

Gujarat University

SYLLABUS
(As per the Guidelines of UGC)

For Graduate Degree in

BOTANY
(Plant Sciences)
(In force from June, 2017)

Three Years – Six Semester studies leading to degree of
Bachelor in Science (B. Sc.)
based on
Choice Based Credit System (CBCS)

GUJARAT UNIVERSITY

Design and Structure of Botany (Plant Sciences) UG Course for Choice Based Credit System to be implemented from June 2017

Course	Sem ester	Course		No. of Hours per week		
		No.	Name	Lectures	Practical	Total
Botany	1	BOT101	U-1- Study of lower plants U-2- Cytology, Genetics and Molecular biology U-3- Environmental Biology and Climate change U-4- Plant Biotechnology	4		4
		BOT102 PR	Based on theory		2	2
			Total	4	2	6
	2	BOT103	U-1: Study of higher plants U-2: Plant Morphology and Taxonomy U-3: Plant Physiology U-4: Plant resource utilization, Horticulture and Gardening	4		4
		BOT104PR	Based on theory		2	2
			Total	4	2	6

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2017

SEMESTER-I

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Exam Duration: 3 hours

Unit-1 Study of lower plants

Objective: To acquaint students with lower plants.

Algae: *Spirogyra*, *Nostoc* 3 hours

Taxonomic Position, structure of thallus, vegetative, asexual and sexual modes of reproduction of the genus, Economic importance of algae.

Fungi: *Mucor*, *Agaricus* 3 hours

Taxonomic Position, structure of thallus, vegetative, asexual and sexual modes of reproduction of the genus, Economic importance of fungi.

Mushroom Cultivation - Importance

Bryophytes: *Riccia* 2 hours

Taxonomic Position, Morphology, structure of thallus, vegetative, asexual and sexual modes of reproduction of the genus. General characters of Bryophytes.

Pteridophytes: *Nephrolepis* 2 hours

Taxonomic Position, Morphology, structure of thallus, vegetative, asexual and sexual modes of reproduction of the genus, Economic importance of Pteridophytes

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.
- (ii) Collage Botany Vol. I & II Das, Dutta, Gangulee and Kar., New Central Book Agency
- (iii) Algae, Fungi, Bryophyte, Pteridophyte by Vasishta., S. Chand Pub, New Delhi
- (iv) Smith, G. M. 1972. *Cryptogamic Botany*. Vol. 1 & 2. Tata McGraw Hill Publishing Co. Ltd. New Delhi.
- (v) Webster, J. 1985. *Introduction to Fungi*. Cambridge University Press.
- (vi) Sporne, K.K. 1991. *The Morphology of Pteridophytes*. B.I. Publishing Pvt. Ltd. Bombay.

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Contact Hours per week: 4

Exam Duration: 3 hours

Unit-2 Cytology, Genetics and Molecular biology

Objective: To acquaint students with the concepts of cell biology and genetics

1. Ultra structure of Plant Cell	1 hour.
2. Structure & Function of Mitochondria and Chloroplast	2 hours.
3. DNA Structure ,Watson and Crick's Model & Forms of DNA	1 hour
4. Structure and Types of RNA	1 hour
5. DNA Replication	1 hour
6. Genetic Code & its Properties , Protein Synthesis	2.5 hours
7.Regulation of gene expression in prokaryotes – LAC Operon concept	1.5 hours

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* (2nd 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* (4th Ed.). W.H. Freeman and Co., New York, USA.
- (viii) Cytogenetics by S. Sundara Rajan., First edition, Anmol Publications, New Delhi

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Contact Hours per week: 4

Exam Duration: 3hours

Unit-3 Environmental Biology & Climate Change

Objective: acquaint students with the concept of Ecology and Environment.

