

# GUJARAT UNIVERSITY



## B. Sc. BOTANY ( Faculty of Science )

### Choice Based Credit System ( C B C S ) Theory syllabus Effective from June-2022

Detailed Curriculum has been designed as per **Semester** system.  
There shall be **One** theory paper having four units and **One** Practical Paper in The Semester .

### SEMESTER-I

B.Sc. Botany Semester-I	Unit	Title	Contact Hours per Week	External Exam	Internal Exam	Credit
Theory CC BOTANY-101	1	Study of Lower Group Plants.	04 Hours  ( for All Units )	70 marks	30 marks	04
	2	Cytology ,Genetics & Molecular Biology				
	3	Environmental Biology & Climate Change				
	4	Plant Biotechnology				
Practical CC BOTANY-102		Based on Theory Paper 101	04 Hours	70 marks	30 marks	03



## SEMESTER-I

### Unit-1 : Study of lower Group Plants

[ 10 hours ]

**Objectives:** *To acquaint students with various Plants group and focus on Biology of lower plants.*

- **Brief Introduction about Plant Groups :** Cryptogams & Phanerogams.
- **Algae :** Taxonomic Position, structure of Thallus ,vegetative ,asexual and sexual modes of reproduction of the following genus .  
*1. Spirogyra 2. Nostoc*  
  
Economic importance of algae.
- **Fungi :** Taxonomic Position, structure of Thallus ,vegetative ,asexual and sexual modes of reproduction of the following genus .  
*1. Mucor . 2. Agaricus*  
  
Economic importance of Fungi.
- **Mushrooms:** General account of Edible & Non-edible Mushroom ,  
Mushroom cultivation Importance in Startup Industry and Medicine.  
General information :White Button, Oyster and Paddy straw Mushroom
- **Bryophytes:** General characters of Bryophytes .  
Taxonomic Position, structure of Thallus ,vegetative ,asexual and sexual modes of reproduction of the following genus .  
*1. Riccia*

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#### Suggested Readings:

- (i) *A Textbook of Botany vol. I and II S.N. Pandey, P. S. Trivedi and S. P. Misra., Vikas Publication House Pvt. Ltd Collage*
- (ii) *Botany Vol. I & II Das, Dutta, Gangulee and Kar., New Central Book Agency,*
- (iii) *Fungi, Bryophyte, Pteridophyte by Vasishta., S. Chand Pub, New Delhi*
- (iv) *Introduction to Fungi ,Webster, J.1985.. Cambridge University Press.*
- (v) *Mushroom cultivation in India , B.C.Suman & V.P.Sharma, ,Daya Publishing House (2021)\*
- (vij) *Cryptogamic Botany. Vol. 1 & 2. Smith, G. M. 1972. Tata McGraw Hill Publishing Co. Ltd.*



## **SEMESTER-I**

### **Unit-2 : Cytology, Genetics and Molecular biology**

**[ 10 hours ]**

***Objectives: To acquaint students with various Cell structure, its organelles, Genes and Molecular structure and Function.***

- Brief Account: Plant Cytology, Genetics and Molecular Biology.
- Ultra structure of Plant Cell.
- Ultra-Structure & Function of Mitochondria.
- Ultra-Structure & Function of Chloroplast.
- DNA Structure: Watson and Crick's Model of DNA.
- Structure and Types of RNA.
- DNA Replication.
- Genetic Code & its Properties.
- Protein Synthesis.
- Regulation of Gene expression in prokaryotes – Lac Operon & Its concept.

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#### **Suggested Readings**

- (i) *The World of Cell by Backer, Kleinsmith and Hardin Pearson Education*
- (ii) *Elements of Cytology by C. B. Powar*
- (iii) *Lewin, B.2000. Genes VIII. Oxford University Press, New York.*
- (iv) *Alberts, B., Bray,D., Lewis, J., Raff, M., Roberts, K. and Watson, J.D. 1999. Molecular Biology of the Cell. Garland Publishing, Inc. New York.*
- (v) *Wolfe, S.L. 1993. Molecular and Cellular Biology. Wadsworth Publishing Co. California, USA.*
- (vi) *Kleinsmith, L.J. and Kish, V.M.1995. Principles of cell and Molecular Biology (2<sup>nd</sup> Ed.). Harper Collins College Publishers, New York, USA.*
- (vii) *Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Molecular Cell Biology (4<sup>th</sup> Ed.). W.H. Freeman and Co., New York, USA.*
- (viii) *Cytogenetics by S. Sundara Rajan., First edition, Anmol Publications, New Delhi.*
- (viii) *Cryptogamic Botany. Vol. 1 & 2. Smith, G. M. 1972. Tata McGraw Hill Publishing Co. Ltd.*



## SEMESTER-I

### Unit-3 : Environmental Biology & Climate Change

[ 10 hours ]

**Objectives:** *To acquaint students with Basic concept and current trends of Ecology , Environment and climate change .*

- Introduction, Scope and Branches of Ecology.
- Ecosystems; Its Kinds: Natural, Artificial.
- Ecosystems; Structure and Functions of Ecosystems.  
Components of Freshwater Ecosystem (Pond).  
Components of Terrestrial Ecosystem (Grassland).  
Biogeochemical Cycles - Nitrogen, Phosphorus.
- Biotic Factors : Symbiotic Interactions  
Positive Interactions: Mutualism, Commensalism, Protocooperation.  
Negative Interactions: Exploitation (Parasitism, Predation) Antibiosis, Competition
- Climate change & Sustainable Biodiversity: Importance of Biodiversity Sources.  
IUCN Categories of threat and list of endangered plant species of Gujarat.  
Concept of Carbon foot print & Carbon trading.  
Effect & Control of Air, Water and Soil Pollution.

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#### **Suggested Readings**

- (i) *Textbook of Ecology by G.Tailer Miller, Jr.Scott E. Spoolman. Cengage Learning*
- (ii) *Plants and Environment by Daubenmire (Wiley-Eastern Pvt. Ltd., New Delhi)*
- (iii) *Ecology and Environment by P.D.Sharma Rastogee Publication*
- (iv) *Basic Ecology – Eugene P. Odum*
- (v) *Fundamentals of Ecology- P. Odum*
- (vi) *Concept in Indian Ecology and Environmental Science – S. V. S. Rana*
- (vii) *Ecology Theories and Application – Peter Stiling*
- (viii) *Ecology & Environment – P. D. Sharma, Rastogi Publications*
- (ix) *Indian Manual of Plant Ecology – R .Misra & G. S. Puri*



## **SEMESTER-I**

### **Unit-4 : Plant Biotechnology**

**[ 10 hours ]**

**Objectives:** *To acquaint students with latest technological developments in the field of Biotechnology and plant tissue culture.*

- Introduction, Brief History, Scope and Types of Plant Biotechnology.
  - Plant Tissue Culture – Tools & Laboratory organization.
  - Technique of Plant tissue culture.
  - Introduction to Synthetic Seeds & Edible Vaccines
  - Protoplast Culture and Somatic Hybridization.
  - Applications of Plant Tissue Culture in Agriculture and Forestry
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### **Suggested Readings:**

- I. Biotechnology by U. Satyanarayana Books and Allied (P) Ltd*
- II. Elements of Biotechnology by P.K.Gupta, Rastogi Publications.*
- III. Plant cell and tissue culture by Narayanswamy, Tata McGraw Hill. Bhojwani, S.S. 1990.*
- IV. Plant Tissue Culture: Theory and Practical (a revised edition).Elsevier Science Publishers, New York, USA.*
- V. Basic Biotechnology by S. Ignacimuthu, Tata McGraw Hill*
- VI. A Text Book of Biotechnology by R.C. Dubey, S. Chand & Co.Vasil, I.K. and Thorpe, T.A. 1994.*
- VII. Plant Cell and Tissue Culture. Kluwer Academic Publishers, the Netherlands Snustad, D.P. and Simmons, M.J.2000.*
- VIII. Principals of Genetics. John Wiley & Sons, Inc., USA Stent, G.S. 1986.*
- IX. Molecular Genetics. CBS Publication.Brown, T.A. 1999. Genomes. John Wiley & Sons (Asia) Pvt. Ltd., Singapore.*



## SEMESTER-I

### Practicals Based on Theory 101 Unit-1 to 4 :

[ 40 hours ]

**Objectives:** *To acquaint students with Laboratory experiments, Specimen collection/ preservation, mounting, Identification in the field of Botany.*

1. Study of Algae - *Spirogyra* Mounting, Thallus and conjugations types.  
*Spirogyra* ( P.S ) Thallus and conjugations types.
  2. Study of Algae - *Nostoc* Mounting, Thallus and Hormogonia  
*Nostoc* ( P.S ) Thallus and Hormogonia.
  3. Study of fungi - *Mucor*: Bread / Roti with *Mucor*  
*Mucor*: Mounting -Thallus and Reproductive structure, Sporangia  
*Mucor* (P.S) Thallus ,Sporangia,Zygospore.
  4. Study of fungi - *Agaricus*: Thallus structure,Sporangia  
*Agaricus* (P.S) Reproductive structure.  
*Agaricus* (P.S) L.S.of Stroma.
  5. Study of Mushrooms - *White Button Mushroom*: Thallus structure( Image/Specimen)  
*Oyster Mushroom*: Thallus structure ( Image/Specimen)  
*Paddy straw Mushroom*: Thallus structure( Image/Specimen)
  6. Study of Bryophytes - *Riccia*: Specimen –Thallus with Sporophyte  
*Riccia*: ( P.S.) Thallus V.T.S Antheridia.  
*Riccia*: ( P.S.) Thallus V.T.S Archegonia.  
*Riccia*: ( P.S.) Thallus V.T.S Sporophyte.
  7. Study of structure of **Nucleic acids** (DNA, RNA) through charts or models- Watson & Crick.
  8. DNA Replication, Chloroplast and Mitochondria through charts or models.
  9. Study of Biotic Factors- Mutualism Symbiosis-Mycorrhiza /Root nodules, Lichens  
Protocooperation- Hermit crab and Fierasfer fish  
Commensalism- *Tinospora*  
Parasitism: *Cuscuta*, *Loranthes*,  
Predation: *Utricularia*, *Nepenthes*, *Drosera*.
  10. Study of various tools: Plant Tissue Culture. by actual,/charts/nearby PTC Laboratory.  
A. Laboratory design  
B. Laminar Air Flow, Autoclave, pH meter,  
C Oven, Digital balance  
D. Study of Artificial seeds through chart/Photograph/Demonstration
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Teachers must give attention to students about laboratory Manual and Guide for Specimen collection. To do visit nearby campus area to bring awareness about Vegetation and Green Environment. Students must prepare Project / Participate in Quiz / Seminar during University Practical Examination.

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### **Suggested Readings**

*A Textbook of Practical botany -1,2 3 Dr.Ashok Kumar bendre & Dr. Ashok Kumar,Rastogi Publication.*



GUJARAT UNIVERSITY

B.Sc. BOTANY PRACTICAL CC- PAPER-102

**SEMESTER-I**  
**University Practical Examination Skeleton**

Date: \_\_\_\_\_

Total Marks : 70

Time: 5 Hours

**SESSION-I**

- Q.1 Identify and describe Specimen A and B (Algae / Fungi / Mushroom/ Bryophyte) 08
- Q.2 Mount the reproductive organ from the Specimen C and show it to the examiner (Algae/Fungi/ Bryophyte) 06
- Q.3 Name the amino acids for \_\_\_\_\_ , \_\_\_\_\_ and \_\_\_\_\_ genetic codes. 03
- Q.4 Identify and describe the specimens 18
- I. Specimen -D ( Algae/Fungi )
  - II. Specimen -E ( Mushroom/Bryophyte )
  - III. Specimen -F ( Ecology)
  - IV. Specimen -G ( Ecology )
  - V. Specimen -H ( Genetics / Cytology )
  - VI. Specimen -I ( Plant tissue culture )

**SESSION-II**

- Q.5 Project / Quiz / Seminar 15
- Q.6 Practical based Viva-voce 15
- Q. 7 Certified Journal 05

# GUJARAT UNIVERSITY



## B. Sc. BOTANY ( Faculty of Science )

### Choice Based Credit System (CBCS) Theory syllabus Effective from June-2022

Detailed Curriculum has been designed as per **Semester** system.  
There shall be **One** theory paper having four units and **One** Practical Paper in each Semester .

