

GUJARAT UNIVERSITY

Ahmedabad



Syllabus as per NEP 2020 B. Sc. – BOTANY (Major) Semester –IV (Theory and Practical)

Effective from June - 2023

Core course (CC)	Botany Theory	Botany Theory	Botany Practical
Paper No.	BOT - 241	BOT - 242	BOT - 243 (Part A / Session-I + Part B / Session-II)
Credit	04 credits	04 credits	4 credits
Teaching hours / week	04 hours	04 hours	08 hours (Part A - 04 hours + Part B - 04 hours)
Examination marks (External + Internal)	100 marks	100 marks	100 marks (Part A- 50 marks + Part B- 50 marks)
Semester end External Examination Marks	50 marks	50 marks	50 marks (Part A - 25 marks + Part B - 25 marks)
Internal Exam. Marks.	50 marks	50 marks	50 marks (Part A -25 marks + Part B -25 marks)
Semester end External Examination Duration	04hours	04 hours	08 hours Part A- 04.00 hours + Part B -04.00 hours

Core course	Paper BOT - 241 Theory	Paper BOT - 242 Theory	Paper BOT - 243 Practical
UNIT-1	Pteridophytes	Plant Anatomy	Section - A / Session - I Practicals Based on Theory Paper BOT-241
UNIT-2	Gymnosperms	Plant Physiology	
UNIT-3	Plant Morphology, Taxonomy	Plant Embryology	
UNIT-4	Applied Botany	Plant Resource Utilization	Section - B / Session - II Practicals Based on Theory Paper BOT-242

- 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 seminars 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 weightage



GUJARAT UNIVERSITY
B. Sc. Semester-IV
BOTANY
NEP 2020 Syllabus: Effective from June - 2023

DSC-C-BOT- 241 (Theory)

[PTERIDOPHYTES, GYMNOSPERMS, PLANT MORPHOLOGY & TAXONOMY, APPLIED BOTANY]

Credits: 04

Teaching Hours: 04 hours / Week

Total Marks: 100 (External 50 + Internal 50) Marks

UNIT - I: PTERIDOPHYTES .

- Life history of the following genera with morphology and anatomy excluding development. (classification as per Riemeer)
1. Marselia 2. Adiantum
- Heterospory and seed habitat.
- Formation of fossils
- Types of fossils.

UNIT - II: GYMNOSPERMS .

- General characters of Gymnosperms.
- 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.
- Economic importance of Gymnosperms

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. Brassicaceae 2. Caesalpiniaceae 3. Apocynaceae 4. Convolvulaceae
5. Nyctaginaceae 6. Liliaceae

APPLIED BOTANY .

- Pomology- Cultivation and preservation of **Mango** and **Guava**.
- Floriculture- General account.
- General account of Social Forestry
- General account of Agroforestry.
- Nursery management.
- Bonsai : General account .
- Arboriculture
- Lawn making



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DSC-C- BOT- 241 (Theory)

[PTERIDOPHYTES , GYMNOSPERMS ,PLANT MORPHOLOGY & TAXONOMY,APPLIED 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.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 De-pot, 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 and 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. Sundararjan, S. *College Botany Vol. I to IV*. Himalaya Publishing House.
20. Ashok Kumar , *Botany in Forestry and Environment*, Khanna bandhu.
21. V.,Kumarsen : *Horticulture* ,Saras Publication-Nagarcoil.



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B. Sc. Semester-IV

BOTANY

NEP 2020 Syllabus : Effective from June - 2023

DSC-C- BOT- 242 (Theory)

[PLANT ANATOMY , PLANT PHYSIOLOGY, PLANT EMBRYOLOGY AND PLANT RESOURCE UTILIZATION]

Credits: 04

Teaching Hours: 04 hours / Week

Total Marks: 100 (External 50 + Internal 50) Marks

UNIT - I: PLANT ANATOMY.

- Epidermal tissue system including Periderm and Lenticels.
- Mechanical Tissue system, (Nyctanthes stem, Maize leaf)
- Vascular tissue system-types of vascular bundles; types of stele
- Absorbing tissue system(Haustoria, velamen tissue, scutellum)
- Anomalous Secondary growth in **Achyranthes** and **Mirabilis** stem.
- Anomalous Secondary growth in **Carrot** root.

UNIT - II: PLANT PHYSIOLOGY.

- Photosynthesis-Introduction, Light and Dark reaction, Cyclic and non-cyclic photophosphorylation
- Properties of water. Mechanism of Absorption of water.
- Transportation of water: Dixon's theory of cohesion force.
- Growth and development: Definition, Phases of Growth.
- Mineral nutrition in plants- General account
- Macro and Micronutrients- C, H, O, N, S, P, K, Ca, Fe, Mg, Mn, Zn, B, Cu, Mo Source, Functions, Deficiency symptoms and remedies.

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 RESOURCE UTILIZATION.