Course content:

1. Introduction, Scope and Branches of Ecology	0.5 hour
2. Ecosystems :	2.5 hours
• Kinds of Ecosystems: Natural, Artificial	
• Structure and Functions of Ecosystems	
• Ecological Pyramids, Productivity of an Ecosystem, Energy flow in an Ecosystem	
3. Biogeochemical Cycles- Nitrogen, Sulphur	1hour
4. Components of Freshwater Ecosystem (Pond)	1hour
• Components of Terrestrial Ecosystem (Grassland)	
3. Biotic Factors :	2 hours
Symbiosis: Mutualism, Proto-cooperation, Commensalism	
Antagonism: Predation, Parasitism, Antibiosis, Competition, Saprophytism	
4. Climate change & Sustainable Biodiversity	
Concept of Carbon foot print & Carbon trading	1 hour
IUCN Categories of threat and list of endangered plant species of Gujarat, Importance of Biodiversity	1 hour
Sources , Effect & Control of Air and Water Pollution	1 hour

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
- (ix) Indian Manual of Plant Ecology – R .Misra & G. S. Puri

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Contact Hours per week: 4

Exam Duration: 3 hours

Unit-4 Plant Biotechnology

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

1. Introduction, Brief History, Scope and Types of Plant Biotechnology	1 hour
2. Plant Tissue Culture – Tools & Technique & Laboratory organization	2 hours
3. Organ & Pollen Culture	2 hours
4. Introduction to Synthetic Seeds & Edible Vaccines	1.5 hours
5. Protoplast Culture and Somatic Hybridization.	1.5 hours
6. Applications of Plant Tissue Culture	2 hour

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.
- (iv) Bhojwani, S.S. 1990. 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.
- (vii) Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue Culture. Kluwer Academic Publishers, the Netherlands
- (viii) Snustad, D.P. and Simmons, M.J. 2000. Principles of Genetics. John Wiley & Sons, Inc., USA.
- (iv) Stent, G.S. 1986. Molecular Genetics. CBS Publication.
- (v) Brown, T.A. 1999. Genomes. John Wiley & Sons (Asia) Pvt. Ltd., Singapore.

CBCS BOTANY PRACTICAL SYLLABUS

SEMESTER 1:

1. Study of Algae- ***Spirogyra***
 - a) Mounting- Thallus, conjugation types
 - b) P.S. - Thallus and conjugations***Nostoc***
 - a) Mounting- Colony
 - b) P.S. - Colony
2. Study of Fungi- ***Mucor***
 - a) Specimen- Bread/ Roti with Mucor
 - b) Mounting- Reproductive structure- spores, sporangia
 - c) PS- Mucor sporangia, Zygosporangia***Agaricus***
 - a) Specimen- -Plant body
 - b) Mounting- Reproductive structures
 - c) PS- L.S of Stroma
3. Study of Bryophytes-***Riccia***
 - a) Specimen - Thallus with Sporophyte
 - b) P.Slides – Thallus v.t.s., thallus with Antheridia and Archegonia
4. Study of Pteridophytes- ***Nephrolepis***
 - a) Specimen-Sporophytic plant
 - b) Mounting-Ramenta, Sporangia
 - c) PS- Prothallus with Antheridia and Archegonia; T.S. leaflet passing through sorus
5. Study of structure of Nucleic acids (DNA, RNA) through charts or models- Watson & Crick Model of DNA, Types of RNA
6. DNA Replication, Chloroplast and Mitochondria through charts or models.
7. Study of Biotic Factors- examples of Symbiosis and Antagonism through specimen, models or charts
 - a) Symbiosis-Root nodules, Lichen
 - b) Protocooperation- Hermit crab and Fierasfer fish
 - c) Antagonism- Cuscuta, Loranthus, Utricularia, Nepenthes, Drosera, Mushroom
8. Study of various tools: Plant Tissue Culture.
 - a) Laboratory design
 - b) Laminar Air Flow, Autoclave, pH meter, oven, digital balance
 - c) Study of Artificial seeds through chart/Photograph

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Choice Based Credit System (CBCS) Practical paper

Effective from June-2011

SEMESTER-I

Date: _____

Total Marks: 30

Time: 3 Hours

Q.1 Identify and describe Specimen A and B.	06
Q.2 Mount the _____ from the Specimen C.	04
Q.3 Identify and Describe the specimens	15
Specimen D (Algae/Fungi/Bryo-/Pteridophytes)	
Specimen E (Cytology)	
Specimen F (Genetics)	
Specimen G (Ecology)	
Specimen H (Ecology)	
Specimen I (PTC)	
Q.5 Journal	05

GUIDENCE FOR ARRANGEMENT OF SPECIMENS IN THE EXAMINATION. Specimen A: Algae or Fungi.

Specimen B: Bryophytes or Pteridophytes.