### SEMESTER-II

B.Sc. Botany Semester-II	Unit	Title	Contact Hours per Week	External Exam	Internal Exam	Credit
Theory  CC BOTANY-103	1	Study of Pteridophytes & Higher Plants	04 Hours  ( for All Units )	70 marks	30 marks	04
	2	Plant Physiology				
	3	Plant Morphology & Taxonomy				
	4	Plant Resource ,Utilization, Horticulture & Gardening				
Practical  CC BOTANY-104		Based on Theory Paper 103	04 Hours	70 marks	30 marks	03





## SEMESTER-II

### Unit-1 : Study of Pteridophytes and Higher plants.

[ 10 hours ]

**Objectives:** To acquaint students with various Plants group and focus on Pteridophytes and Higher group of plants.

- **Brief Introduction about Plant Groups:** Pteridophytes & Higher group Plants.
- **Pteridophytes:** Taxonomic Position, structure of Thallus, vegetative, asexual and sexual modes of reproduction of the following genus .  
**1. Nephrolepis**  
Economic importance of Pteridophytes.
- **Gymnosperms:** Outline Classification of Gymnosperms by Chamberlain  
Occurrence, distribution, taxonomic position, morphology, reproduction and life history of the genus (excluding anatomy) .  
**1. Cycas.**  
Indian contribution on Gymnosperms.
- **Angiosperms:** Occurrence, distribution, taxonomic position, morphology, reproduction and life history of the genus (excluding anatomy)  
**1. Sunflower                      2.Maize**
- **Differences between Gymnosperms and Angiosperms**

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#### Suggested Readings:

- Sporne, K.K. 1991. The Morphology of Pteridophytes. B.I. Publishing Pvt. Ltd. Bombay*
- Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International Pvt. Ltd., New Delhi.*
- Raghavan, V.1999. Developmental Biology of Flowering plants. Springer - Verlag, New York.*
- Singh, G. 1999. Plant Systematics - Theory and Practice. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.*
- Naik, V.N. 1984. Taxonomy of Angiosperms. Tata McGraw - Hill Publishing Co. Ltd. New Delhi.*
- Verma B. K. 2011. Introduction to Taxonomy of Angiosperms. PHI Learning Private Ltd. New Delhi*
- Botany for degree students- Vol. V, Gymnosperm by P. C. Vasishta (S. Chand, Delhi)*
- Gymnosperm by G. L. Chopra (S. Nagin & Co., Jullundhar)*
- Gymnosperm by Vasishta (S. Chand, Delhi)*



## SEMESTER-II

### Unit-2 Plant Morphology and Taxonomy

[ 10 hours ]

*Objectives: To acquaint students with basic morphology and taxonomy of higher plants.*

- **Plant Morphology**

- Types of leaves. Phyllotaxy , Venations .Stipules : Types & their Modifications
- Bracts : Scaly, Involucral, Foliaceous, Petaloid and Spathe,
- Inflorescence **Racemose** – Raceme Spike, Catkin, Spadix, Umbel, Capitulum
- Inflorescence **Cymose** – Solitary Terminal, Solitary Axillary, Helicoid, Scorpioid, Biparous, Multiparous cymes.
- Types of Flowers based on position of ovary, Aestivation, Placentation,

- **Plant Taxonomy:**

- To enable students to understand systematic botany of higher plants with the examples of plants with economic importance.
- Give Brief account of Bentham & Hookers Classification and How to describe a plant family with Flower Diagram and Flower formula. Detailed study of the following families :
- Class - Dicotyledons – 1. *Malvaceae* Class- Monocotyledons- 2. *Amaryllidaceae*

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### Suggested Readings

- I. *Plant Systematics, Gurucharan Singh, Oxford & IBH.*
- II. *Advanced Plant Taxonomy, A. K. Mondal, New Central Book Agency (P) Ltd.*
- III. *Taxonomy of Angiosperms, B. P. Pandey, S. Chand Publication.*
- IV. *Raghavan, V.1999. Developmental Biology of Flowering plants. Springer - Verlag, New York. Stebbins, G.L. 1974.*
- V. *Flowering Plant - Evolution above Species Level. Edward Arnold Ltd. London.*
- VI. *Takhtajan, A.L. 1997. Diversity and Classification of Flowering Plants. Columbia University Press, New York.*
- VII. *Naik, V.N. 1984. Taxonomy of Angiosperms. Tata McGraw - Hill Publishing Co. Ltd. New Delhi*
- VIII. *Systematic botany By R.N.Sutaria , Khdayata Book Depot.*



## SEMESTER-II

### Unit-3: Plant Physiology

[10 hours]

*Objectives: To acquaint students with Basic physiology in Higher group of plants*

- **Plant-Water Relations:** Water Potential, Diffusion, Imbibition.
- **Respiration:** Mechanism, Aerobic & anaerobic respiration, significance and factors affecting them.
- **Photosynthesis:** Significance, Historical aspect, Photosynthetic pigments, C<sub>3</sub>-C<sub>4</sub> Pathways.
- **Physiology of Flowering:** Role of temperature in flowering, Vernalization.
- **Photoperiodism:** Role of light in flowering .
- **Transpiration:** Bell-Jar Experiment, types, significance and factors affecting transpiration,
- **Guttation**

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#### Suggested Readings:

- I. *Plant Physiology by S.N.Pandey and B.K. Sinha, Vikas Publishing House.*
- II. *Plant Physiology by S.N.Pandey and B.K. Sinha, Vikas Publishing House (iii)*
- III. *Plant Physiology and Biochemistry by S.K. Verma, S. Chand & Co. Hopkins, W. G. 1995.*
- IV. *Introduction to Plant Physiology. John wiley & Sons, Inc., New York, USA Salisbury, F.B. and Ross, C.W. 1992.*
- V. *Plant Physiology (4<sup>th</sup> edition). wadsworth Publishing Co. california, USA*
- VI. *Singhal, G.S., Renger, G., Sopory, S.K., Irrgang, K.D. and Govindjee 1999 Concept in Photobiology: Photosynthesis and Photomorphogenesis Narosa Publishing House, New Delhi*
- VII. *Taiz, L. and Zeiger, E. 1998. Plant Physiology (2<sup>nd</sup> edition). Sinauer Associates, Inc., Publishers,*
- VIII. *Massachusetts, USA Weshthoff, P. 1998. Molecular Plant Development: from Gene to Plant.Oxford University Press,*



## SEMESTER-II

### **Unit-4: Plant resource, utilization, Horticulture and Gardening**

**[10 hours]**

*Objectives: To acquaint students with Economic Botany and Horticulture Science.*

- **Plant resource, utilization**
- Botanical name, common name, family, useful part, brief description, important chemical constituents if any, climate and cultivation and uses of the following plants:  
Cereals: Wheat, Maize , Oil Seeds: Ground nut , Pulses- Tuver.
- Botanical name, common name, family, useful part, Uses and important chemical constituents of Medicinal plants- Ginger, Aloe, Neem and Ashwagandha.
- Food Adulteration- Awareness, importance, Tests for checking adulteration of Tea, coffee, Turmeric & Chili Powder.
  
- **Horticulture and Gardening**
- Horticulture: Definition, Scope and Branches
- Gardening: Introduction, Uses of gardens, Types of gardens
- Kitchen garden, water garden and rock garden
- Garden Equipments. Sprinkler, Hoe, Scissors, Hose pipe, Watering can
- Garden Operations- Digging, planting
- Identification of common plants for different garden locations (Minimum 03 plants for each location): Avenue, hedges and flower beds.
- Cutting, Layering and grafting methods of asexual plant propagation

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#### **Suggested Readings:**

- I. Economic Botany of the Tropics by S.L.Kochhar Economic Botany by A.F. Hill & O.P.Sharma Tata McGraw Hill, New Delhi. Gardening in India – Percy Lancaster, Oxford*
- II. Oxford & IBH Publishing Co. Pvt Ltd. Gardens – Laeeq Futehally, National Book Trust, India*
- III. Economic Botany by A.V.S.S. Samba Murty and N..S. Subramanyam,Wiley Easternpublication.*
- IV. A Manual of Ethnobotany, 2<sup>nd</sup> Edition, by S.K. Jain Scientific Publishers, Jodhpur*



## SEMESTER-II

### Practicals Based on Theory 103 Unit-1 to 4 :

[ 40 hours ]

**Objectives:** *To acquaint students with Laboratory experiments , Speciman collection/ preservation, mounting, Identification in the field of Botany.*

1. Study of Pteridophytes - *Nephrolepis* Thallus and sporophytic Plant Specimen.  
*Nephrolepis* mounting: Ramenta ,Sporangia.  
*Nephrolepis* ( P.S ) Prothallus with. Antheridia and Archegonia  
*Nephrolepis* ( P.S ) T.S. leaflet passing through sorus
2. Study of Gymnosperms - ***Cycas: Life History***  
*Cycas*: Specimen-*Cycas* whole plant, coralloid roots, compound leaf  
*Cycas*: Male cone Microsporophyll. Mounting Microspore.  
*Cycas*: Female cone Megasporophyll and ovules.  
*Cycas*: (P.S)- T.S Microsporophyll, LS Ovule, *Cycas* leaflet T.S
3. A. Study of Angiosperms : **Sunflower:** Life-History  
**Sunflower:** Specimen – Whole plant, Inflorescence, Root System  
**Sunflower** Mounting – Ray floret and Disc floret  
B. Study of Angiosperms : **Maize:** Life-History  
**Maize:** Specimen – Whole plant, Inflorescence, Seed, Root System  
**Maize:** (P.S) L.S of Seed.
4. Study of Plant Morphology-1: **Phyllotaxy** : Alternate ,Opposite Superposed& Decussate, Whorled.,  
**Types of leaves** (simple & All compound )  
**Venation** : Parallel & Reticulate  
**Stipules** :Types & their Modifications
5. Study of Plant Morphology-2 **Types of Bracts**- Foliaceous, Involucral, scaly, Spathe, Petaloid  
**Inflorescence**- Racemose- Raceme, Spike, Spikelet, Catkin, Umbel,  
Capitulum **Inflorescence** Cymose – Solitary –Terminal and Axillary;  
Monochasial Helicoid, Scorpioid; Dichasial and Multichasial
6. Types of Flowers :  
A. Based on position of ovary-03 types through charts  
B. Aestivation through charts C. Placentation through charts
7. Study of Plant families-  
Classification with reasons, Identifying characters ,androecium,  
gynoecium and TS of ovary; floral formula , botanical/common  
names of examples. a **Malvaceae**, and b. **Amaryllidaceae**  
Prepare minimum Two Herbarium Sheet.
8. Plant Physiology-  
Demo. Experiments for-  
Diffusion- Saffranin or Potassium permanganate in water,  
Imbibition- Demonstration of Endosmosis , Exosmosis in grapes
9. Plant Physiology-  
Demo. Experiments for-  
Transpiration- Four Leaf experiment  
Bell Jar experiment.
10. A. Economic Botany- Study of plants as per theory syllabus by specimen or herbaria.  
B. Study of Garden tools through charts- Scissors, Hoe, Hose, Watering can, Sprinkler  
C. Study of any 03 Avenue trees, 03 Hedges and 03 Flower-bed plants of your area through fresh specimen and herbaria.

Teachers must give attention to students about laboratory Manual and Guide for Specimen collection. To do visit nearby campus area to bring awareness about Vegetation and Green Environment. Students must prepare Project / Participate in Quiz / Seminar during University Practical Examination-----

### **Suggested Readings**

*A Textbook of Practical botany -1,2 3 Dr.Ashok Kumar bendre & Dr. Ashok Kumar,Rastogi Publication.*



GUJARAT UNIVERSITY

B.Sc. BOTANY PRACTICAL CC- PAPER-104

**SEMESTER-II**  
**University Practical Examination Skeleton**

Date: \_\_\_\_\_

Total Marks : 70

Time: 5 Hours

**SESSION-I**

- Q.1 Identify and describe Specimen A ( Sunflower , Maize Nephrolepis, Cycas) 06
- Q.2 Mount the reproductive organ from the Specimen B. ( Nephrolepis, Cycas) 05
- Q.3 Identify the Family of Specimen C, classify with reasons, Describe & draw labeled diagrams. 10
- Q.4 Identify and describe the specimens 14
- Specimen D (MORPHOLOGY)
- Specimen E (MORPHOLOGY)
- Specimen F (MORPHOLOGY)
- Specimen G (PLANT PHYSIOLOGY)
- Specimen H (ECONOMIC BOTANY)
- Specimen I (GARDEN TOOLS)
- Specimen J ( AVENUE TREE, HEDGES , FLOWER BED PLANT)

**SESSION-II**

- Q.5 Project / Quiz / Seminar 15
- Q.6 Practical based Viva-voce 15
- Q.7 Certified Journal 05

**GUJARAT UNIVERSITY**  
**Ahmedabad**



**Choice Based Credit System (CBCS) Syllabus**  
**B. Sc. - BOTANY**  
**Semester –III**  
( Theory and Practical )

**Effective from June - 2018**

Core course ( CC )	Botany Theory	Botany Theory	Botany Practical
<b>Paper No.</b>	<b>BOT-201</b>	<b>BOT-202</b>	<b>BOT-203</b> ( Part A / Session-I + Part B / Session-II )
<b>Credit</b>	<b>04 credit</b>	<b>04 credit</b>	<b>2.5 credit</b>
<b>Teaching hours / week</b>	<b>04 hours</b>	<b>04 hours</b>	<b>06 hours</b> ( Part A -03 hours + Part B -03 hours )
<b>Examination marks</b> ( External + Internal )	<b>100 marks</b>	<b>100 marks</b>	<b>100 marks</b> ( Part A-50 marks + Part B-50 marks )
<b>Semester end External Examination Marks</b>	<b>70 marks</b>	<b>70 marks</b>	<b>70 marks</b> ( Part A - 35 marks + Part B - 35 marks )
<b>Internal Exam. Marks.</b>	<b>30 marks</b> [15 ( Written Test ) 15 ( Assignment, Seminar / Quiz , Attendance)]	<b>30 marks</b> [15 ( Written Test ) 15 ( Assignment, Seminar / Quiz , Attendance)]	<b>30 marks</b> ( Part A -15 marks + Part B -15 marks )
<b>Semester end External Examination Duration</b>	<b>03 hours</b>	<b>03 hours</b>	<b>09 hours</b> Part A- 04.30 hours + Part B -04.30 hours

