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
Paper No.	**BOT-201**	**BOT-202**	**BOT-203** (Part **A** / Session-I + Part **B** / Session-II)
Credit	**04** credit	**04** credit	**2.5** credit
Teaching hours / week	**04** hours	**04** hours	**06 hours** (Part **A** -03 hours + Part **B** -03 hours)
Examination marks **(** External + Internal **)**	**100** marks	**100** marks	**100** marks (Part **A**-50 marks + Part **B**-50 marks)
Semester end External Examination Marks	**70** marks	**70** marks	**70** marks (Part A - 35 marks + Part B - 35 marks)
Internal Exam. Marks.	**30** marks **[15 (Written Test)** **15 (Assignment, Seminar / Quiz , Attendance)]**	**30** marks **[15 (Written Test)** **15 (Assignment, Seminar / Quiz , Attendance)]**	**30** marks (Part A -15 marks + Part B -15 marks)
Semester end External Examination Duration	**03** hours	**03** hours	**09** hours 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	**Section - A / Session - I** Practicals Based on Theory Paper BOT-201 **Section - B / Session - II** Practicals Based on Theory Paper BOT-202
UNIT-2	Fungi, Lichens, Plant Pathology	Plant Ecology	
UNIT-3	Bryophytes	Plant Embryology	
UNIT-4	Economic Botany	Plant Cell Biology	

- 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

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

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. ***Salvadora 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**

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. Alexopoulus, 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. *Bryophyata*. Central Book Depot, Allahabad, India.
16. Puri, P. 1980. *Bryophytes.*Atmaram and Sons., Delhi, India.
17. Sen, S. 1992. *Economic Bota*ny, New Central Book Agency, Culcutta.
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 Botan*y, 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 & Subramamanian N.S.: A textbook of Economic botany, Wiley eastern ltd, New delhi

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

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

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

[PLANT ANATOMY, ECOLOGY, EMBRYOLOGY & CELL BIOLOGY]

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. 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 cellPaul, A. Cell and Molecular Biology. Allied Pvt.
21. Lyndon, R.F. 1990. Plant development. The Cellular Basis. Unnin Hyman, London.
22. Roberties, E.D.P ., Cell and molecular biology CBS Publishers & distributers.

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)

To study following practicals :

1. **To study Algae – Oedogonoium.**
   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.

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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 **Sunflowe**r 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.

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

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

SKELETON OF UNIVERSITY PRACTICAL EXAMINATION

Date:__ /__ /____ **Exam Hours:** 4 Hours 30 min **Total Marks**: 35

Que. 1	Identify, classify and describe peculiarities of given Specimen **A** and **B**.	12
Que. 2	Expose the reproductive organ from given specimen **C**. Prepare temporary slide and show it to the examiner.	06
Que. 3	Identify and describe the following specimens (i) Specimen: **D** (Types) (ii) Specimen: **E** (Types) (iii) Specimen: **F** (Economic Botany) (iv) Specimen: **G** (Economic Botany)	12
Que. 4	Journal.	05

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

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

SKELETON OF UNIVERSITY PRACTICAL EXAMINATION

Date:__ /__ /____ **Exam Hours:** 4 Hours 30 min **Total Marks**: 35

Que. 1	Take T. S. and prepare a temporary double stained slide of given specimen **A ,** show it to your examiner.	08
Que. 2	Identify and describe external and internal ecological adaptation of given specimen **B** and comment upon its ecological nature.	05
Que. 3	Expose pollen grain and germinate in proper media from specimen **C**.	04
Que. 4	Identify and describe the following specimens (i) Specimen: **D** (Chart / Micrograph - Cell biology) (ii) Specimen: **E** (Chart / Micrograph - Cell biology) (iii) Specimen: **F** (Chart / Slide - Embryology) (iv) Specimen: **G** (Chart / Slide - Embryology)	08
Que. 5	Project work / Submission /Viva voce.	10

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.	**BOT - 204**	**BOT - 205**	**BOT - 206** (Part **A** / Session-I + Part **B** / Session-II)
Credit	**04** credit	**04** credit	**2.5** credit
Teaching hours / week	**04** hours	**04** hours	**06 hours** (Part **A** - 03 hours + Part **B** - 03 hours)
Examination marks (External + Internal)	**100** marks	**100** marks	**100** marks (Part **A**- 50 marks + Part **B**- 50 marks)
Semester end External Examination Marks	**70** marks	**70** marks	**70** marks (Part A - 35 marks + Part B - 35 marks)
Internal Exam. Marks.	**30** marks **[15 (Written Test) 15 (Assignment, Seminar / Quiz , Attendance)]**	**30** marks **[15 (Written Test) 15 (Assignment, Seminar / Quiz , Attendance)]**	**30** marks (Part A -15 marks + Part B -15 marks)
Semester end External Examination Duration	**03** hours	**03** hours	**09** hours Part **A**- 04.30 hours + Part **B** -04.30 hours