Specimen C: Reproductive structure of Algae, Fungi, Bryophytes or Pteridophytes or Ramenta may be asked.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2017

SEMESTER-II

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Exam Duration: 3hours

Unit-1 Study of higher plants

Objective: To acquaint students with Higher plants.

Gymnosperms:

Outline Classification of Gymnosperms by Chamberlain 1 hour

Cycas 4 hours

Occurrence, distribution, taxonomic position, morphology, reproduction and life history of the genus (excluding anatomy), Indian contribution on Gymnosperms.

Angiosperms: Sunflower and Maize 5 hours

Occurrence, distribution, taxonomic position, morphology, reproduction and life history of the genus (excluding anatomy).

Suggested reading:

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

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Contact Hours per week: 4

Exam Duration: 3 hours

Unit-2 Plant Morphology and Taxonomy

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

1. Morphology 7.5 hours

1. Phyllotaxy, Types of leaves & Venation
2. Types of Stipules & their Modifications
3. Bracts : Scaly, Involucral, Foliaceous, Petaloid and Spathe,
4. Inflorescence **Racemose** – Raceme Spike, Catkin, Spadix, Umbel, Capitulum

Cymose – Solitary terminal, Solitary axillary, Helicoid, Scorpioid, Biparous, Multiparous cymes.

Special Types of Inflorescences: Hypanthodium, Verticillaster, Cyathium

5. Types of Flowers based on position of ovary
6. Aestivation & Placentation

2. Taxonomy

To enable students to understand systematic botany of higher plants with the economic importance of plants.

Detailed study of the following families:

2.5hours

Dicotyledons- *Malvaceae*

Monocotyledons- *Amaryllidaceae*

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.
- (v) Stebbins, G.L. 1974. *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.

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Contact Hours per week: 4

Exam Duration: 3hours

Unit-3 Plant physiology

Objective: To acquaint students with basic physiology of higher plants. 2hours

1. Plant-Water Relations: Water Potential, Diffusion, Imbibition,

Osmosis, Plasmolysis

2. Respiration .Mechanism, Aerobic and anaerobic respiration,significance and factors affecting them

2 hours

3 Photosynthesis- Significance, Mechanism-Light & Dark reactions 2.5 hours

4. Physiology of Flowering:

2 hours

Role of temperature in flowering (Vernalization)

Role of light in flowering (Photoperiodism)

5. Transpiration and Guttation - Bell-Jar Experiment, types, significance and factors affecting transpiration, Guttation 1.5 hours

Suggested Readings

(i) Plant Physiology by S Mukherji and A K Ghosh, New Central Book Agency(P) Ltd

(ii) Plant Physiology by S.N.Pandey and B.K. Sinha, Vikas Publishing House.

(iii) Plant Physiology and Biochemistry by S.K. Verma, S. Chand & Co.

(iv) Hopkins, W. G. 1995. *Introduction to Plant Physiology*. John wiley & Sons, Inc., New York, USA.

(v) Moore, T. C. 1989. *Biochemistry and Physiology of Plant Hormones* (2nd edition). Springer - Verlag, New York, USA

(vi) Salisbury, F.B. and Ross, C.W. 1992. *Plant Physiology* (4th edition). wadsworth Publishing Co. california, USA.

(vii) 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.

(viii) Taiz, L. and Zeiger, E. 1998. *Plant Physiology* (2nd edition). Sinauer Associates, Inc., Publishers, Massachusetts, USA.

(ix) Westhoff, P. 1998. *Molecular Plant Development: from Gene to Plant*. Oxford University Press, Oxford, UK.

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SEMESTER-II

Detailed Curriculum has been designed as per semester system.

There shall be one theory paper having four units.

Contact Hours per week: 4

Exam Duration: 3 hours

Unit-4 Plant resource, utilization, Horticulture and gardening

3 hours

Botanical name, common name, family, useful part, brief description, important chemical

constituents if any, climate and cultivation (only for cereals and oil seeds) and uses of

the following plants:

1. Cereals- Wheat, Rice

2. Oil seeds- Ground nut

3. Medicinal plants- Ginger, Aloe, Neem and Ashwagandha

4. Invasive species.- 1. *Parthenium hesterophorous* 2. *Lantana camara*

3. *Prosopis juliflora* 4. *Eichhornia cresipis*

5. Food Adulteration- awareness, importance

Horticulture and Gardening

1. Horticulture: Definition, Scope and Branches

1 hour

2. Gardening: Introduction, Uses of gardens, Types of gardens

1 hour

(Kitchen garden, water garden, rock garden and terrace garden)

3 Garden Equipments. Sprinkler, Hoe, Scissors, Hose pipe, Watering can

0.5 hour

4. Garden Operations- digging, planting

1 hour

5. Identification of common plants for different garden locations

1 hour

(Minimum 5 plants for each location): paths, avenue, hedges and flower beds.

