of the practicals** | **Duration** | **Marks** |
| I | Cryptogamic Botany and Plant Pathology | 3 Hours | 35 |
| II | Biology of Seed Plants | 3 Hours | 35 |
| III | Ecology | 3 Hours | 35 |
| **SEMESTER – VI** | | | |
| IV | Genetics, Molecular Biology, Biotechnology, Horticulture, Plant Breeding and Anatomy | 3 Hours | 35 |
| V | Plant Physiology, Biochemistry, Biostatistics, Microbiology and Biodiversity | 3 Hours | 35 |
| VI | Instrumentation, Advance Techniques in Biology, Forest – Forestry, Medicinal Plants and Economic Botany | 3 Hours | 35 |
| PROJECT | **Project Work (work should be done during whole year)** | 3 Hours | **100** |

# Project work

Science is the field of experimental research and comprehensible reading. In order to fulfill 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. Permanent slides (minimum 6)
   Giant Chromosomes - 1, Mitosis -1, Meiosis-1, Double Stain- 2, Embryo- 1
2. Herbarium Sheets (minimum 10)
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 Center 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 $V^{th}$–Semester. Submission work must be presented on third day of practical exam of semester – $VI^{th}$ .

# Semester – V
# New theory Syllabus
# BOTANY PAPER: B-501
# (CRYPTOGAMIC BOTANY AND PLANT PATHOLOGY)

**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*
I.2 Evolution of sex in algae

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

II.1 Life history of following genus (Excluding development)
II.1.1 *Peziza* II.1.2 *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 General Symptoms of diseases
V.2 Study of different diseases of plants
V.2.1 Tikka disease of ground nut
V.2.2 Red rot of sugarcane
V.2.3 Whip smut of sugarcane
V.2.4 Citrus canker
V.2.5 Leaf curl of papaya
V.3 Plant disease control

# Semester – V
# New theory Syllabus
# BOTANY PAPER: B-502
# (BIOLOGY OF SEED PLANTS)

**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 anatomy of *Lyginodendron*, *Cycadeoidea*

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

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

II.1 Concept of taxon and taxonomic hierarchy

II.1.1 Taxonomic categories

II.1.2 Concept of genus and species

II.1.3 Concept of families

II.2 Principles of taxonomy

II.3 Classification systems of Bentham and Hooker

**UNIT: III** **TAXONOMIC STUDIES OF FOLLOWING FAMILIES**
**(According to Bentham and Hooker System)** **[28 marks]**

III.1 Detailed studies of family of Polypetalae

III.1.1 Capparidaceae III.1.2 Tiliaceae

III.1.3 Lythraceae III.1.4 Rosaceae

III.2 Detailed studies of family of Gamopetalae

III.2.1 Asteraceae III.2.2 Asclepidaceae

III.2.3 Convolulaceae III.2.4 Solanaceae

III.2.5 Bignoneaceae

III.3 Detailed studies of family of Monochlamydeae

III.3.1 Amaranthaceae III.3.2 Polygonaceae

III.4 Detailed studies of family of Monocotyledon

III.4.1 Canaceae III.4.2 Cypraceae

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

**I**V.1 Types and function of endosperm

**I**V.2 Embryo development in monocotyledons (sagittaria type)

**I**V.3 Embryo development in dicotyledons (crucifer type)

**I**V.4 Characters of pollen grain and factors affecting pollen germination.

# Semester – V
# New theory Syllabus
# BOTANY PAPER: B-503
## (ECOLOGY)

**UNIT: - I INTRODUCTION TO ECOLOGY [14 marks]**

I.1 Structure of ecosystem
I.2 Types of ecosystems
I.3 Energy flow in ecosystem system
I.4 Productivity of ecosystem

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

II.1 Characters of community
II.2 Characters used in community structures
II.3 Methods of ecological studies

**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 pyramids

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

IV.1 Biological clocks
IV.2 Liebig's law of the minimum; Shelford's law of tolerance
IV.3 Principle of limiting factors and ecological factors
IV.4 Ecological concept of species and individuals

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

V.1 Environmental education and organization
V.2 Environmental laws
V.3 GPS

# Semester – VI
# New theory Syllabus
# BOTANY PAPER: B-601
## (GENETICS, MOLECULAR BIOLOGY, BIOTECHNOLOGY, HORTICULTURE, PLANT BREEDING AND ANATOMY)