- General account of dyes and dye yielding plants- Butea, Indigo and Henna
- General account of millets including Pearl millet, Sorghum and Finger millet
- Sugar and starch—sugarcane-(general account, cultivation and processing)
- Beverages- Tea, Coffee- -(general account, cultivation and processing)
- Gums- Karaya gum, Gum Arabic
- Spices and condiments-Ginger, Clove, Cinnamon
- Rubber yielding plant-Hevea brasiliensis: General account, Cultivation and processing



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SUGGESTED READING : REFERENCE BOOKS / TEXT BOOKS

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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. A.C. Dutta, *An Introduction to Plant Embryology*, Oxford & IBH Publishing, 2004.
13. P.K. Gupta, *Plant Embryology*, Rastogi Publications, 2005.
14. R.B.G.N. Bhat, *Developmental Botany: Embryology of Angiosperms*, Vikas Publishing, 1999.
15. M.L. Green, *Introduction to Plant Embryology*, McGraw-Hill, 1994.
16. N.A.P.J.D. Williams, *Plant Embryology: A Textbook*, Kluwer Academic Publishers, 2001.
17. S.M. Raghavan, *Embryology of Angiosperms*, Springer, 2004.
18. S.P. Nayar, *Economic Botany*, Tata McGraw-Hill, 2001.
19. V.L. Chopra, P.K. Gupta, *Economic Botany: Plants in Our World*, Oxford & IBH Publishing, 2000.
20. N.S.P.S. A. Kumar, *Economic Botany: A Textbook*, Kalyani Publishers, 2015.
21. P.S.S. R. Anjaneyulu, *Economic Botany: Plants and Their Uses*, New Age International Publishers, 2016.
22. B.R. Maslanka, W.E.L. Linde, *Economic Botany: Plants in Our World*, McGraw-Hill, 1990.
23. M.A.U.K. M.K.R.R.S. Chari, *Economic Botany: Principles and Practices*, John Wiley & Sons, 2005.
24. G.E. Wickens, *Economic Botany: A Survey of the Plant Kingdom and Its Economic Uses*, Springer, 1995.
25. M.K.S. Leary, *Plant Products and Their Utilization*, Academic Press, 2003.



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NEP 2020 Syllabus : Effective from June - 2023

BOT- 243 (Practical)

Credits : 2 (Part -A & B) Teaching Hours: 04 hrs / Week Total Marks: 100 (Ext.50 + Int.50)

[PART- A (SESSION - I) BASED ON THEORY PAPER BOT-243]

To study following practicals :

- 1. To study Pteridophytes : *Marsilia***
Classification , Specimen .
- 2. Permanent slides of *Marsilia* Sporocarp L.S. & T.S. Mounting of *Marsilia* spores from sporocarp.**
- 3. To study Pteridophytes : *Adiantum*.**
Classification , Specimen of plant body.
Permanent slides of *Adiantum* leaflet Passing through sori . Mounting of sporangia of *Adiantum*.
- 4. To study Gymnosperms : *Pinus***
Classification, Specimens: Male cone, Female cone, Needle Permanent slides: Ovule, Needle, male cone L.S. Mounting of Pollen grain. T.S. of *Pinus* needle.
- 5. To study Plant morphology : Fruit.**
Specimen / Chart of fruit : Simple Dry , Simple Fleshy , Composite , Aggregate Fruit.
- 6. To study Plant Family : Brassicaceae, Caesalpiniaceae**
- 7. To study Plant Family : Apocynaceae, Convolvulaceae.**
- 8. To study Plant Family : Nyctaginaceae**
- 9. To study Plant Family : Arecaceae (Palmae) .**
- 10. Cultivation chart of Mango and Guava**
- 11. Types of Bonsai through charts/specimens/photographs**

To study of 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.



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BOT- 243 (Practical)

Credits : 2 (Part -A & B) Teaching Hours: 04 hrs / Week Total Marks: 100 (Ext.50 + Int.50)

[PART- B (SESSION - II) BASED ON THEORY PAPER BOT-243]

To study following practicals :

1. To study Plant anatomy : Epidermal tissue system

Mounting of stellate hairs, ramenta and PS of stinging hairs, T-shaped hairs. Types of stomata, Types of Epidermis (Uniseriate and Multiseriate) Lenticel and Periderm

2. To study Plant anatomy : Types of stele and vascular bundles by charts/slides

3. To study Plant anatomy : Absorbing tissue system - Haustoria, velamen tissue, scutellum

4. To study Plant anatomy : Mechanical tissue system - (Nyctanthes stem, Maize leaf)

5. To study Plant anatomy : Anomalous secondary growth

Make a temporary double stained slide preparation of **Achyranthus** a stem

6. To study Plant anatomy : Anomalous secondary growth

Make a temporary double stained slide preparation of **Mirabilis** stem

7. To study Plant anatomy : Anomalous secondary growth

Make a temporary double stained slide preparation of **Ficus** aerial root , **Carrot** root.