6. Cutting, Layering and grafting methods of asexual plant propagation

2.5 hours

Suggested Readings

(i) Economic Botany by V. Verma

(ii) Economic Botany of the Tropics by S.L.Kochhar

(iii) Economic Botany by A.F. Hill & O.P.Sharma, Tata McGraw Hill, New Delhi.

(iv) Gardening in India – Percy Lancaster, Oxford & IBH Publishing Co. Pvt Ltd.

(v) Gardens – Laeeq Futehally, National Book Trust, India.

(vi) Economic Botany by A.V.S.S. Samba Murty and N.S. Subramanyam, Wiley Eastern

(vii) A Manual of Ethnobotany, 2nd Edition, by S.K. Jain. Scientific Publishers, Jodhpur.

CBCS BOTANY PRACTICAL SYLLABUS

SEMESTER-II

1. Study of Gymnosperms- Life-History of <i>Cycas</i>
a) Specimen- <i>Cycas</i> whole plant, coralloid roots, compound leaf, male cone, Megasporophyll and ovules
b) Mounting – <i>Cycas</i> microspores
c) Permanent slides- TS Microsporophyll, LS Ovule, <i>Cycas</i> leaflet T.S
2. Study of Angiosperms - Life-History of Sunflower
a) Specimen – Whole plant, Inflorescence, Root System
b) Mounting –Ray floret and Disc floret
Life-History of Maize
a) Specimen – Whole plant, Inflorescence, Seed , Root system
b) Slides – LS of Seed
3. Study of Plant Morphology:
a) Phyllotaxy -4,Types of leaves (simple & compound-all)& Venation (only 3)
b) Types of Stipules & their Modifications
c) Types of Bracts- Foliaceous, Involucral, Spathe, Petaloid
d) Types of Inflorescences including Special types
i) Racemose- Raceme, Spike, Spikelet, Catkin, Umbel, Capitulum
ii) Cymose – Solitary –Terminal and Axillary; Monochasial- Helicoid and Scorpioid; Dichasial or Biparous and Multichasial(-multiparous)
iii) Special types- Verticillaster, Cyathium, Hypanthodium
e) Types of Flowers based on position of ovary-3 types
f) Aestivation & Placentation
4. Study of Plant families- <i>Malvaceae</i> , and <i>Amaryllidaceae</i> - Classification with reasons, Identifying characters, floral formula, androecium, gynoecium and TS of ovary; 3-4 botanical and common names of examples.
5. Plant Physiology- Demo. Experiments for-
a) Diffusion- Saffranin or Potassium permanganate in water,
b) Imbibition- Demonstration of Endosmosis, Exosmosis in grapes
c) Osmosis- Potato osmoscope
d) Plasmolysis- Tradescantia leaf
e) Transpiration- Four Leaf experiment
6. Economic Botany- Study of plants as per theory syllabus
7. Study of Garden tools as per theory syllabus through charts- Scissors, Hoe, Hose, Watering can, Sprinkler
8. Study of any five Avenue trees, five ornamentals and five foliage plants of your area through fresh specimen and herbaria.
9. Prepare herbaria- minimum 3

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SEMESTER-II

Date: _____

Total Marks: __30__

Time: 3 Hours

- Q.1 Identify and describe Specimen A. 04
- Q.2 Mount the _____ from the Specimen B. 03
- Q.3 Identify the Family of the Specimen C, classify it, give general characters
and draw labeled diagrams. 04
- Q.4 Identify and describe the specimens 15
- Specimen D (MORPHOLOGY)
- Specimen E (MORPHOLOGY)
- Specimen F (PLANT PHYSIOLOGY)
- Specimen G (ECONOMIC BOTANY)
- Specimen H (GARDEN TOOLS)
- Q.6 Journal 04

GUIDENCE FOR ARRANGEMENT OF SPECIMENS IN THE EXAMINATION.