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

I.1 Linkage (coupling and repulsion hypothesis)
I.2 Crossing over (chromosome mapping)
I.3 Structure of RNA
I.4 Gene mutations (somatic/germ line and spontaneous / induced)

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

II.1 Restriction endonucleases
II.2 Cloning vectors
II.3 Techniques used in recombinant DNA technology.
II.4 Gene expression in prokaryotes (Lac operon concept)

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

III.1 Transgenic plants
III.2 Tissue culture: media preparation technique and application
III.3 Cryopreservation and germplasm storage

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

IV.1 Aims, objective and impacts of plant breeding
IV.2 Techniques of hybridization, Emasculation, Bagging, Tagging
IV.4 Self pollinated plants: Pedigree method, Bulk method
IV.4 Horticulture: propagation methods (cutting, layering, budding and grafting)

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

V.1 Simple tissues
V.2 Complex tissues
V.4 Anomalous secondary growth in stem (Salvadora, Bougainvillea)
V.5 Histological techniques: Microtome, Block preparation, Sectioning and Staining

# Semester – VI
# New theory Syllabus
# BOTANY PAPER: B-602
## (PLANT PHYSIOLOGY, BIOCHEMISTRY, BIOSTATISTIC, MICROBIOLOGY AND BIODIVERSITY)

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

I.1 Germination: Different phases of germination, Factors affecting germination
I.2 Respiration: Pentose phosphate pathway (PPP)
I.3 Plant Growth Regulators (Auxins, Gibberellins, Cytokinins, Abscisic acid, Ethylene): biosynthesis and physiological functions
I.4 Stress Physiology: Light stress and Temperature stress- Injury and resistance

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

II.1 Carbohydrates – classification, properties and functions
II.2 Proteins – classification and Structure and functions (Primary, secondary, tertiary and quaternary)
II.3 Lipids – classification, structure 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

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

IV.1 Ultra structure of *E.coli* and T4 Phage
IV.2 Staining and sterilization methods
IV.3 Culture media and concept of pure culture
IV.4 Methods of population estimation, growth determination

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

V.1 Concept of biodiversity
V.2 Different Levels in Biodiversity organization
V.3 Biodiversity conservation strategies
V.4 Biodiversity for human welfare

# Semester – VI
# New theory Syllabus
# BOTANY PAPER: B-603
## (INSTRUMENTATION, ADVANCE TECHNIQUYES IN BIOLOGY, FOREST AND FORESTERY, MEDICINAL PLANTS AND ECONOMIC BOTANY)

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

Principle, design, function of following instruments

I.1 Spectrophotometer
I.2 Autoclave
I.3 Incubator
I.4 Centrifuge
I.5 Oven

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

II.1 TLC, HPLC, GC
II.2 Electrophoresis
II.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 Wild life and biosphere reserves
III.5 Study tour of rich biodiversity region of the country outside the state and students have to submit tour report

**UNIT:-IV** **MEDICINAL PLANTS** **[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

**UNIT: - V** **ECONOMIC BOTANY** **[14 marks]**

V.1 General account, methods of cultivation, botanical name, family and use:

V.1.1 Cereals (Wheat, Rice and Maize)
V.1.2 Pulses (Gram, green gram and Pea)
V.1.3 Beverages (Tea and coffee)
V.1.4 Oils (Groundnut and sesamum)
V.1.5 Spices (Taj, Laving, cardamom)

# T.Y.B.Sc. – BOTANY
# PRACTICAL – 1
# Semester – V
# (Based on paper B-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 *alternaria* fungi with help of class work materials and permanent slides for their vegetative and reproductive structures.
6. Studies of *peziza* fungi with help of class work materials and permanent slides for their vegetative and reproductive structures.
7. Studies of morphology, anatomy and reproductive structure of *pellia*.
8. Studies of morphology, anatomy and reproductive structure of *sphagnum*.
9. Studies of morphology, anatomy and reproductive structure of *ophioglossum*.
10. Studies of morphology, anatomy and reproductive structure of *marsilea*.
11. Study of plant diseases: Tikka disease of ground nut; Red rot of sugarcane; Whip smut of sugarcane; Citrus canker

# PRACTICAL – 2
# Semester – V
# (Based on paper B-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).
5. To study the different types of ovules through permanent slides:
6. Dissection and mounting of various types of embryo.