Core course	Paper **BOT - 204** Theory	Paper **BOT - 205** Theory	Paper **BOT - 206** Practical
UNIT-1	Pteridophytes	Plant Anatomy	**Section - A / Session - I** Practicals Based on Theory Paper BOT-204 **Section - B / Session - II** Practicals Based on Theory Paper BOT-205
UNIT-2	Gymnosperms	Biophysics, Biochemistry	
UNIT-3	Plant Morphology, Taxonomy	Plant Genetics	
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 ,Partcipation 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.

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

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

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.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* 2nd edition.

GUJARAT UNIVERSITY
B. Sc. Semester-IV
BOTANY
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 Epistatis.
- Cytoplasmic inheritance : Definition and Example of Mirabilis
- Sex determination in plants : Chromosomal theory and theory of heterogamesis.

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 .

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

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

SUGGESTED READING : REFERENCE BOOKS / TEXT BOOKS

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

1. Gangulee , H.C , Das, K. S. & Dutta ,C.. *College Botany Vol. I* , New Central book Agency.
2. Gangulee H.C., and Kar, A.K. *College Botany Vol. II*, New Central book Agency.
3. Esau, K. 2006. *Plant Anatomy*. Pub John Willey & Sons Inc.
4. Fahn, A. 1990. *Plant Anatomy*. Pergamon Press, University of Michigan
5. Mc Daniels, Eanes. *Plant Anatomy*. Pub John Willey & Sons Inc.
6. Pandey, B.P. *Plant anatomy* , S. Chand Publications, New Delhi.
7. Roy, Piyush. *Plant Anatomy*, New Central Book Agency, Calcutta
8. Verma, S.K. *Plant Physiology*. S. Chand & Co.
9. Sundararjan, S. *College Botany vol. I to IV*. Himalaya Publishing House.
10. Witham, F.H., Delvin , R.M. 1983. *Plant Physiology*. Willard Grant. Boston, MA.
11. Salisbury, F.B. & Ross, C.W. 1992. *Plant Physiology*. Wadsworth Publishing Co. California, USA.
12. Kumar, A. &Purohit, S.S.2001. *Fundamentals & Application 2nd edition*. Agrobios. Powar. *Genetics* Vol. I & II
13. Strickberger, M.W. 2008. *Genetics*. PHI Learning Pvt. Ltd. New Delhi.
14. Arumugon, N. *Cell Biology, Genetics, Evolution*. Saras Publication, Kanyakumari.
15. Stent, G.S. 1971. *Molecular Genetics*. W.H. Freeman. San Francisco.
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.

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.

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 (Unisereate and Multisereate)
   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.

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

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

SKELETON OF UNIVERSITY PRACTICAL EXAMINATION

Date:__ /__ /____ **Exam Hours:** 4 Hours 30 min **Total Marks**: 35

Que. 1	Identify, classify and describe given Specimen **A**.	04
Que. 2	Identify and classify giving general characters of the given family specimen **B & C**.	12
Que. 3	Expose reproductive structure from specimen **D**.	04
Que. 4	Identify and describe the following specimens Specimen : **E** (Pteridophyte) Specimen : **F** (Gymnosperms) Specimen : **G** (Morphology) Specimen : **H** (Physiology)	10
Que. 5	Journal	05

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

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

SKELETON OF UNIVERSITY PRACTICAL EXAMINATION

Date:__ /__ /____ **Exam Hours:** 4 Hours 30 min **Total Marks**: 35

Que. 1	Take T. S. and prepare a double stained slide of given specimen **A**.	08
Que. 2	Determine pH value of given solution with the help of universal indicator and show your results to examiner.	04
Que. 3	Solve the genetic problem.(As per given slip)	04
Que. 4	Identify and describe the following specimens Specimen B : (Anatomy slide) Specimen C : (Anatomy slide) Specimen D : (Bonsai specimen / chart)	09
Que. 5	Project Work / Submission / Viva voce.	10

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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.)