Specimen A: Gymnosperm or Angiosperm.

Specimen B: Gymnosperm or Angiosperm.

Specimen C: Plant family

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SEMESTER-III

Course BOT-201

Detailed Curriculum has been designed as per semester system. There shall be three theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

Unit-1 Study of lower plants

Objective: To acquaint students with lower plants.

UNIT I: ALGAE

1. Habit and habitat of algae.
2. Life history of following genera including morphology and excluding development:
 - a. *Oedogonium*
 - b. *Ectocarpus*
 - c. *Batrachospermum*

Suggested Readings

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. Das, Dutta, Gangulle and Kar., 1959. *College Botany Vol. I and II*, New Central book Agency.
3. Vashishta, D.R. 2005. *Algae*, S. Chand Publications, New Delhi.
4. Smith, G.M. 1972. *Cryptogamic Botany Vol. I*, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
5. Morris, I. 1986. *An Introduction to the Algae*. Cambridge University press, U.K.
6. Round, F.E. 1986. *The biology of Algae*, Cambridge University Press, U.K.
7. Kumar, H.D. 1988. *Introductory Phycology*. Affiliated East-West Press Ltd., New Delhi

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SEMESTER-III

Course BOT-201

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT II: FUNGI

1. Ultra structure of fungal cell
2. Life histories of following genera including morphology excluding development (classification according to Ainsworth):-
 - a. *Claviceps*
 - b. *Puccinia*
3. Types of Lichens

Suggested Readings:

1. Webster, J. 1985. *Introduction to Fungi*. Cambridge University Press, U.K.
2. Pandey, S. N. , Trivedi, P.S. and Misra S.P. 2005. *A Textbook of Botany Vol. I and II*, Vikas Publishing House Pvt. Ltd.
3. Das, Dutta, Gangulle and Kar., 1959. *College Botany Vol. I and II*, New Central book Agency.
4. Vashishta, B.R. 1969. *Botany for degree student Part II. Fungi*. S. Chand Publications, New Delhi.
5. Smith, G.M. 1972. *Cryptogamic Botany Vol. I*, Tata McGraw hill Publishing Co. Ltd. New Delhi.
6. Mehrotra, R.S. and Aneja, R.S. 1988. *An Introduction to Mycology*, New Age Intermediate Press.
7. Alexopoulos, C.J. 1962. *Introductory Mycology*. John Wiley and Sons Inc.

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SEMESTER-III

Course BOT-201

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT III: BRYOPHYTA

1. Life histories of the following with external and internal structure excluding development.
 - a. **Hepaticopsida** : *Plagiochasma*
 - b. **Bryopsida** : *Funaria*.
2. Economic importance of Bryophyta.

Suggested Readings:

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. Das, Dutta, Gangulle and Kar., 1959. *College Botany Vol. I and II*, New Central book Agency.
3. Vashishta, B.R. 1983. *Botany for degree student- Bryophytes*, S. Chand Publications, New Delhi.
4. Parihar, N.S. 1991. *Bryophyta*. Central Book Depot, Allahabad, India.
5. Puri, P. 1980. *Bryophytes*. Atmaram and Sons., Delhi, India.
6. Smith, G.M. 1972. *Cryptogamic Botany Vol. I*, Tata McGraw Hill Publishing Co. Ltd. New Delhi, India.

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SEMESTER-III

Course BOT-201

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT IV: ECONOMIC BOTANY

1. Plant fibers: Cotton, Jute and Coir.
2. Habit, Habitat, Family, Botanical name, Useful parts and uses of the following Timber species:
 - i. *Tectona grandis*
 - ii. *Dalbergia sissoo*
 - iii. *Gmelina arborea*
 - iv. *Madhuca indica*
 - v. *Azadirachta indica*.
3. Habit, Habitat, Family, Botanical name, Useful parts and uses of the following Essential oils – Sandalwood, Eucalyptus, Jasmine, Kewra.
4. A general account of organic manure.