## PRACTICAL – 3
## Semester – V
## (Based on paper B-503 – P)

1. To determine the minimum size of the quadrate by species area curve.
2. To demonstrate the frequency of various species occurring in a given area.
3. To demonstrate the density and abundance of various species occurring in given area.
4. To demonstrate 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)

## PRACTICAL – 4
## Semester – VI
## (Based on paper B-601 – P)

1. 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 and Bougainvillea )
7. To study the histological techniques : Microtome, Block preparation
8. Section cutting through microtome (In practical exam readymade bock will be provided to the student).
9. Staining (In practical exam readymade slide will be provided to the students for staining).

## PRACTICAL – 5
## Semester – VI
## (Based on paper B-602 – P)

1. To demonstrate the phenomenon of dialysis
2. To extract and separate chloroplast pigments by solvent method and demonstrate fluorescence in chloroplast extracts.
3. Preparation of solutions: Molar, Molal, Normal, Percent Concentrations
4. Qualitative analysis of carbohydrates (Fehling's test, Benedict's test, Barfoed's test, Molisch's test, Anthrone test)
5. Qualitative analysis of priteins (Xanthoproteic Reaction, Millon's test, Hopkin's test)
6. Biuret test for protein estimation.
7. Estimation of fatty acid by titration
8. Qualitative analysis of Amylase enzymes.
9. Calculation of central tendencies –mean, median and mode (minimum three exercise)
10. Calculation of standard deviation (minimum three exercise)
11. To study the bacterial cell morphology through Gram's staining.

## PRACTICAL – 6
## Semester – VI
## (Based on paper B-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:
   8.1 Extraction of calcium citrate from lemon
   8.2Isolation of starch from potatoes
8. Separation of plant extraction and application of separated plant ingredients as source of medicines: Tulsi, Neem and Ardushi
9. Prepare ten herbarium sheets for submission.
10. Utilization of plants for human welfare: Cereals, Pulses, Beverages, Oils and Timber
11. To study the medicinal plants as per theory syllabus - Tulsi , Neem , Ardusi, Ashwagandha, Bili , Nagod , Eucalyptus

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

**Semester – V** **Practical – 1**

**(Based on paper B-501 – P)**

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

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| | | |
|---|---|---|
| Q – 1 | Identify & describe with labeled diagram **Specimen A & B** | **[08]** |
| Q – 2 | Identify & Classify with reasons **Specim C and D** | **[08]** |
| Q – 3 | Expose & show the preparation of **Specimen E** to the examiner | **[05]** |
| Q – 4 | Rotation: Identify & Describe **Specimen F, G, H** | **[06]** |
| Q – 5 | (a) Viva voce | **[05]** |
| | (b) Certified Journal | **[03]** |

## T.Y.B.Sc. – 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 labeled 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** | **[03]** |
| Q – 3 | Classify with reasons & draw the floral diagram and floral formula of **Specimen D&E** | **[08]** |
| Q – 4 | Prepare the slides of given materials **Specimen F** | **[04]** |
| Q – 5 | Rotation: Identify & Describe **Specimen G, H** | **[04]** |
| Q – 6 | (a) Viva voce | **[05]** |
| | (b) Certified Journal | **[03]** |

## T.Y.B.Sc. – 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 dissolved oxygen (DO) of given water sample | **[07]** |
| Q – 5 | Estimation of hardness of given water sample | **[07]** |
| Q – 6 | (a) Viva voce | **[05]** |
| | (b) Certified Journal | **[03]** |

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

**Semester – VI** **Practical – 4**

**(Based on paper B-601 – P)**

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

| | | |
|---|---|---|
| Q – 1 | Prepare the slide of giant chromosome slide | **[05]** |
| Q – 2 | Perform the exercise of mitosis / meiosis | **[05]** |
| Q – 3 | Take the thin section of given specimen A and - show the _____ tissues to the examiner | **[05]** |
| Q – 4 | Take the thin section of given specimen B (anomalous - secondary growth) and show the examiner | **[05]** |
| Q – 5 | Prepare a slide of given specimen C with double staining method- and show it to the examiner | **[07]** |
| Q – 6 | (a) Viva voce | **[05]** |
| | (b) Certified Journal | **[03]** |

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

**Semester – VI** **Practical – 5**

**(Based on paper B-602 – P)**

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

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| | | |
|---|---|---|
| Q – 1 | Perform the qualitative test for Carbohydrate / Protein / Enzyme | **[05]** |
| Q – 2 | Calculation of Central tendencies | **[04]** |
| Q – 3 | Calculation of standard deviation | **[05]** |
| Q – 4 | Gram Staining | **[05]** |
| Q – 5 | Perform the exercise given by the examiner …… | **[08]** |
| Q – 6 | (a) Viva voce | **[05]** |
| | (b) Certified Journal | **[03]** |