Core course	Paper BOT - 201 Theory	Paper BOT - 202 Theory	Paper BOT - 203 Practical
UNIT-1	Algae	Plant Anatomy	<b>Section - A / Session - I</b> Practicals Based on Theory Paper BOT-201
UNIT-2	Fungi, Lichens, Plant Pathology	Plant Ecology	
UNIT-3	Bryophytes	Plant Embryology	
UNIT-4	Economic Botany	Plant Cell Biology	
			<b>Section - B / Session - II</b> Practicals Based on Theory Paper BOT-202

- Detailed Curriculum has been designed as per semester system.
- There shall be two theory papers having four units each and one practical paper in semester.
- Students must be taken on a Botanical excursion / Field Trip or visit to a Research /Academic Institute , Science / Space exhibition , Participation in science based Seminar etc. to enhance the study experience.
- Students must record the laboratory work done in a journal. The journal is to be certified by the Teacher in-charge and Head of the department.
- Duly certified journals have to be produced while appearing at the time of university exam.
- Project work should be in tune with the syllabus and the presentation will carry due weight-age



**GUJARAT UNIVERSITY**  
**B. Sc. Semester-III**  
**BOTANY**

Choice Based Credit System Syllabus : Effective from June - 2018

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**Core Course ( CC ) Paper BOT- 201 (Theory )**  
[ CRYPTOGAMES , PLANT PATHOLOGY & ECONOMIC BOTANY ]

**Credit: 04**

**Teaching Hours:** 04 hours / Week

**Total Marks :** 100 ( External 70 + Internal 30 ) Marks

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**UNIT – I : ALGAE .**

- To acquaint students with lower group of plants ( **Cryptogams** ).
- General account : Habit and habitat of algae .
- Life history of the following genera including morphology and reproduction excluding development: ( Classification as per G. M. Smith )  
**1. Oedogonium.                      2. Ectocarpus.                      3. Batrachospermum.**

**UNIT - II: FUNGI , LICHENS AND PLANT PATHOLOGY.**

- Ultrastructure of fungal cell.
- Life history of the following genera including morphology and reproduction, excluding development ( Classification according to Ainsworth):-  
**1. Claviceps                      2. Puccinia**
- Types of Lichens.
- Introduction to plant pathology, Types of plant diseases- bacterial, fungal & viral; Types of symptoms- Necrosis, hypertrophy, atrophy, change in colour .

**UNIT - III: BRYOPHYTES.**

- Life history of the following genera with external and internal structure, reproduction, excluding development. ( Classification as per Rothmaler )  
**1. Plagiochasma                      2. Funaria ( Moss )**
- Economic importance of Bryophytes.

**UNIT- IV: ECONOMIC BOTANY**

- General account, ecological factors, cultivation , Botanical name ,Family and uses of plants.  
Plant fibers : **1. Cotton                      2. Jute                      3. Coir**
- Habit, Habitat, Botanical name , Family, wood characteristics and uses of Tree species:  
Timber :                      **1. Tectona grandis                      2. Gmelina arborea**  
Firewood :                      **3. Zizyphus jujuba                      4. Salvadoria persica**
- Habit, Habitat, Botanical name , Family, Useful parts and uses of the following Plants.  
Essential oils –                      **1. Eucalyptus                      2. Jasmine                      3. Rose**
- Habit, Botanical name , Family, Useful parts and Chemical constituents and uses of Plants.  
Medicinal plants:                      **1. Adhatoda                      2. Trigonella                      3. Tinospora**





**GUJARAT UNIVERSITY**  
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**BOTANY**

Choice Based Credit System Syllabus : Effective from June - 2018

**Core Course (CC) Paper BOT- 201 ( Theory )**  
[ CRYPTOGAMES , PLANT PATHOLOGY & ECONOMIC BOTANY ]

**SUGGESTED READING : REFERENCE BOOKS / TEXT BOOKS**

Teacher may suggest revised or latest published books etc.to the students

1. Pandey, S.N., Trivedi, P.S. and Misra, S.P. 2005. *A Textbook of Botany Vol. I and II*, Vikas Publishing House Pvt. Ltd.
2. Gangulee , H.C , Das, K. S. & Dutta ,C.. *College Botany Vol. I* , New Central book Agency.
3. Gangulee H.C., and Kar, A.K. *College Botany Vol. II*, New Central book Agency.
4. Vashishta, B.R. 2005. *Algae*, S. Chand Publications, New Delhi.
5. Smith, G.M. . *Cryptogamic Botany Vol. I*, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
6. Morris, I. 1986. *An Introduction to the Algae*. Cambridge University press, U.K.
7. Round, F.E. 1986. *The biology of Algae*, Cambridge University Press, U.K.
8. Kumar, H.D. 1988. *Introductory Phycology*. Affiliated East-West Press Ltd., New Delh
9. Webster, J. 1985. *Introduction to Fungi*. Cambridge University Press, U.K.
10. Vashishta, B.R. *Botany for degree student Part II. Fungi*. S. Chand Publications, New Delhi.
11. Mehrotra, R.S. and Aneja, R.S. *An Introduction to Mycology*, New Age Intermediate Press.
12. Alexopoulos, C.J. 1962. *Introductory Mycology*. John Wiley and Sons Inc.
13. Annie and Kumaresan, 2010. *Fungi & Plant Pathology*, Saras Publication
14. Vashishta, B.R. *Botany for degree student- Bryophytes*, S. Chand Publications, New Delhi.
15. Parihar, N.S. 1991. *Bryophyta*. Central Book Depot, Allahabad, India.
16. Puri, P. 1980. *Bryophytes*. Atmaram and Sons., Delhi, India.
17. Sen, S. 1992. *Economic Botany*, New Central Book Agency, Calcutta.
18. Verma, V. 1974. *A Textbook of Economic Botany*, Emcay Publication, New Delhi.
19. Kochar, S.L. 2011. *Economic Botany in the Tropics*, McMillan Publications, New Delhi.
20. Hiil, A. 1976. *Economic Botany*, Tata McGraw Hill Publishing Co., Ltd., New Delhi.
21. Bendre, A., Kumar, A. *Economic Botany*, Rastogi Publication, New Delhi. India.
22. Sambhamurthy ,A.V.S.S & Subramanian N.S.: *A textbook of Economic botany*, Wiley eastern ltd, New delhi



**GUJARAT UNIVERSITY**  
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Choice Based Credit System Syllabus : Effective from June - 2018

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**Core Course (CC) Paper BOT- 202 (Theory)**

[ PLANT ANATOMY, ECOLOGY, EMBRYOLOGY & CELL BIOLOGY ]

**Credits: 04**

**Teaching Hours:** 04 hours / Week

**Total Marks:** 100 (External 70 + Internal 30 ) Marks

**UNIT - I: PLANT ANATOMY .**

- Meristems: Characteristics, classification and theories of root - shoot apical meristem.
- The cambium: Types and functions.
- Simple Plant tissues: Types, Structure and functions.
- Comparative account of anatomy in following :  
Dicot stem (**Sunflower**) and Monocot stem (**Maize**)  
Dicot root (**Sunflower**) and Monocot root (**Maize**).
- Normal Secondary growth in **Sunflower** stem .

**UNIT - II: PLANT ECOLOGY :**

- Edaphic factors: Composition of soil, origin and development of soil, soil water, soil profile, soil erosion and soil conservation.
- Autecology of species-Biological clock , Definition and brief understanding of Ecads and Ecotypes, Ecological niche.
- Remote sensing- Definition and applications for ecosystem management.
- Ecological adaptations in Hydrophytes and Xerophytes : General account.  
External and Anatomical adaption of Following :  
Hydrophytes : **Hydrilla** stem and **Nymphaea** petiole  
Xerophytes : **Nerium** leaf and **Casuarina** stem

**UNIT - III: PLANT EMBRYOLOGY.**

- Structure of microsporangium and male gametophyte.
- Structure of ovule and its types.
- Structure of megasporangium and female gametophyte.  
Monosporic, Bisporic, Tetrasporic ( Fritillaria type ).
- Pollination- Definition and types. Pollination in **Salvia** and **Calotropis**.
- Fertilization in plants, Double fertilization.

**UNIT- IV: PLANT CELL BIOLOGY**

- Ultrastructure and Function of the following cell organelles :
  1. Cell wall
  2. Endoplasmic reticulum
  3. Ribosome
  4. Nucleus
  5. Lysosomes
  6. Dictyosomes
- Structure and models of plasma membrane :  
Sandwich model, Unit- membrane model and Fluid-mosaic model



**GUJARAT UNIVERSITY**  
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Choice Based Credit System Syllabus : Effective from June - 2018

**Core Course (CC) Paper BOT- 202 (Theory)**  
[ PLANT ANATOMY, ECOLOGY, EMBRYOLOGY & CELL BIOLOGY ]

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2. Gangulee, H.C., Das, K. S. & Dutta, C.. College Botany Vol. I, New Central book Agency.
3. Gangulee, H.C., and Kar, A.K. College Botany Vol. II, New Central book Agency.
4. Esau, K. 2006. Plant Anatomy. Pub John Willey & Sons Inc.
5. Fahn, A. 1990. Plant Anatomy. Pergamon Press, University of Michigan
6. Mc Daniels, Eanes. Plant Anatomy. Pub John Willey & Sons Inc.
7. Pandey, B.P. Plant anatomy, S. Chand Publications, New Delhi.
8. Chadha, A. Plant anatomy and embryology, S. Chand Publications, New Delhi.
9. Sharma, P.D. 2001. Ecology and Environment. Rastogi Publication, Meerut.
10. Odum, E.P. 1983. Basic Ecology. Saunders, Philadelphia.
11. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders, Philadelphia.
12. Misra, R. & Puri, G.S. 1968. Indian Manual of Plant Ecology. Oxford & IBH, New Delhi.
13. Stiling, P. Ecology: Theories and application. Harper Collins New York.
14. Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of angiosperms. Vikas Publishing House, New Delhi.
15. Bhojwani, S.S. and Bhatnagar, S.P. The Embryology. Rastogi Publication, Meerut.
16. Johri, B. M. 1984. Embryology of angiosperms, Nordic Journal of Botany.
17. Johri, B. M. Shivanna 1984. The Angiosperms pollen. Nordic Journal of Botany.
18. Verma, P. Agarwal S. Cytology. S. Chand and Co.
19. Gunnings, B.E.S. and Steer, M.W. 1996. Plant cell Biology structure & function. Jones Barlett Publishers, Boston, Massachusetts.
20. Smith, B. Hardin, P. The world of the cell Paul, A. Cell and Molecular Biology. Allied Pvt.
21. Lyndon, R.F. 1990. Plant development. The Cellular Basis. Unwin Hyman, London.
22. Roberties, E.D.P., Cell and molecular biology CBS Publishers & distributors.



**GUJARAT UNIVERSITY**  
**B. Sc. Semester-III**  
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Choice Based Credit System Syllabus : Effective from June - 2018

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**Core Course (CC) Paper BOT- 203 ( Practical )**

[ PART- A ( SESSION - I ) BASED ON THEORY PAPER BOT-201 ]

**Credits : 2.5 ( Part -A & B )    Teaching Hours: 03 hrs / Week    Total Marks: 50 (Ext.35 + Int.15)**

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**To study following practicals :**

1. **To study Algae – Oedogonium.**  
Classification , Mounting of Vegetative thallus and Macrandrous and Nanandrous species. Permanent slides of sexual reproduction organs and cap cell in thallus.
2. **To study Algae – Ectocarpus.**  
Classification, Mounting of vegetative thallus, Unilocular and Plurilocular sporangia. Permanent slides of Unilocular and Plurilocular sporangia.
3. **To study Algae - Batrachospermum .**  
Classification , Mounting of vegetative thallus, Cystocarp. Permanent slides of antheridia, archegonia and Cystocarp.
4. **To study Fungi – Claviceps .**  
Classification , Mounting of conidia. Permanent slide of Claviceps stroma (V.S).
5. **To study Fungi – Puccinia.**  
Classification , Mounting of Uredospore and Teleutospore. Permanent slides of Uredospore , Teleutospore , Pycniospore and Aeciospore.
6. **To study Bryophytes – Plagiochasma.**  
Classification , Specimen of Thallus, reproductive organs. Permanent slides or charts of V.S. of thallus and reproductive organs.
7. **To study Bryophytes- Funaria ( Moss ).**  
Classification , Mounting : Antheridia, Archegonia, Peristomial teeth. Specimen : Funaria gametophyte with sporophyte. Permanent slides : Antheridia, Archegonia, Sporophyte L.S.
8. **To study Economic Botany of Plant fibers , Timbers and Firewoods.**  
As Plant fibres :            1. Cotton            2. Jute            3. Coir  
As Timbers:                4. *Tectona grandis*            5. *Gmelina arborea*  
As Firewoods:            6. *Zizyphus jujuba*            7. *Salvadora persica*
9. **To study Economic Botany of Essential oils and Medicinal plants :**  
As Essential oil :            1. Eucalyptus    2. Jasmine    3. Rose  
As Medicinal Plants    4. Adhatoda    5. Trigonella    6. Tinospora

***Suggested Readings:***

Practical Botany vol. I & II By Bendre and Kumar, Rastogi Publication.