Suggested Readings:

1. Sen, S. 1992. *Economic Botany*, New Central Book Agency, Calcutta.
2. Verma, V. 1974. *A Textbook of Economic Botany*, Emcay Publication, New Delhi.
3. Kochar, S.L. 2011. *Economic Botany in the Tropics*, 4th edition, Mc Millan Publications, New Delhi.
4. Hiil, A. 1976. *Economic Botany*, Tata McGraw Hill Publishing Co., Ltd., New Delhi.
5. Bendre, A., Kumar, A. *Economic Botany*, Rastogi Publication, New Delhi. India.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-III (Practical)

Course BOT-203

1. Study of Algae-

- (i) ***Oedogonoium***: Mounting of Vegetative thallus and Macrandrous and Nanedrous species.

Permanent slides of sexual reproduction, cap cell.

- (ii) ***Ectocarpus***: Mounting of vegetative thallus, Unilocular and Plurilocular sporangium.

Permanent slides of Unilocular and Plurilocular sporangium.

- (iii) ***Batrachospermum***: Mounting of vegetative thallus, Cystocarp.

Permanent slides of antheridia, archegonia and cystocarp.

2. Study of Fungi-

- (i) ***Claviceps***: Mounting of conidia

Permanent slides of Claviceps stroma.

- (ii) ***Puccinia***: Mounting of Uredospore and Telutospore.

Permanent slides of Uredospore, Telutospore, Pycneospore and aciospore.

3. Study of Bryophytes-

- (i) ***Plagiochasma***: Specimen of Thallus, Reproductive organs.

Permanent slides or charts of V.S. of thallus, Reproductive organs.

- (ii) ***Funaria***: Mounting of Antheridia, Archegonia, Peristomial teeth.

Specimen Funaria gametophyte with sporophyte

Permanent slides of Antheridia, Archegonia, Sporophyte

4 Study of Economic Botany as per theory syllabus.

Suggested Readings:

- (i) Practical Botany Vol. I by Bendre & Kumar, Rastogi Publication.

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SEMESTER-III (Practical)

Course BOT-203

Session-I

Date: _____

Total Marks: 35

Time: 3 Hours

Q.1 Identify and classify with reasons Specimen A and B.	10
Q.2 Identify and describe peculiarities of given specimen C and D.	10
Q.3 Viva voce	15

Session-II

Date: _____

Total Marks: 35

Time: 3 Hours

Q.1 Expose the reproductive organ from given specimen E. Prepare the temporary slide and show it to the examiner.	06
Q.2 Identify and describe the specimens F, G, H with its family, Botanical name, Chemical constituents and economic importance.	12
Q.3 Project or Submission (as per Semester-III topics)	12
Q.4 Journal	05

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-III

Course **BOT-202**

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT I: ANATOMY

1. Meristems: characteristics, classification and theories of root and shoot apex.
2. The cambium: Types and functions.
3. Simple tissues
4. Secondary growth in Sunflower stem and root.
5. Anomalous Secondary growth in *Salvadora* stem

Suggested Readings:

1. Roy, Piyush. *Plant Anatomy*, New Central Book Agency, Calcutta
2. Das, Dutta, Gangulle and Kar., 1959. *College Botany Vol. I and 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.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-III

Course BOT-203

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT II: ECOLOGY

1. Edaphic factors:

Composition of soil, origin and development of soil, soil moisture, soil profile, soil erosion and soil conservation.

2. Biological clock

3. Remote sensing

4. Heterotrophic nutrition in plants.

5. Ecological adaptation in Hydrophytes and Xerophytes.

Suggested Readings:

1. Sharma, P.D. 2001. *Ecology and Environment*. Rastogi Publication, Meerut.
2. Odum, E.P. 1983. *Basic Ecology*. Saunders, Philadelphia.
3. Odum, E.P. 1971. *Fundamentals of Ecology*. W.B. Saunders, Philadelphia.
4. Misra, R.& Puri, G.S. 1968. *Indian Manual of Plant Ecology*. Oxford & IBH, New Delhi.
5. Stiling, P. *Ecology: Theories and application*. Harper Collins New York.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-III

Course BOT-203

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT III: EMBRYOLOGY

1. Structure of microsporangium and male gametophyte.
2. Structure of ovule and its types.
3. Structure of megasporangium and female gametophyte.
Monosporic, Bisporic, Tetrasporic (Fritillaria type).
4. Pollination in *Salvia* and *Calotropis*.
5. Fertilization.