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

**Semester – VI** **Practical – 6**

**(Based on paper B-603 – P)**

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

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| | | |
|---|---|---|
| Q – 1 | Perform the exercise given by the examiner …… (TLC / tree height) | **[04]** |
| Q – 2 | Extract out the given plant materials | **[02]** |
| Q – 3 | Rotation - specimen A, B and C | **[06]** |
| Q – 4 | Tour report and institutional visit | **[10]** |
| Q – 5 | Submission work | **[05]** |
| Q – 6 | (a) Viva voce | **[05]** |
| | (b) Certified Journal | **[03]** |

# T.Y.B.Sc. – BOTANY PROJECT WORK

**Semester – VI**

**Times: - 3 hours** **Total Marks: - 100**

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**Project work: The repot of the project work should be submitted for assessment.**

## A 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. | Algae | B.R.Vashishta |
| 8. | Algae | G.L.Chopra |
| 9. | An Introduction to plant tissue culture | M.K.Razdan |
| 10. | An introduction to taxonomy of angiosperms | Shukla P. & S.P.Sharma |
| 11. | Anatomy and embryology | Singh, Pandey & Jain |
| 12. | Applied Plant Biotechnology | V.L.Chopra |
| 13. | Basic concept in biochemistry | H.F.Gilbert |
| 14. | Biochemistry | Lehninger |
| 15. | Biochemistry | S.K.Dasgupta |
| 16. | Biostatistics | P. Ramakrishnan |
| 17. | Biotechnology | M.D.Trevan & et.al |
| 18. | Bryophytes | B.R.Vashishta |
| 19. | College Botany Vol. – I & Vol. – II | B.P.Pandey |
| 20. | Cryptogamic Botany Vol. – I & Vol. – II | G.M.Smith |
| 21. | Ecology and Environment | P.D.Sharma |
| 22. | Ecology and Soil Science | Shukla & Sharma |
| 23. | Ecology and sustainable development | S.Ramkrishnan |
| 24. | Economic Botany | B.P.Pandey |
| 25. | Embryology | P.Maheshwary |
| 26. | Forest and Forestery | K.P.Sagariya |
| 27. | Fundamental of biochemistry | V.K.Jain |
| 28. | Fundamentals of Ecology | E.P.Odum |

29. Gene IX — Benzamin & lewin
30. Genetics Today — Jagjit Singh
31. Genetics — A.M.Winchester
32. Gymnosperms — O.P.Sharma
33. Indian manual of plant ecology — Mishra & Puri
34. Instant Note in Ecology — Aulay. Mackenzie & et.al
35. Instant Notes : Biochemistry — B.D.Hames & N.M.Hooper
36. Instant Notes : Genetics (bioinformatics – p.no. 288) P.C.Winter & et.al
37. Instant Notes : Genetics — P.C.Winter & et.al
38. Instant Notes : Molecular Biology — P.C.Turner & at.al
39. Introduction to bioinformatics — T.K.Attwood & D.J.Parry Smith
40. Introduction to fungi — Dayal & Raizada
41. Introductory Biostatistics — Chap.T.Le
42. Laboratory manual in Biochemistry — J.Jayraman
43. Medicinal Plants — S.K.Jain
44. Microbiology Vol. – I & Vol. - II — P.D.Sharma
45. Modern Phytomedicine — Iqbal Ahmad & et.al.
46. Plant Anatomy — B.P.Pandey
47. Plant Anatomy — P.J.Chandurkar
48. Plant Physiology — P.L.Kocchar
49. Plant Physiology — Pandey & Sinha
50. Plant Physiology — Salisbury & Ross
51. Plant Physiology — V.K.Jain
52. Plant Physiology — V.Verma
53. Plant tissue culture: Application and limitation — S.S.Bhojwani
54. Practical Pharmacognosy — C.K.Kokate
55. Pteridophyta : New look — O.P.Sharma
56. Pteridophytes — P.C.Vashishta
57. Taxonomy of angiosperms — B.P.Pandey
58. Taxonomy of angiosperms — V.H.Naik
59. The Embryology of Angiosperms — Bhojwani & Bhatnagar
60. The fungi — B.P.Pandey
61.Plant breeding : Principles and Methods, — B. D. Singh, Kalyani Publisher