Practical Botany by S. C. Santra, Chettarjee and Das, New Central Book Agency.

Experimental Plant Ecology by Pratim Kapur and Sudha Rani, CBS Publication.



## GUJARAT UNIVERSITY

### B. Sc. Semester-III BOTANY

Choice Based Credit System Syllabus : Effective from June - 2018

#### **Core Course (CC) Paper BOT- 203 ( Practical )**

[ PART- B ( SESSION - II ) BASED ON THEORY PAPER BOT-202 ]

**Credits : 2.5 ( Part -A & B )    Teaching Hours: 03 hrs / Week    Total Marks: 50 (Ext.35 + Int.15)**

#### **To study following practicals :**

- 1. To study Plant anatomical structure : Shoot and root apex.**  
Permanent slides of shoot apex ( **Dictyota** and **chara**) and root apex.  
Mounting of shoot apex from **hydrilla** shoot.
- 2. To study Plant anatomical structure : Simple tissues and cambium.**  
Permanent slides of Parenchyma, Collenchyma, Sclerenchyma and Chlorenchyma.  
Permanent slides of cambium and cork cambium.
- 3. To study Plant anatomical structure: Comparative study of Root & Stem .**  
Permanent slides of **Sunflower** and **Maize** stem T.S.  
Permanent slides of **Sunflower** and **Maize** root T.S.  
Double stain temporary preparation of **Sunflower** stem T.S. and **Maize** stem T.S.  
Double stain temporary preparation of **Sunflower** root T.S. and **Maize** root T.S.
- 4. To study Plant anatomical structure: Normal Secondary growth.**  
Double stained temporary preparation of **Sunflower** stem T.S. for normal secondary growth.
- 5. To study External and anatomical ecological adaptation:**  
Hydrophytes : **Hydrilla** stem and **Nymphaea** petiole.  
Xerophytes : **Nerium** leaf and **Casuarina** stem.
- 6. To study plant embryology : Anther and Pollen grain.**  
Permanent slide of T.S. of Anther .  
Pollen grain germination. (in vitro), Permanent slide of Pollen grain germination on stigma.
- 7. To study plant embryology : Ovules and female gametophyte**  
Permanent slides or charts of Ovule types.  
Permanent slides of female gametophyte.
- 8. To study cell organelles :**  
Micrograph or charts of Cell wall , Endoplasmic reticulum , Ribosome and Nucleus.
- 9. To study cell organelles :**  
Micrograph or charts of Lysosome, Dictyosome and cell membrane models.  
( Sandwich model, Unit- membrane model and Fluid-mosaic model ).
- 10. Project work / Submission.**

#### ***Suggested Readings:***

Practical Botany vol. I & II By Bendre and Kumar, Rastogi Publication.  
Practical Botany by S. C. Santra, Chettarjee and Das, New Central Book Agency.  
Experimental Plant Ecology by Pratim Kapur and Sudha Rani, CBS Publication.





**GUJARAT UNIVERSITY**  
**B. Sc. Semester-III**  
**BOTANY**

Choice Based Credit System (CBCS) Syllabus : Effective from June - 2018

**UNIVERSITY THEORY EXAMINATION PAPER PATTERN**

**B. Sc. Semester – III Theory Examination**

Month/ Year \_\_\_\_\_

**BOTANY**

**Core Course (CC) Paper BOT - 201**

[ CRYPTOGAMES , PLANT PATHOLOGY & ECONOMIC BOTANY ]

**Core Course (CC) Paper BOT - 202**

[ PLANT ANATOMY, ECOLOGY, EMBRYOLOGY & CELL BIOLOGY ]

Date: \_\_\_ / \_\_\_ / \_\_\_

Duration : 03 hours

Total Marks:70

**Instructions: .....**

**Que: 1 ( A ) Unit-1 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**OR**

**Que: 1 ( A ) Unit-1 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**Que: 1 ( B ) Unit-1 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**OR**

**Que: 1 ( B ) Unit-1 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**Que: 2 ( A ) Unit-2 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**OR**

**Que: 2 ( A ) Unit-2 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**Que: 2 ( B ) Unit-2 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**OR**

**Que: 2 ( B ) Unit-2 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**Que: 3 ( A ) Unit-3 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**OR**

**Que: 3 ( A ) Unit-3 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**Que: 3 ( B ) Unit-3 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**OR**

**Que: 3 ( B ) Unit-3 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**Que: 4 ( A ) Unit-4 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**OR**

**Que: 4 ( A ) Unit-4 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**Que: 4 ( B ) Unit-4 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**OR**

**Que: 4 ( B ) Unit-4 Describe / Explain / Write short notes on \_\_\_\_\_ 07 marks**

**Que: 5 Write your answer in short : ( each sub-question carry 01 marks) \_\_\_\_\_ 14 marks**

Set 14 Sub-Questions as (a),( b ),( c )..to ( n ) **or** ( i ),( ii ),( iii ),...to ( xiv ) from

**Unit-1** ( 3 or 4 que. ), **Unit-2** ( 3 or 4 que. ), **Unit-3** ( 3 or 4 que. ), **Unit-4** ( 3 or 4 que. )

**GUJARAT UNIVERSITY**  
**Ahmedabad**



**Choice Based Credit System (CBCS) Syllabus**

**B. Sc. - BOTANY**

**Semester –IV**

( Theory and Practical )

**Effective from June - 2018**

Core course ( CC )	Botany Theory	Botany Theory	Botany Practical
Paper No.	<b>BOT - 204</b>	<b>BOT - 205</b>	<b>BOT - 206</b> ( Part A / Session-I + Part B / Session-II )
Credit	<b>04</b> credit	<b>04</b> credit	<b>2.5</b> credit
Teaching hours / week	<b>04</b> hours	<b>04</b> hours	<b>06</b> hours ( Part A - 03 hours + Part B - 03 hours )
Examination marks ( External + Internal )	<b>100</b> marks	<b>100</b> marks	<b>100</b> marks ( Part A- 50 marks + Part B- 50 marks )
Semester end External Examination Marks	<b>70</b> marks	<b>70</b> marks	<b>70</b> marks ( Part A - 35 marks + Part B - 35 marks )
Internal Exam. Marks.	<b>30</b> marks [15 ( Written Test ) 15 ( Assignment, Seminar / Quiz , Attendance)]	<b>30</b> marks [15 ( Written Test ) 15 ( Assignment, Seminar / Quiz , Attendance)]	<b>30</b> marks ( Part A -15 marks + Part B -15 marks )
Semester end External Examination Duration	<b>03</b> hours	<b>03</b> hours	<b>09</b> hours Part A- 04.30 hours + Part B -04.30 hours

Core course	Paper <b>BOT - 204</b> Theory	Paper <b>BOT - 205</b> Theory	Paper <b>BOT - 206</b> Practical
UNIT-1	Pteridophytes	Plant Anatomy	<b>Section - A / Session - I</b> Practicals Based on Theory Paper BOT-204
UNIT-2	Gymnosperms	Biophysics, Biochemistry	
UNIT-3	Plant Morphology, Taxonomy	Plant Genetics	<b>Section - B / Session - II</b> Practicals Based on Theory Paper BOT-205
UNIT-4	Plant Physiology	Applied Botany	

- Detailed Curriculum has been designed as per semester system.
- There shall be two theory papers having four units each and one practical paper in semester.
- Students must be taken on a Botanical excursion / Field Trip or visit to a Research /Academic Institute , Science / Space exhibition ,Participation in science based Seminar etc. to enhance the study experience.
- Students must record the laboratory work done in a journal. The journal is to be certified by the Teacher in-charge and Head of the department.
- Duly certified journals have to be produced while appearing at the time of university exam .
- Project work should be in tune with the syllabus and the presentation will carry due weight-age





**GUJARAT UNIVERSITY**  
**B. Sc. Semester-IV**  
**BOTANY**

Choice Based Credit System Syllabus : Effective from June - 2018

**Core Course (CC) Paper BOT- 204 (Theory)**

[ PTERIDOPHYTES , GYMNOSPERMS ,PLANT MORPHOLOGY & TAXONOMY, PLANT PHYSIOLOGY ]

**Credits: 04**

**Teaching Hours:** 04 hours / Week

**Total Marks:**100 (External 70 + Internal 30 ) Marks

**UNIT - I: PTERIDOPHYTES .**

- Life history of the following genera with morphology and anatomy excluding development. (classification as per Riemer)  
**1. Selaginella            2. Adiantum**
- Heterospory and seed habitat.
- Formation and types of fossils.

**UNIT - II: GYMNOSPERMS .**

- General characters.
- Classification of Gymnosperms given by Chamberlain (1934).
- Life history of **Pinus** including Morphology, Anatomy (Secondary structure of stem, R.L. S., T.L.S.), Reproduction and Embryogeny.

**UNIT - III: PLANT MORPHOLOGY & TAXONOMY .**

- Fruit morphology : Development , structure and types.
- Introduction to artificial, natural and phylogenetic systems of classification.
- Bentham and Hooker's system of classification : Merits and demerits.
- Classification of the following families as per Bentham and Hooker's system of classification including examples of economic importance plants.  
**1. Caesalpiniaceae    2. Rubiaceae            3. Apocynaceae        4. Convolvulaceae**  
**5. Euphorbiaceae    6. Nyctaginaceae       7. Arecaceae ( Palmae )**

**UNIT- IV: PLANT PHYSIOLOGY.**

- Absorption of water .
- Properties of water.
- Mechanism of water absorption.
- Transportation of water : Dixon's theory of cohesion force.
- Growth and development : Definition , Phases of Growth .
- Mineral nutrition in plants.
- Macro and Micronutrients- C, H, O, N, S, P, K, Ca, Fe, Mg, Mn, Zn, B, Cu, Mo  
Source, Functions, Deficiency symptoms and remedies.



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Choice Based Credit System Syllabus : Effective from June - 2018

**Core Course (CC) Paper BOT- 204 (Theory)**

[ PTERIDOPHYTES , GYMNOSPERMS ,PLANT MORPHOLOGY & TAXONOMY,PLANT PHYSIOLOGY ]

**SUGGESTED READING : REFERENCE BOOKS / TEXT BOOKS**

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2. Gangulee , H.C , Das, K. S. & Dutta ,C.. *College Botany Vol. I* , New Central book Agency.
3. Gangulee H.C., and Kar, A.K. *College Botany Vol.III*, New Central book Agency.
4. Vashishta, B.R.1983. *Botany for degree student- Pteridophyta*, S. Chand pub, New Delhi.
5. Parihar, N.S. 1991. *Pteridophyta*. Central Book Depot, Allahabad.
6. Sporne, K.K.. *The Morphology of Pteridophytes*. B.I. Publishing Pvt. Ltd. Bombay.
7. Bhatnagar, S.P. and Moitra, A., *Gymnosperms*. New Age International Pvt. Ltd., New Delhi.
8. Vashishta,P.C. *Botany for degree student-Gymnosperms*, S. Chand Publications, New Delhi.
9. Chopra, G.L. *Gymnosperms*. S. Nagin & Co., Jullundhar.
10. Coulter, J.M. & Chamberlain, C.J. 1978. *Morphology of Gymnosperms*. Central Book Depot, Allahabad.
11. Foster, A.S. and Gifford, F.M. 1967. *Comparative Morphology of Vascular plants*. Freeman Publishers, Sanfransisco.
12. Bierhost, D.W. 1971. *Morphology of vascular plants*. McMillan, New York.
13. Raghavan, V. 1999. *Developmental Biology of flowering plant*. Springer- Verlag, New York.
14. Singh, G. 1999. *Plant Systematics- Theory nad Practice*. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
15. Sutaria ,R.N. *A textbook of Systematic Botany* . Khadayata book depot.Tata McGraw- Hill Publishing Co. Ltd. New Delhi.
16. Naik, V.N. 1984. *Taxonomy of angiosperms*. Tata McGraw- Hill Publishing Co. Ltd. New Delhi.
17. Verma B.K. 2011. *Introduction to Taxonomy of angiosperms*. PHI Learning Pvt. Ltd. New Delhi.
18. Takhtajan 1997, *Diversity and Classifaication of Flowering Plants*. Columbia University Press, New York. Verma, S.K. *Plant Physiology*. S. Chand & Co.
19. Verma, S.K. *Plant Physiology*. Emkay Publication.
20. Sundararjan, S. *College Botany Vol. I to IV*. Himalaya Publishing House.
21. Witham, F.H., Delvin , R.M. 1983. *Plant Physiology*. Willard Grant. Boston, MA.
22. Salisbury, F.B.& Ross, C.W. *Plant Physiology*. Wadsworth Publishing Co. California, USA.
23. Kumar, A. & Purohit, S.S.2001. *Plant Physiology Fundamentals & Application* 2<sup>nd</sup> edition.