Suggested Readings:

1. Bhojwani, S.S. and Bhatnagar, S.P. 2000. *The Embryology of angiosperms*. Vikas Publishing House, New Delhi.
2. Bhojwani, S.S. and Bhatnagar, S.P. *The Embryology*. Rastogi Publication, Meerut.
3. Das, Dutta, Gangulle and Kar., 1959. *College Botany Vol. I and II*, New Central book Agency.
4. Johri, B. M. 1984. *Embryology of angiosperms*, Nordic Journal of Botany.
5. Johri, B. M. Shivanna 1984. *The Angiosperms pollen*. Nordic Journal of Botany.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-III

Course BOT-203

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT IV: Cytology

- Plant cell: Ultra structure.
- Structure and Function of:
 - a. Cell wall
 - b. Endoplasmic reticulum
 - c. Ribosome
 - d. Nucleus
 - e. Lysosome
 - f. Dictyosome

Suggested Readings:

1. Verma, P. Agarwal S. *Cytology*. S. Chand and Co.
2. Gunnings, B.E.S. and Steer, M.W. 1996. *Plant cell Biology structure & function*. Jones Barlett Publishers, Boston, Massachusetts.
3. Smith, B. Hardin, P. *The world of the cell*
4. Paul, A. *Cell and Molecular Biology*. Allied Pvt.
5. Lyndon, R.F. 1990. *Plant development. The Cellular Basis*. Unnin Hyman, London.
6. Roberties, D. *Cell biology*

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-III (Practical)

Course BOT-204

Session-I

SEMESTER-III:

Unit-I Anatomy

- (i) Permanent slides of shoot apex (Dictyota and chara) and root apex.
- (ii) Permanent slides of cambium and cork cambium
- (iii) Permanent slides of Parenchyma, Collenchyma, Sclerenchyma and Chlorenchyma
- (iv) Mounting of shoot apex from hydrilla shoot.
- (v) Permanent slides of Sunflower stem, root and Salvadoria stem secondary growth.
- (vi) Double stain temporary preparation of Sunflower stem, root and Salvadoria stem secondary growth.

Unit-II Ecology

- (i) Water holding capacity of soil.
- (ii) Heterotrophic nutrition in plant specimens
- (iii) Hydrophytes- Hydrilla, Nymphaea, Eichornea, Trapa.
- (iv) Xerophytes- Nerium, Agave, Opuntia, Euphorbia

Unit-III Embryology

- (i) Pollen germination
- (ii) Permanent slide of T.S. of Anther, Pollen grain on stigma
- (iii) Permanent slide or charts of Ovules.
- (iv) Permanent slide of female gametophyte.

UNIT IV: Cytology

- (i) Plant cell: Ultra structure model or chart
- (ii) Cell wall chart

- (iii) Micrograph or chart of Endoplasmic reticulum, Ribosome, Nucleus, Lysosome, Dictyosome

Suggested Readings:

- (i) Practical Botany vol. I & II By Bendre and Kumar, Rastogi Publication
- (ii) Practical Botany by S. C. Santra, Chettarjee and Das, New Central Book Agency.
- (iii) Experimental Plant Ecology by Pratima Kapur and Sudha Rani, CBS Publication

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-III (Practical)

Course BOT-204

Session-I

Date: _____

Total Marks: 35

Time: 3 Hours

- | | |
|--|----|
| Q.1 Take T. S. and prepare a double stained slide of given specimen A. | 10 |
| Q.2 Identify and describe external and internal ecological adaptation of given specimen B. | 06 |
| Q.3 Identify and describe mode of nutrition in given specimen C & D
E Ecology | 09 |
| Q.4 Viva voce | 10 |

Session-II

Date: _____

Total Marks: 35

Time: 3 Hours

- | | |
|--|----|
| Q.1 Expose pollen grain and germinate in proper media from specimen A. | 06 |
| Q.2 Identify and describe specimen B & C with cytological view. | 08 |
| Q.3 Identify and describe permanent slides of E & F (Embryology) | 06 |
| Q.4 Project (Ecology or Cytology) | 10 |
| Q.5 Journal | 05 |

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV

Course **BOT-205**

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Exam Duration: 3hours

UNIT I: PTERIDOPHYTA

1. Life histories of the following with morphology and anatomy excluding development.
 - a. Lycopsidea : *Selaginella*
 - b. Pteropsida : *Adiantum*
2. Heterospory and seed habitat.
3. Condition and formation of fossils.