8. To study Plant Physiology

Demonstration experiments: 1) Demonstration of absorption of water by xylem

2) Demonstration of growth by Arc indicator

9. To study Plant Physiology

Micro and macro nutrients- uses, deficiency symptoms and remedy by charts/specimens/slides

10. Plant Embryology: Chart/PS of Mature Anther TS, Types of ovules, MMC, 2-, 4-, 8 nucleated embryo sac

11. Plant resource utilization:

Specimens and Charts as per theory syllabus

- dye yielding plants- Butea, Indigo and Henna
- millets : Pearl millet, Sorghum and Finger millet
- Sugar and starch—sugarcane
- Beverages- Tea, Coffee
- Gums- Karaya gum, Gum Arabic
- Spices and condiments-Ginger, Clove, Cinnamon
- Rubber yielding plant-Hevea brasiliensis

12. Project work / Submission. Beverages- Tea, Coffee- -(general account, cultivation and processing)

Suggested Reading:

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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DSC-C-BOT- 243 (Practical)

[PART- A (SESSION - I) BASED ON THEORY PAPER BOT-241]
TENTATIVE SKELETON OF UNIVERSITY PRACTICAL EXAMINATION

Date: __ / __ / __ Exam Hours: 4 Hours 30 min Total Marks: 25

Que. 1	Identify, classify and describe given Specimen A.	04
Que. 2	Expose reproductive structure from specimen B.	05
Que. 3	Identify and classify giving general characters of the given family specimen C.	05
Que. 4	Identify and describe the following specimens Specimen : E (Pteridophyte) Specimen : F (Gymnosperms) Specimen : G (Morphology) Specimen : H (Applied Botany)	08
Que. 5	Journal	03

DSC-C- BOT- 243 (Practical)

[PART- B (SESSION - II) BASED ON THEORY PAPER BOT-242]
SKELETON OF UNIVERSITY PRACTICAL EXAMINATION

Date: __ / __ / __ Exam Hours: 4 Hours 30 min Total Marks: 25

Que. 1	Take T. S. and prepare a double stained slide of given specimen A. Draw a labelled diagrammatic sketch. Show to the examiner	07
Que. 2	Identify and describe the following specimens Specimen B : (Anatomy) Specimen C : (Mineral nutrition) Specimen D : (Embryology) Specimen E : (Plant resource) Specimen F : (Plant resource)	10
Que. 5	Project and viva	08



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B. Sc. Semester-IV

BOTANY

NEP 2020 Syllabus : Effective from June - 2023

UNIVERSITY THEORY EXAMINATION PAPER PATTERN

B.Sc. Semester-IV Theory Examination

Month/ Year _____

BOTANY

DSC-C BOT - 241

[PTERIDOPHYTES ,GYMNOSPERMS ,PLANT MORPHOLOGY & TAXONOMY, APPLIED BOTANY]

DSC-C BOT - 242

[PLANT ANATOMY ,BIOPHYSICS & BIOCHEMISTRY ,GENETICS AND PLANT RESOURCE UTILIZATION]

Date: ____/____/____

Duration : 02 hours

Total Marks:50

Instructions:

Que: 1 (A) Unit-1 Describe / Explain / Write short notes on _____ 05 marks

OR

Que: 1 (A) Unit-1 Describe / Explain / Write short notes on _____ 05 marks

Que: 1 (B) Unit-1 Describe / Explain / Write short notes on _____ 05 marks

OR

Que: 1 (B) Unit-1 Describe / Explain / Write short notes on _____ 05 marks

Que: 2 (A) Unit-2 Describe / Explain / Write short notes on _____ 05 marks

OR

Que: 2 (A) Unit-2 Describe / Explain / Write short notes on _____ 05 marks

Que: 2 (B) Unit-2 Describe / Explain / Write short notes on _____ 05 marks

OR

Que: 2 (B) Unit-2 Describe / Explain / Write short notes on _____ 05 marks

Que: 3 (A) Unit-3 Describe / Explain / Write short notes on _____ 05 marks

OR

Que: 3 (A) Unit-3 Describe / Explain / Write short notes on _____ 05 marks

Que: 3 (B) Unit-3 Describe / Explain / Write short notes on _____ 05 marks

OR

Que: 3 (B) Unit-3 Describe / Explain / Write short notes on _____ 05 marks

Que: 4 (A) Unit-4 Describe / Explain / Write short notes on _____ 05 marks

OR

Que: 4 (A) Unit-4 Describe / Explain / Write short notes on _____ 05 marks

Que: 4 (B) Unit-4 Describe / Explain / Write short notes on _____ 05 marks

OR

Que: 4 (B) Unit-4 Describe / Explain / Write short notes on _____ 05 marks

Que: 5 Write your answer in short : (each sub-question carry 01 marks)_____ 10 marks

Set 10 Sub-Questions as (a),(b) ,(c)..to (n) or (i) ,(ii) ,(iii) ,...to (xiv) from

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