**GUJARAT UNIVERSITY**  
**B. Sc. Semester-IV**  
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Choice Based Credit System Syllabus : Effective from June - 2018

**Core Course (CC) Paper BOT- 205 (Theory)**

[ PLANT ANATOMY , BIOPHYSICS & BIOCHEMISTRY , GENETICS AND APPLIED BOTANY ]

**Credits: 04**

**Teaching Hours:** 04 hours / Week

**Total Marks:** 100 (External 70 + Internal 30 ) Marks

**UNIT - I: PLANT ANATOMY .**

- Complex tissue ( Xylem and Phloem ).
- Epidermal tissue system including Periderm and Lenticels.
- Anomalous Secondary growth in **Achyranthes** and **Mirabilis** stem.
- Anomalous Secondary growth in **Ficus** aerial root and **Carrot** root.

**UNIT - II: BIOPHYSICS & BIOCHEMISTRY.**

- General account of pH and Buffer.
- Protoplasm as a colloidal system.
- Enzymes: Definition , Nomenclature and classification of enzymes,
- Chemical nature of enzymes , Properties of enzymes , Mechanism of enzyme action .
- Factors affecting enzyme activity .
- General account of Secondary metabolites .
- Alkaloides : Definition, types and their importance .

**UNIT - III: GENETICS .**

- Mendelian genetics : Monohybrid ratio , Dihybrid ratio.
- Gene interactions: Allelic interactions, Non-allelic gene interactions-Complementary and Supplementary genes, Dominant and recessive Epistasis.
- Cytoplasmic inheritance : Definition and Example of **Mirabilis**
- Sex determination in plants : Chromosomal theory and theory of heterogametes.

**UNIT- IV: APPLIED BOTANY .**

- Pomology- Cultivation and preservation of **Mango** , **Amla** and **Jamphal**.
- Floriculture- General account.
- Social Forestry and Agroforestry.
- Nursery management.
- Bonsai : General account .



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Choice Based Credit System Syllabus : Effective from June - 2018

**Core Course (CC) Paper BOT- 205 (Theory)**

[ PLANT ANATOMY , BIOPHYSICS & BIOCHEMISTRY ,GENETICS AND APPLIED BOTANY ]

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4. Fahn, A. 1990. *Plant Anatomy*. Pergamon Press, University of Michigan
5. Mc Daniels, Eanes. *Plant Anatomy*. Pub John Willey & Sons Inc.
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14. Arumugan, N. *Cell Biology, Genetics, Evolution*. Saras Publication, Kanyakumari.
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16. Russel, P.J. 1992. *Genetics*. Harper Collins College.
17. Text book of horticulture – K. ManibhushanRao , MACMILLAN India Ltd.
18. Basic Horticulture – Victor R. Gardner, The MACMILLAN Company, New York 1.
19. Ashok Kumar ,*Botany in Forestry and Environment*, Khanna bandhu.
20. V.,Kumarsen : Horticulture ,Saras Publication-Nagarcoil.
21. N.,Arumugam : Fundamental of Biochemistry ,Saras Publication-Nagarcoil.
22. N.,Arumugam : Biophysics ,Saras Publication-Nagarcoil.
23. Meyyan,R.P., : Genetics ,Saras Publication-Nagarcoil.



## GUJARAT UNIVERSITY

### B. Sc. Semester-IV BOTANY

Choice Based Credit System Syllabus : Effective from June - 2018

#### **Core Course (CC) Paper BOT- 206 ( Practical )**

[ PART- A ( SESSION - I ) BASED ON THEORY PAPER BOT-204 ]

**Credits : 2.5 ( Part -A & B )    Teaching Hours: 03 hrs / Week    Total Marks: 50 (Ext.35 + Int.15)**

#### **To study following practicals :**

- 1. To study Pteridophytes : Selaginella.**  
Classification , Specimen .  
Permanent slides of *Selaginella strobilus* L.S. & T.S.  
Mounting of *Selaginella* spores from strobilus.
- 2. To study Pteridophytes : Adiantum.**  
Classification , Specimen .  
Permanent slides of *Adiantum leaflet* Passing through sori .  
Mounting of sporangia of *Adiantum*.
- 3. To study Gymnosperm : Pinus**  
Classification , Specimen , Mounting of Pollen grain.  
T.S. of *Pinus* needle.  
Specimens: Male cone, Female cone, Needle  
Permanent slides: Ovule, Needle, male cone L.S.
- 4. To study Plant morphology : Fruit.**  
Specimen / Chart of fruit : Simple Dry , Simple Fleshy , Composite , Aggregate Fruit.
- 5. To study Plant Family : Caesalpiniaceae , Rubiaceae.**
- 6. To study Plant Family : Apocynaceae, Convolvulaceae.**
- 7. To study Plant Family : Euphorbiaceae , Nyctaginaceae**
- 8. To study Plant Family : Arecaceae ( Palmae ) .**
- 9. To Study Demonstration of experiment :**  
Conduction of water through xylem.  
Examples of plants showing mineral deficiency through photos or specimen

#### ***Suggested Readings:***

1. Practical Botany vol. I & II By Bendre and Kumar, Rastogi Publication.
2. Practical Botany by S. C. Santra, Chettarjee and Das, New Central Book Agency.
3. Experimental Plant Ecology by Pratim Kapur and Sudha Rani, CBS Publication.



**GUJARAT UNIVERSITY**  
**B. Sc. Semester-IV**  
**BOTANY**

Choice Based Credit System Syllabus : Effective from June - 2018

**Core Course (CC) Paper BOT- 206 ( Practical )**

[ PART- B ( SESSION - II ) BASED ON THEORY PAPER BOT-205 ]

**Credits : 2.5 ( Part -A & B )    Teaching Hours: 03 hrs / Week    Total Marks: 50 (Ext.35 + Int.15)**

**To study following practicals :**

- 1. To study Plant anatomy : Complex Tissues**  
Permanent slides of Xylem and Phloem
- 2. To study Plant anatomy : Epidermal tissue system**  
Permanent slides of hairs and glands types .  
Types of stomata  
Types of Epidermis ( Uniseriate and Multiseriate)  
Periderm and Lenticel
- 3. To study Plant anatomy : Anomalous secondary growth**  
Make a temporary double stained slide preparation of **Achyranthus** a stem
- 4. To study Plant anatomy : Anomalous secondary growth**  
Make a temporary double stained slide preparation of **Mirabilis** stem
- 5. To study Plant anatomy : Anomalous secondary growth**  
Make a temporary double stained slide preparation of **Ficus** aerial root , **Carrot** root.
- 6. To study Plant Biochemistry**  
Determination of pH of various solutions.
- 7. To study Plant Biochemistry**  
Enzyme activity- amylase and Catalase.  
Demonstration of alkaloid extraction using Soxhlet apparatus.
- 8. Examples of Genetics:**  
Monohybrid / Dihybrid /Interaction of genes.
- 9. To study bonsai:**  
Specimen and Chart of Bonsai.
- 10. Project work / Submission.**

***Suggested Readings:***

Practical Botany vol. I & II By Bendre and Kumar, Rastogi Publication.  
Practical Botany by S. C. Santra, Chettarjee and Das, New Central Book Agency.  
Experimental Plant Ecology by Pratim Kapur and Sudha Rani, CBS Publication.





**GUJARAT UNIVERSITY**  
**B. Sc. Semester-IV**  
**BOTANY**

Choice Based Credit System Syllabus : Effective from June - 2018

**UNIVERSITY THEORY EXAMINATION PAPER PATTERN**

**B.Sc. Semester – IV Theory Examination**

Month/ Year \_\_\_\_\_

**BOTANY**

**Core Course (CC) Paper BOT - 204**

[ PTERIDOPHYTES ,GYMNOSPERMS ,PLANT MORPHOLOGY & TAXONOMY,PLANT PHYSIOLOGY ]

**Core Course (CC) Paper BOT - 205**

[ PLANT ANATOMY ,BIOPHYSICS & BIOCHEMISTRY ,GENETICS AND APPLIED BOTANY ]

Date: \_\_\_/\_\_\_/\_\_\_

Duration : 03 hours

Total Marks:70

**Instructions: .....**

- Que: 1 ( A )** Unit-1 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**  
**OR**  
**Que: 1 ( A )** Unit-1 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**
- Que: 1 ( B )** Unit-1 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**  
**OR**  
**Que: 1 ( B )** Unit-1 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**
- Que: 2 ( A )** Unit-2 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**  
**OR**  
**Que: 2 ( A )** Unit-2 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**
- Que: 2 ( B )** Unit-2 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**  
**OR**  
**Que: 2 ( B )** Unit-2 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**
- Que: 3 ( A )** Unit-3 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**  
**OR**  
**Que: 3 ( A )** Unit-3 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**
- Que: 3 ( B )** Unit-3 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**  
**OR**  
**Que: 3 ( B )** Unit-3 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**
- Que: 4 ( A )** Unit-4 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**  
**OR**  
**Que: 4 ( A )** Unit-4 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**
- Que: 4 ( B )** Unit-4 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**  
**OR**  
**Que: 4 ( B )** Unit-4 Describe / Explain / Write short notes on \_\_\_\_\_ **07 marks**
- Que: 5 Write your answer in short : ( each sub-question carry 01 marks) \_\_\_\_\_ 14 marks**  
Set 14 Sub-Questions as (a),( b ),( c )..to ( n ) **or** ( i ),( ii ),( iii ),...to ( xiv ) from  
**Unit-1** ( 3 or 4 que. ), **Unit-2** ( 3 or 4 que. ), **Unit-3** ( 3 or 4 que. ), **Unit-4** ( 3 or 4 que. )



# GUJARAT UNIVERSITY

Ahmedabad



## Choice Based Credit System (CBCS) Syllabus B. Sc. – BOTANY Semester–V ( Theory and Practical ) ( Effective from June-2019 )

	Botany Theory	Botany Theory	Botany Theory	Botany Theory	Botany Subject Elective	Botany Practical
<b>Paper No.</b>	<b>BOT-301</b>	<b>BOT-302</b>	<b>BOT-303</b>	<b>BOT-304</b>	<b>BOT-305</b>	<b>BOT-306</b>
<b>Credits</b>	04	04	04	04	02	05
<b>Teaching Hrs/Week</b>	04 hrs	04 hrs	04 hrs	04 hrs	03 hrs	12 hrs
<b>External Exam Marks</b>	70	70	70	70	70	140
<b>Internal Exam Marks</b>	30	30	30	30	30	60
<b>Total Exam Marks</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>200</b>

PAPER	BOT-301	BOT-302	BOT-303	BOT-304	BOT-305	BOT-306
Unit-1	Algae	Systematic Botany	Plant Physiology	Plant Ecology	Elective course from the University approved Subject  Plant Tissue Culture	There are two Practicals : i.e. Practical I and II. Each practical has 2 sessions ( I & II ), each of 5 hours
Unit-2	Fungi	Angiosperms	Biochemistry	Phyto-geography		
Unit-3	Plant Pathology	Plant Embryology	Cell Biology	Economic Botany		
Unit-4	Bryophytes	Plant Anatomy	Genetics	Biostatistics		

### Instructions:

- Students must be taken on a Botanical excursion for studying vegetation in natural state or visit a University department or research Institute of subjective Importance.
- Report of Excursion or visit and submission of specimens during the practical examination will be given due weightage.
- Students are expected to submit the following at the various respective examinations :  
Cryptogamic and Gymnospermic specimens or charts , Herbarium sheets of Angiospermic plants ( Minimum 10 ), herbarium sheets or specimens of Economic botany .
- Students must record the work done in the laboratory in the journal.
- The journal is to be certified by the in charge teacher and Head of the department.
- Certified journals have to be produced while appearing at the time of examination



**BOT 301 ( Algae , Fungi, Plant Pathology, Bryophytes )**

**301/1: UNIT: I**

(10 lectures)

**ALGAE:**

Structure, Reproduction (excluding development) and life history .

- CYANOPHYTA: *Scytonema*
- CHLOROPHYTA: *Chara*
- PHAEOPHYTA: *Sargassum*
- RHODOPHYTA: *Polysiphonia*
- Role of Algae in human welfare ( Industrial utilization, Algal culture, Pollution indicators )

**301/2 UNIT: 2**

(10 lectures)

**FUNGI:**

Occurrence, Distribution, Structure, Reproduction, utilization and life history (excluding development):

- MASTIGOMYCOTINA: *Erysiphe*
- ASCOMYCOTINA: *Peziza and Aspergillus (Eurotium)*
- BASIDIOMYCOTINA: *Ustilago*
- General account of Mycoplasma and Actinomycetes
- General Account of Mushroom cultivation.

**301/3 UNIT:3**

(10 lectures)

**PLANT PATHOLOGY:**

- Tools and Procedure to recognise symptoms and pathogen in a diseased plant
- Pathogen, symptoms and control of the following plant diseases:
  - Tikka disease of Groundnut
  - White rust of Crucifer
  - Wart disease of Potato
  - Citrus canker
  - Leaf curl of Papaya
  - Red rot of Sugarcane

**301/4 UNIT: 4**

(10 lectures)

**BRYOPHYTES:**

- Classification As per given by Rothmeler
- Adaptation in Bryophytes and land plants
- Comparative account of morphology and reproduction in *Riccia*, *Anthoceros*, *Pellia*, *Polytrichum* and *Funaria*.
- Structure, Reproduction and life history (excluding development):
  - HEPATICOSPODIA: *Pellia*
  - ANTHOCEROTOPSIDA: *Anthoceros*
  - BRYOPSISIDA: *Polytrichum*



**BOT 302: (Systematic Botany, Angiosperms, Embryology and Anatomy)**

**302/1 UNIT: I**

(10 lectures)

**SYSTEMATIC BOTANY:**

- Principles of taxonomy : principles, merits and demerits of systems of Engler -Prantle and Hutchinson, APG System.
- ICBN:
  - Principles and rules.
  - Typification.
  - Priority.
  - Effective and valid publications.
- Herbarium techniques: Plant collection and preparation of Herbarium.
- Role of Herbaria and Botanical Gardens.
- Some important Herbaria of India.

**302/2 UNIT: 2**

(10 lectures)

**ANGIOSPERMS:**

- Outline classification of systems of Bentham and Hooker (only families of the syllabus)
- Study of families: Classification as per Bentham and Hooker with economic importance
- DICOTS:
  - Polypetalae:        Tiliceae , Capparidaceae, Sterculiaceae, Rhamnaceae, Fabaceae.
  - Gamopetalae:     Asclepiadaceae, Bignoniaceae
  - Apetalae:         Polygoneceae
- MONOCOTS:         Commelinaceae, Cyperaceae

**302/3 UNIT: 3**

(10 lectures)

**PLANT EMBRYOLOGY:**

- Palynology: Exine ornamentation, concept of palynogram.
- Application of Palynology in coal, oil exploration, forensic science.
- NPC system of classification.
- Endosperm: Types and functions.
- Embryo development in Monocotyledons.
- Sagittaria, Sagittifolia type of embryo development.
- Apomixis, Polyembryony.

**302/4 UNIT: 4**

(10 lectures)

**PLANT ANATOMY:**

- Mechanical tissue system.
- Secretory tissue system (excluding Laticiferous).
- Absorbing tissue system.
- Root development: lateral roots; root hairs.
- Root-microbes interaction.
- Leaf – fall.
- Root – stem transition.



**BOT 303: (Plant Physiology, Biochemistry, Cell Biology, Genetics)**

**303/1 UNIT: 1**

(10 lectures)

**PLANT PHYSIOLOGY:**

- Dormancy:
  - Bud dormancy: Causes of seed dormancy.
  - Methods of breaking seed dormancy.
- Germination :
  - Seed viability, Different phases of seed germination.
  - Factors affecting on seed germination .
- Vernalization:
  - Definition, Mechanism, Practical applications and devernalization

**303/2 UNIT:2**

(10 lectures)

**BIOCHEMISTRY:**

- Amino acids: Structure, Classification and types of amino acids on the basis of R-group, peptide bond
- Proteins: Properties, Classification of proteins on the basis of structure, Simple and complex, Primary, Secondary and Tertiary proteins, Signification of Proteins.
- Lipids: Structure and components of lipids, Types of fatty acids, importance of lipids
- Carbohydrates: Significance, Structure and classification, Monosaccharides, Disaccharides and Polysaccharides

**303/3 UNIT:3**

(10 lectures)

**CELL BIOLOGY:**

- Ultra structures and functions:
  - Giant Chromosomes: Morphology, structure and function of Polytene chromosome, Lamp brush chromosome.
  - Microbodies.
  - Vacuole.
- Cell-cell interaction
- Cell Cycle:
  - Interphase , Mitosis and Meiosis
- Cell fractionation methods to study cell organelles.

**303/4 UNIT:4**

(10 lectures)

**GENETICS:**

- Deviation from Mendelian genetics- Polygenic inheritance, Multiple alleles, Pleiotropism
- Linkage: complete and incomplete linkage, Coupling & Repulsion hypothesis; Importance and factors affecting linkage, Linkage groups
- Crossing over: Chromosome mapping. Three point test cross;
- Factors affecting crossing over-interference and coincidence
- Gene mutations- General account and Types- somatic/germinal, spontaneous/induced, gross/point- base pair substitutions-transversion, transition; effect of substitution mutation on phenotype- Missense, Nonsense, Neutral, Silent mutations, Mutagens



**BOT 304: ( Ecology, Phytogeography, Economic Botany, Biostatistics )**

**304/1 UNIT:1** (10 lectures)

**PLANT ECOLOGY:**

- Vegetation development: Concept of Succession, Types of succession, Mechanism of ecological succession; Hydrosere, Xerosere.
- Synecology: Methods of studying plant communities.
- Analytical and Synthetic characters of plant community.
- Raunkiaer's life forms, Biological Spectrum.
- Halophytes: Types of Halophytes, ecological adaptations in Halophytes.

**304/2 UNIT:2** (10 lectures)

**PHYTOGEOGRAPHY:**

- Phytogeography: Definition, aims, objectives, scope and relation with other disciplines
- Endemism: Definition, Types, Causes, Theories.
- Botanical regions of India. ( with vegetation importance)
- Vegetation of Gujarat.
- Remote sensing and GIS for plant analysis.

**304/3 UNIT:3** (10 lectures)

**ECONOMIC BOTANY:**

- General account, Botanical name, family, cultivation methods, climate and uses:
  - CEREALS: Oats, Maize
  - PULSES: Tuber,
  - PLANTATION CROPS: Sugarcane
  - OIL CROPS: Sesamum
- Botanical name, family, useful part, chemical constituents and uses:
  - Condiments and Spices : Clove, Cinnamon, Saffron, Black Pepper
  - Aromatic plants: Fennel: Coriander, Cumin
  - Medicinal Plants: Cinchona, Belladonna, Holy basil-Tulsi

**304/4 UNIT:4** (10 lectures)

**BIOSTATISTICS:**

- Biometrics: Aims and objectives as applicable to biological science.
- Methods of data collection and graphical representation.
- Measures of central tendency- Mean, mode and Median
- Measures of Dispersion: Range, mean deviation,
- Standard deviation.
- Chi-square and goodness of fit.
- Normal, binomial and Poisson distribution



**BOTANY SUBJECT ELECTIVE PAPER BOT 305 : Plant Tissue Culture**

**305/1 UNIT:1** ( 5 lectures)

**Introduction and laboratory organisation:**

- Definition,
- Origin and History of plant tissue culture,
- Laboratory organization (washing area, transfer area, culture area, green house)
- Laboratory instruments (autoclave, laminar air flow, pH meter, oven, distillation unit).

**305/2 UNIT:2** ( 5 lectures)

**Techniques in plant tissue culture:**

- Sterilization techniques ( media sterilization, glassware sterilization, plant material sterilization, culture room sterilization and small instrument sterilization).
- Media composition and preparation.
- roles of various plant growth regulators( PGRs).
- Inoculation of the explants and maintenance of culture.

**305/3 UNIT:3** ( 5 lectures)

**Types of cultures :**

- Seed culture.
- embryo culture.
- callus culture.
- organ culture.
- cell culture.
- protoplast culture.

**305/4 UNIT:4** ( 5 lectures)

**Applications of plant tissue culture :**

- Industries, .’
- Forestry,
- Horticulture,
- Plant breeding
- Agriculture.

**Suggested reading:**

Introduction to plant tissue culture – M. K. Razdan, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.

Introduction to Plant Biotechnology- H. S. Chawla, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.



**BOTANY PRACTICALS:**  
**BOT - 306 Practical - I : Session-I**  
**(Algae, Fungi, Bryophytes, Pteridophytes)**

**Study of types through fresh, preserved material and permanent slides.**

**(a).** Identify and classify following types:

- |                                 |            |              |
|---------------------------------|------------|--------------|
| 1. Identify and classify types: | ALGAE:     | Scytonema.   |
| 2. Identify and classify types: | ALGAE:     | Sargassum    |
| 3. Identify and classify types: | FUNGI:     | Peziza.      |
| 4. Identify and classify types: | FUNGI:     | Aspergillus. |
| 5. Identify and classify types: | BRYOPHYTA: | Anthoceros.  |
| 6. Identify and classify types: | BRYOPHYTA: | Pellia.      |

**(b).** Study of Reproductive organs of following types:

- |                                   |            |                    |
|-----------------------------------|------------|--------------------|
| 7. Study of Reproductive organs:  | ALGAE:     | Chara              |
| 8. Study of Reproductive organs:  | ALGAE:     | Polysiphonia       |
| 9. Study of Reproductive organs:  | FUNGI:     | Peziza             |
| 10. Study of Reproductive organs: | FUNGI:     | Ustilago           |
| 11. Study of Reproductive organs: | BRYOPHYTA: | Funaria capsule,   |
| 12. Study of Reproductive organs: | BRYOPHYTA: | Polytrichumcapcule |
| 13. Study of Reproductive organs: | BRYOPHYTA: | Anthoceros Capsule |

**(c)** Plant diseases: charts, specimens and Permanent slides:

- |                              |                            |
|------------------------------|----------------------------|
| 14. Study of Plant diseases: | Tikka disease of Groundnut |
| 15. Study of Plant diseases: | White rust of Crucifer     |
| 16. Study of Plant diseases: | Wart disease of Potato     |
| 17. Study of Plant diseases: | Citrus canker              |
| 18. Study of Plant diseases: | Leaf curl of Papaya        |
| 19. Study of Plant diseases: | Red rot of Sugarcane       |

**(d)** Mycoplasma chart.

20. Study of Mycoplasma chart

**(e)** Submission. chart/specimens of cryptogams/plant diseases.







**BOTANY PRACTICALS:**  
**BOT - 306 Practical II : Session-I**  
**( Plant Physiology, Biochemistry, Cell Biology, Genetics )**

**A). PLANT PHYSIOLOGY & BIOCHEMISTRY:**

**a). Physiological experiments:**

The following physiological experiments to be performed by the students , results are expected :

- a To determine the water potential of given tissue (Any tuber) .
- b Separation of amino acids in a mixture by paper chromatography & their identification by comparison with standard  $R_f$  value.
- c Qualitative tests for proteins from plant material.
- d Test for the presence of fats from oil seeds.
- e To detect the seed viability.

**b) Biochemistry charts of following per theory syllabus.**

- a Amino acids .
- b Proteins.
- c Lipids.
- d Carbohydrates.

**B). CELL BIOLOGY:**

- a To study mitosis in onion root tip by squash method.
- b Electron micrographs of following cell organelles.
- c Microbodies.
- d Chromosomes. polytene and lampbrush
- e Plant Vacuole.

**C). GENETICS:**

- a Genetics problems on multiple alleles.
- b Charts of Deletion, substitution, Inversion, duplication.



**BOTANY PRACTICALS:**  
**BOT - 306 Practical II :Session-II**  
**( Ecology, Plant Geography, Economic Botany, Biostatistics )**

**A). ECOLOGY:**

1. Determination of Frequency (%), Density and Abundance Of plant species.
2. Study of Biological Spectrum and prediction of vegetation of a given area by comparing it's biological spectrum to the normal .

**B). PHYTOGEOGRAPHY:**

1. To prepare map showing vegetation of Gujarat and to comment on it.
2. To prepare map of India with respect to –Biogeographical regions

**C). ECONOMIC BOTANY:**

- Study of various economicbotany specimens.
- General account, Botanical name, family, cultivation methods, climate and uses:
  - a CEREALS: Oats, Maize
  - b PULSES: Tuver,
  - c PLANTATION CROPS: Sugarcane
  - d OIL CROPS: Sesamum
- Botanical name, family, useful part, chemical constituents and uses:
  - a Condiments and Spices : Clove, Cinnamon, Saffron, Black Pepper
  - b Aromatic plants: Fennel: Coriander, Cumin
  - c Medicinal Plants: Cinchona, Belladonna, Holy basil-Tulsi
- **Submissions: Economic Botany specimen and herbarium.**

**D). BIOSTATISTICS:**

- Statistical Problems on:
  - a Mean
  - b Mode
  - c Median
  - d Standard deviation





# GUJARAT UNIVERSITY

Ahmedabad



**Choice Based Credit System (CBCS) Syllabus**  
**B. Sc. – BOTANY**  
**Semester–VI ( Theory and Practical )**  
( Effective from June-2019 )

	Botany Theory	Botany Theory	Botany Theory	Botany Theory	Botany Subject Elective	Botany Practical
<b>Paper No.</b>	<b>BOT-307</b>	<b>BOT-308</b>	<b>BOT-309</b>	<b>BOT-310</b>	<b>BOT-311</b>	<b>BOT-312</b>
<b>Credits</b>	04	04	04	04	02	05
<b>Teaching Hrs/Week</b>	04 hrs	04 hrs	04 hrs	04 hrs	03 hrs	12 hrs
<b>External Exam Marks</b>	70	70	70	70	70	140
<b>Internal Exam Marks</b>	30	30	30	30	30	60
<b>Total Exam Marks</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>200</b>

PAPER	BOT-307	BOT-308	BOT-309	BOT-310	BOT-311	BOT-312
<b>Unit-1</b>	<b>Pteridophytes</b>	<b>Angiosperms</b>	<b>Advanced Plant Physiology</b>	<b>Environmental Biology</b>	Elective course from the University approved Subject  <b>Horticulture and Gardening</b>	There are two Practicals : i.e. Practical I and II. Each practical has 2 sessions ( I & II ), each of 5 hours
<b>Unit-2</b>	<b>Pteridophytes fossils</b>	<b>Plant Anatomy</b>	<b>Plant Breeding</b>	<b>Gardening</b>		
<b>Unit-3</b>	<b>Gymnosperms</b>	<b>Advanced Biochemistry</b>	<b>Molecular biology</b>	<b>Ethno - Botany</b>		
<b>Unit-4</b>	<b>Gymnosperms fossils</b>	<b>Microbiology</b>	<b>Biotechnology</b>	<b>Forestry</b>		

## Instructions:

- There must be at least one visit to a public garden to study landscape design principles.
- Project report, garden visit report and submission of specimens during the practical examination will be given due weightage.
- Students are expected to submit the following at the respective practical examinations:
- Cryptogamic and Gymnospermic specimens or charts, Angiospermic specimens, Herbarium sheets of angiospermic plants (Minimum 10), Herbarium sheets of Ethnobotanical plants, garden visit report as project.
- Students are expected to record the work done in the laboratory in the journal.
- The journal is to be certified by the in charge teacher and Head of the department.
- Certified journals have to be produced while appearing at the time of examination.



**BOT 307 ( Pteridophytes, Pteridophyte fossils, Gymnosperms , Gymnosperm fossils)**

**307/1: UNIT: I**

(10 lectures)

**PTERIDOPHYTES::**

- General characters of Pteridophytes
- Classification of Pteridophytes by Reimer (1954)
- Structure, Reproduction and life history (excluding development):
  - SPHENOPSISIDA: *Equisetum*
  - LYCOPSISIDA: *Isoetes*
  - PTEROPSISIDA: *Marsilea*
- Stellar evolution in Pteridophytes
- Comparative account of morphology and reproduction in *Isoetes*, *Selaginella*, *Equisetum*, *Marsilea* and *Adiantum*.
- Apospory and Apogamy

**307/2 UNIT: 2**

(10 lectures)

**PTERIDOPHYTE FOSSILS :**

- Geological Time-Scale
- Psilophytales: General Characters: *Rhynia*
- Lepidodendrales: General Characters: *Lepidodendron* and *Lepidocarpon*
- Calamitales: General Characters: *Calamites* and *Calamostachys*

**307/3 UNIT:3**

(10 lectures)

**GYMNOSPERMS::**

- Outline classification by Chamberlin
- Economic importance of Gymnosperms
- Morphology, anatomy, reproduction and life history:
  - GINKGOALES: Ginkgo
  - GNETALES: Ephedra, Gnetum

**307/4 UNIT: 4**

(10 lectures)

**GYMNOSPERM FOSSILS:\**

- General account of Carbon dating.
- Fossil biology of Gymnosperms: General characters:
  - CYCADOFILICALES *Lygenopteris aldhamia*, *Corsotheca* (Male organ)
  - BENNETTITALES Spore bearing organs
  - CORDAITALES *Cordaites* , *Cordaitanthus*
  - PENTOXYLALES General account
- Economic importance of Gymnosperms



**BOT 308 (Angiosperms, Plant Anatomy, Advanced Biochemistry, Microbiology)**

**308/1: UNIT: I** (10 lectures)

**ANGIOSPERMS:**

- Classification as per Bentham and Hooker with economic importance
  - DICOTYLEDONS:
    - Polypetalae: Menispermaceae, Meliaceae, Umbelliferae, Mimosae
    - Gamepetalae: Sapotaceae, Boraginaceae
    - Apetalae: Urticaceae, Chenopodiaceae
  - MONOCOTYLEDONS: Cannaceae

**308/2 UNIT: 2** (10 lectures)

**PLANT ANATOMY:**

- Anomalous secondary growth:
  - Abnormal behavior of normal cambium Eg. Draceana stem
  - Accessory cambium formation and its activity Eg. Bougainvillea and Boerhaavia stem
  - Abnormal secondary growth in fleshy roots Eg. Raphanus and Beet root
- Methods in plant anatomy- collection fixation, presentation and microtomy
- Nodal Anatomy – Unilacunar, Trilacunar, Multilacunar.

**308/3 UNIT:3** (10 lectures)

**ADVANCED BIOCHEMISTRY:**

- Carbohydrate metabolism:
  - Glycolysis
  - Krebs cycle
- Protein metabolism- Amino acid pool, Deamination, Transamination
- Lipid metabolism: Glycerol metabolism, Alpha oxidation of fatty acids (with structures), Beta oxidation of saturated fatty acids
- General account of Vitamins

**308/4 UNIT: 4** (10 lectures)

**MICROBIOLOGY:**

Brief outline; Properties of viruses, ultra structure of bacteria and Bacteriophage, Types of bacteria- Rod shaped, spherical, Spirillum and Comma shaped.

- Gram staining
- Industrial application of Bacteria: Milk and milk products, Antibiotics, Biopesticides and Biofertilizers,
- Biodegradation of cellulose and lignin.



**BOT 309 (Advanced Plant Physiology, Plant Breeding, Molecular Biology, Biotechnology)**

**309/1: UNIT: I** (10 lectures)

**ADVANCED PLANT PHYSIOLOGY:**

- Plant movements: Hydrotropism, Geotropism, Phototropism, Thigmotropism
- Plant Growth: Growth curve, measurement of growth, factors affecting growth
- Plant Growth Regulators (Auxins, Gibberellins, Cytokinins, Abscisic acid, Ethylene): biosynthesis, translocation and physiological functions
- General account of Senescence

**309/2 UNIT: 2** (10 lectures)

**PLANT BREEDING:**

- Aims, objectives and impacts of plant breeding
- Procedure of plant introduction
- Selection methods: Mass selection, Pure line selection, Progeny selection
- Techniques of hybridization, Emasculation, Bagging, Tagging, pollination and procedure of selfing Hybridisation methods of plant breeding: Pedigree method, Bulk method of breeding, Back cross method

**309/3 UNIT:3** (10 lectures)

**MOLECULAR BIOLOGY :**

- General account and techniques of gene mapping
- DNA sequencing,
- DNA fingerprinting
- Complex translocation heterozygote
- Transposable elements
- Mitochondria and chloroplast genome Coding and noncoding sequences

**309/4 UNIT: 4** (10 lectures)

**BIOTECHNOLOGY:**

- Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy;
- Artificial Seeds from plant samples
- Edible Vaccines from plants
- Methods of gene transfer in plants: Physical methods-Micro injection, electroporation, particle gun and Biological method- Agrobacterium-mediated gene transfer
- Cryopreservation and Germplasm storage





**BOT 310 ( Environmental Biology , Gardening, Ethnobotany, Forestry)**

**310/1: UNIT: I**

(10 lectures)

**ENVIRONMENTAL BIOLOGY::**

- Brief account: Environmental Impact Assessment (EIA), IBP, Man and Biosphere Program (MAB)
- Greenhouse Gases -CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>, CFCs: Sources, effects and remedies
- Brief account of Climate change and its Consequences -acid rain, Global warming, Sea level Rise, Greenhouse effect Ozone depletion;
- Effects of Air, Water and Soil pollution on vegetation .

**310/2 UNIT: 2**

(10 lectures)

**GARDENING:**

- Principles of Garden Design
- Garden features: Paths or walkways, avenues, arches, lawn, floral beds, hedges, ground cover
- Garden operations: Plant care-Manuring, repotting, Pruning- principles & kinds.
- Landscape designs in India- Buddhist, Mughals, etc.
- Vertical gardening- concept, principle and plant materials.

**310/3 UNIT:3**

(10 lectures)

**ETHNOBOTANY:**

- History and development of Ethnobotany
- General account of Sacred groves
- Methods of Ethnobotanical research
- Plants in religious belief
- Plants used by tribes of Gujarat:
  - *Achyranthes aspera* , *Asparagus racemosus*,
  - *Butea monosperma* , *Calotropis procera*,
  - *Ficus religiosa* , *Vitex negundo*.

**310/4 UNIT: 4**

(10 lectures)

**FORESTRY:**

- Benefits of Forest : Commercial , Ecological and Aesthetical
- General account of benefits of Forests products- major products- lumber, timber, firewood minor products- medicines, oils
- Forest types of India
- Wood- Physical properties, structural features and identification of wood
- Timber Extraction and Paper industry
- Paper industry
- Wild life and biosphere reserves



**BOTANY SUBJECT ELECTIVE PAPER BOT- 311 : Horticulture and Gardening**

**311/1 UNIT:1**

( 5 lectures)

**Fundamentals of Horticulture**

- Definition
- branches
- importance and scope
- Classification of Horticultural Crops- Root and tuber crops, fruit crops and vegetable crops
- Garden tools and equipments

**311/2 UNIT:2**

( 5 lectures)

**Soil and water considerations**

- Physical texture and composition of soil
- soil types
- soil pH
- preparation of beds
- Water needs, how and when to water
- Application of fertilizers, biofertilizers, organic fertilizers

**311/3 UNIT:3**

( 5 lectures)

**Plant Propagation, After care and Plant Protection**

- Vegetative Propagation methods- cutting, layering, grafting
- Method of sowing seeds
- potting, repotting and transplantation
- Weeding, defoliation, pruning
- topiary

**311/4 UNIT:4**

( 5 lectures)

**Special horticultural practices**

- Greenhouse cultivation
- Floriculture
- Terrariums
- Organic gardening
- hydroponics and aeroponics
- sand and gravel culture

**Suggested reading:**

Text book of horticulture – K. ManibhushanRao , MACMILLAN India Ltd.

Basic Horticulture – Victor R. Gardner, The MACMILLAN Company, New York



**BOTANY PRACTICALS:**  
**BOT - 312 Practical I : Session-I**  
**(Pteridophytes, Pteridophyte fossils, Gymnosperms and Gymnosperm fossils)**

**1. Study of types through fresh preserved material and permanent slides.**

(a). Identify and classify following types:

- |                                 |               |          |
|---------------------------------|---------------|----------|
| 1. Identify and classify types: | PTERIDOPHYTA: | Isoetes  |
| 2. Identify and classify types: | PTERIDOPHYTA: | Marsilea |
| 3. Identify and classify types: | GYMNOSPERMS : | Ginkgo.  |
| 4. Identify and classify types: | GYMNOSPERMS:  | Gnetum   |
| 5. Identify and classify types: | GYMNOSPERMS:  | Ephedra  |

(b). **Structure and Reproductive organs:**

- |                                   |               |                     |
|-----------------------------------|---------------|---------------------|
| 6. Study of Reproductive organs:  | PTERIDOPHYTA: | Isoetes Sporophyll  |
| 7. Study of Reproductive organs:  | PTERIDOPHYTA: | Selaginella cone    |
| 8. Study of Reproductive organs:  | PTERIDOPHYTA: | Adiantum sporophyll |
| 9. Study of Reproductive organs:  | PTERIDOPHYTA: | Marselia sporocarp. |
| 10. Study of Reproductive organs: | GYMNOSPERMS:  | Gnetum              |
| 11. Study of Reproductive organs: | GYMNOSPERMS:  | Ephedra             |

**2. The following Fossil Specimens and / or slides should be studied.**

**PTERIDOPHYTA**

- |   |  |
|---|--|
| 12. Study of Fossils specimen/slides :  | PSILOPHYTALES :Rhynia: Stem T.S                        |
| 13. Study of Fossils specimen/slides :: | LEPIDODENDRALES : Lepidodendron Stem T.S.              |
| 14. Study of Fossils specimen/slides :: | LEPIDODENDRALES : Lepidocarpon V.S.Slide               |
| 15. Study of Fossils specimen/slides :: | CALAMITALES : Calamites: Impression, Stem, T.S.        |
| 16. Study of Fossils specimen/slides :: | CALAMITALES : Calamostachys: Peel / Slide, Cone<br>L.S |

**GYMNOSPERMS**

- |                                   |   |
|-----------------------------------|---|
| 17. Study of Reproductive organs: | CYCADOFILICALES: Lygenopteris aldhama – Stem, T.S |
| 18. Study of Reproductive organs: | CYCADOFILICALES:, Corsotheca (Male organ)         |
| 19. Study of Reproductive organs: | CORDAITALES: Cordianthus – L.S of Cone.           |
| 20. Study of Reproductive organs: | CORDAITALES: Cordaites: Stem T.S                  |

**3. Chart preparation or collection of plant specimen for submission**



**BOTANY PRACTICALS:**  
**BOT - 312 Practical I :Session-II**  
**( Angiosperms, Plant Anatomy, Advanced biochemistry , Microbiology)**

**A). ANGIOSPERMS:**

**i). Classification chart of families ( of syllabus ) as per Bentham and Hooker classification**

**ii). Study of families following including floral formula and floral diagram.**

- |                    |                   |                  |
|--------------------|-------------------|------------------|
| 1. Menispermaceae. | 2. Meliaceae.     | 3. Umbelliferae. |
| 4. Mimosae.        | 5. Sapotaceae.    | 6. Boraginaceae: |
| 7. Urticaceae      | 8. Chenopodiaceae | 9. Cannaceae.    |

**B) ANATOMY:**

- Study of different types of stele through charts and permanent slides. The onus should be on the study of abnormality in the secondary growth in:
  - (1) Draceana stem
  - (2) Bougainvillea stem
  - (3) Boerhavia stem
  - (4) Raphanus root
  - (5) Beet root
- Study of charts of nodal anatomy as per syllabus.
- Charts of fixation methods and demonstration of microtomy

**C). ADVANCED BIOCHEMISTRY:**

1. Chart of Vitamins.

**D ). MICROBIOLOGY:**

1. Staining of bacteria through gram staining
2. Electron micrograph: Bacteriophage virus & Bacteria

Submissions: Herbarium sheets of plants of families .



**BOTANY PRACTICALS:**  
**BOT - 312 Practical II :Session-I**

(Advanced Plant Physiology, Plant Breeding, Molecular Biology, Biotechnology)

**ADVANCED PLANT PHYSIOLOGY :**

**1. Major experiments:**

The following physiological experiments to be performed by the students and results are expected :

- (i) To study the rate of photosynthesis under different concentration of CO<sub>2</sub>.
- (ii) To study of the rate of photosynthesis under different wavelength of light .
- (iii) To study of the rate of photosynthesis under different light intensities.

**2. Other experiments:**

The following experiments to be performed by the students

- (i) Hill reaction
- (ii) Synthesis artificial seeds

**3. Demonstration Experiments:**

- (i) To demonstrate the phenomenon of geotropism
- (ii) To demonstrate the phenomenon of hydrotropism
- (iii) To demonstrate the phenomenon of phototropism
- (iv) To demonstrate the phenomenon of thigmotropism

**PLANT BREEDING:** Charts as per theory syllabus.( As per avail charts )

- Emasculation, Bagging, Tagging
- Pedigree / Bulk method of breeding, Back cross method

**MOLECULAR BIOLOGY:** Charts as per theory syllabus. .( As per avail charts )

- Gene mapping/DNA sequencing/DNA fingerprinting
- Mitochondria /chloroplast genome

**BIOTECHNOLOGY:** Charts as per theory syllabus. .( As per avail charts ) :

- Human insulin and vaccine production
- Edible Vaccines from plants
- Gene transfer in plants: Physical /-Micro injection/ electroporation/ particle gun and Biological method- Agrobacterium-mediated gene transfer
- Cryopreservation and Germplasm storage



**BOTANY PRACTICALS:**  
**BOT - 312 Practical II :Session-II**

( Environment biology , Gardening, Ethnobotany, Forestry)

**A). ENVIRONMENTAL BIOLOGY:**

**Mohr's titration method for determination of water hardness:**

1. Determination of Chloride content in water sample
2. Determination of Carbonate and Bicarbonate in water sample
3. Determination of Calcium content in water sample
4. Determination of Total hardness of water sample

**Determination of Carbonate/Nitrate deficiency from the given soil sample. (Quantitative)**

**B). GARDENING**

1. Visit to a garden to study the principles and materials used in landscape design, various garden design .
2. Chart of garden tools and features.

Report to be submitted during practical exam.

**C). ETHNOBOTANY**

Study of Ethnobotanical importance following specimens .

1. *Achyranthes aspera* ,
2. *Asparagus racemosus*
3. *Butea monosperma.*,
4. *Calotropis procera*
5. *Ficus religiosa.*,
6. *Viitex negundo*

**D). FORESTRY**

Identification and characteristics of following wood samples:

1. *Eucalyptus sp.*
2. *Acacia arabica*
3. *Mangifera indica*
4. *Tectona grandis*

**Submissions:** Garden visit Report

**Herbarium of Ethnobotanical samples of plants.**



GUJARAT UNIVERSITY : B. Sc. - BOTANY Semester –VI ( Practical paper ) : Effective from June-2019

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**GUJARAT UNIVERSITY**  
**B. Sc. Sem- VI BOTANY PRACTICAL EXAMINATION**

**BOT 312 : PRACTICAL -I**

**Session I**

**( Pteridophytes, Pteridophyte fossils, Gymnosperms and Gymnosperm fossils)**

Maximum marks – 35

Time: 5 hours

Date : - - 20

- Q.1 Identify, classify with giving reasons, describe briefly. Draw the labelled diagrams (12)  
Of the peculiarities observed in specimen A, B and C.
- Q.2 Expose the reproductive structure from the Specimen D. Make a sketch and (06)  
show your preparation to the Examiner.
- Q.3 Identify and describe briefly the Slides / Specimens. (08)  
(E) Pteridophytes, (F) Gymnosperms, (G) Pteridophyte fossils and (H) Gymnosperms fossils
- Q.4 Journal. (02)
- Q.5 Submission and Viva-voce (07)
- 

**GUJARAT UNIVERSITY**  
**B. Sc. Sem- VI BOTANY PRACTICAL EXAMINATION**

**BOT 312 : PRACTICAL- I**

**Session II**

**(Angiosperms, Anatomy, Advanced Biochemistry and Microbiology)**

Maximum marks – 35

Time: 5 hours

Date : - - 20

- Q.1 Refer the Specimens A and B to their respective families, Giving reasons (10)  
Including floral formula and diagrams.
- Q.2. Prepare a double stained preparation of given material C. show your preparation (07)
- Q.3 Identify and describe (06)  
(D) Microbiology (E) Anatomy (F) Vitamins
- Q.4 Journal. (02)
- Q.5 Submission and Viva-voce (10)



GUJARAT UNIVERSITY : B. Sc. - BOTANY Semester –VI ( Practical paper ) : Effective from June-2019

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**GUJARAT UNIVERSITY**  
**B. Sc. Sem- VI BOTANY PRACTICAL EXAMINATION**

**BOT 312 : PRACTICAL- II**  
**Session I**  
**(Plant Physiology, Plant Breeding, Molecular Biology, Biotechnology)**

Maximum marks – 35

Time: 5 hours

Date : - - 20

- Q.1 Perform the physiological experiment assigned to you ,Tabulate your Observation and calculate,show your experiments and records to the examiner. (10)
- Q.3 Identify and describe briefly the Slides / Specimens. (12)  
(A) Physiology ,(B) Chart from Plant breeding ,(C) Chart from molecular biology  
(D) Chart from Biotechnology
- Q.3 Journal. (03)
- Q.4 Project Report and Viva-voce (10)
- 

**GUJARAT UNIVERSITY**  
**B. Sc. Sem- VI BOTANY PRACTICAL EXAMINATION**

**BOT 312 : PRACTICAL- II**  
**Session II**  
**(Ecology, Gardening, Ethnobotany, Forestry)**

Maximum marks – 35

Time: 5 hours

Date : - - 20

- Q.1 Estimate - Calcium / Carbonate and bicarbonate /Total hardness in terms of p.p.m in a water sample given to you. your observations and results and show them to the Examiner. (08)
- Q.2 Test the given soil sample for Carbonate/Nitrate deficiency (05)
- Q.3 Identify and describe (10)  
(A) Ethnobotany.  
(B) Ethnobotany  
(C) Wood sample  
(D) Gardening chart  
(E) Garden chart
- Q.4 Journal. (02)
- Q.5 Garden visit report & Viva. (10)





### **BOTANY : Suggested Reading**

#### Biochemistry:

- Plant Biochemistry – Hans-Walter Heldt, 2004, Academic Press.
- Biochemistry and Molecular Biology of Plants – Bob Buchanan, W.Gruissem& R.L. Jones.
- Plant Biochemistry & Molecular Biology (2nd Ed.) –P.J. Lea &R.C.Leegood John Wiley & Sons

#### Biostatistics :

- Biostatistics – P.K. Jasra&Gurdeep Raj, Krishna Prakashan Media Ltd.,Meerut.
- Biostatistics- P.N. Arora & P.K. Malhan, Himalaya Publishing House.

#### Cytology:

- Cell & Molecular Biology – DeRobertis&DeRobertis
- Cell & Molecular Biology – Phillip Sheeler & Donald Bianchi
- Molecular and Cellular Biology – S.L. Wolfe, Wadsworth Publishing Co.
- Molecular Biology of the Cell – B.Alberts, D.Bray, J. Lewis, M .Raff,
- K.Roberts and J.D. Watson, Garland Publishing Inc., New York.

#### Plant Ecology:Environment biology

- Ecology and Environment (7th Ed.) – P.D.Sharma .
- Ecology – N.S.Subramanyam&A.V.S.SambaMurty, Narosa Publication House, New Delhi.
- A Text Book of Plant Ecology—R.S.Shukla&P.S.Chandel. Fundamentals of Ecology – Eugene P. Odum.
- Ecology (Indian Edition), Peter Russell et. al., Brooks/Cole, Cengage learning product.
- Ecology and Environmental Biology, T. K. Saha, Books and Allied Pvt. Ltd. Kolkata

#### Economic botany:

- Economic Botany – Pandey &Chaddha, Vikas Publishing House Pvt. Ltd. New Delhi.
- Economic Botany – N.S.Subramanyam&A.V.S.SambaMurty, Wiley Eastern Ltd..
- Economic Botany – B.P. Pandey, Chand & Co., New Delhi
- Economic Botany – A.F. Hill &O.P.Sharma, Tata McGraw Hill, New Delhi.

#### Ethnobotany:

- Ethnobotany – P.C.Trivedi, Aavishkar Publishers, Jaipur.
- Manual of Ethnobotany – S.K. Jain, Scientific Publication, Jodhpur Ethnobotany of primitive tribes in Rajasthan – Printswell, Jodhpur.

#### Genetics:

- An Introduction to Genetics- B.K.Jain, Himanshu Publication, New Delhi
- The Science of Genetics – Atherly A. G., Girton J. R. & McDonald 1999 Principles of Genetics (8th Ed) – Gardner, Simmons &Snustad Genetics – P.K.Gupta, Rastogi Publication
- Genetics (5th Ed.) – Russel P.J. Genetics – Strickberger (McMillan)
- Genetics- Pawar (Vol I & II).
- Cytogenetics& Plant Breeding – Shukla &Chandel.



### **BOTANY : Suggested Reading**

#### Landscape Gardening and Plant breeding:

- Gardens – LaeeqFutehally A New Course in Botany – Kumar, Pradhan, Sharma, Sarangdhar, Sheth Publishers, Mumbai.
- Plant breeding : Principles and Methods, B. D. Singh, Kalyani Publisher

#### Molecular Biology & Biotechnology:

- Plant cell and tissue culture – S. Narayanswamy, Tara McGraw Hill Pub.2004.
- Plant tissue culture, Applications and limitation – Bhojwani S.S.
- Plant cell culture – Collins H. A. & Edwards 1998
- Elements of Biotechnology – Rastogi Publications Molecular Biology- David Freifelder
- Fundamentals Of Molecular Biology – Veer BalaRastogi.
- An Introduction to Plant Biotechnology – H.S.Chawla, Oxford & IBH publishing Co.Pvt.Ltd. New Delhi, 2008
- Biotechnology- U. Satyanarayana, Books and Allied (P) Ltd. Kolkata, 2008
- Cell and Molecular Biology, Phillip Sheeler and Donald E.B., Wiley India

#### Plant Systematics:

- Plant systematics- G. Singh. Oxford and IBH Publishing Co. Pvt. Ltd, NewDelhi.
- Advanced Plant Taxonomy – A.K. Mondal, New Central Book Agency, Kolkatta.
- Taxonomy – A.K. Sharma & Rajeshwari Sharma, PragatiPrakashan, Meerut.
- Plant Taxonomy – N.B.Saxena & S. Saxena, PragatiPrakashan, Meerut.

#### Lower and Higher cryptogams:

- Botany for degree students, Algae, B.R.Vashishta et.al. S. Chand & Company Ltd.
- Botany for degree students, Fungi, B.R.Vashishta et.al. S. Chand & Company Ltd.
- Botany for degree students, Bryophyta, B.R.Vashishta et.al. S. Chand & Company Ltd.
- A text book of Botany, Singh, Pandey and Jain, Rastogi publication