Suggested Readings:

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. Das, Dutta, Gangulle and Kar., 1959. *College Botany Vol. I and II*, New Central book Agency.
3. Vashishta, B.R. 1983. *Botany for degree student- Pteridophyta*, S. Chand pub, New Delhi.
4. Parihar, N.S. 1991. *Pteridophyta*. Central Book Depot, Allahabad.
5. Sporne, K.K. 1991. *The Morphology of Pteridophytes*. B.I. Publishing Pvt. Ltd. Bombay.

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV

Course BOT-205

UNIT II: GYMNOSPERMS.

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

Suggested Readings:

1. Bhatnagar, S.P. and Moitra, A. 1996. *Gymnosperms*. New Age International Pvt. Ltd., New Delhi.
2. Vashishta, P.C. 1983. *Botany for degree student- Gymnosperms*, S. Chand Publications, New Delhi.
3. Chopra, G.L. *Gymnosperms*. S. Nagin & Co., Jullundhar.
4. Vashishta, P.C. 1983. *Gymnosperms*, S. Chand Publications, New Delhi.
5. Coulter, J.M. & Chamberlain, C.J. 1978. *Morphology of Gymnosperms*. Central Book Depot, Allahabad.
6. Foster, A.S. and Gifford, F.M. 1967. *Comparative Morphology of Vascular plants*. Freeman Publishers, Sanfransisco.
7. Bierhost, D.W. 1971. *Morphology of vascular plants*. Mc Millan, New York.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV

Course BOT-205

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT III: MORPHOLOGY AND TAXONOMY

Angiosperms: Morphology:

1. Types of Leaf and phyllotaxy.
2. Classification of the following families as per Bentham and Hooker's system of classification including examples of economic importance.
 - a. Dicotyledons:
 - i. Polypetalae : *Cruciferae, Cesalpinaceae,*
 - ii. Gamopetalae : *Rubiaceae, Apocynaceae*
 - iii. Apetalae: *Euphorbiaceae,*
 - b. Monocotyledons:

Palmae and Gramineae.

Suggested Readings:

1. Raghavan, V. 1999. *Developmental Biology of flowering plant*. Springer- Verlag, New York.
2. Singh, G. 1999. *Plant Systematics- Theory nad Practice*. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
3. Naik, V.N. 1984. *Taxonomy of angiosperms*. Tata McGraw- Hill Publishing Co. Ltd. New Delhi.
4. Verma B.K. 2011. *Introduction to Taxonomy of angiosperms*. PHI Learning Pvt. Ltd. New Delhi.
5. Takhtajan 1997, *Diversity and Classifaication of Flowering Plants*. Columbia University Press, New York.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV

Course **BOT-205**

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3 hours

UNIT IV: PLANT PHYSIOLOGY

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

Suggested Readings:

1. Verma, S.K. *Plant Physiology*. S. Chand & Co.
2. Verma, S.K. *Plant Physiology*. Emkay Publication.
3. Sundararjan, S. *College Botany Vol. I to IV*. Himalaya Publishing House.
4. Witham, F.H., Delvin, R.M. 1983. *Plant Physiology*. Willard Grant. Boston, MA.
5. Salisbury, F.B. & Ross, C.W. 1992. *Plant Physiology*. Wadsworth Publishing Co. California, USA.
6. Kumar, A. & Purohit, S.S. 2001. *Fundamentals & Application* 2nd edition. Agrobios.

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV (Practical)

Course BOT-207

SEMESTER 4:

Unit-I Pteridophytes:

- (i) *Selaginella*: Specimen
Selaginella cone L.S. & T.S. Permanent slides.
Mounting of *Selaginella* spores from cone.
- (ii) *Adiantum*: Specimen
Permanent slide of T.S. Passing through sori of *Adiantum* leaflet.
Mounting of sporangia of *Adiantum*

Unit-II Gymnosperm

- (i) Pinus
Mounting of Pollengrain
T.S. of Pinus needle.
Specimens: Male cone, Female cone, Needle
Permanent slides: Ovule, Needle, male cone L.S.

Unit-III Morphology and Taxonomy

- (i) Morphology specimens as per theory syllabus.
- (ii) Study of Families as per theory syllabus.

Unit-IV Plant Physiology

- (i) Demonstration practical Conduction of water through xylem.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV (Practical)

Course **BOT-207**

Session-I

Date: _____

Total Marks: 35

Time: 3 Hours

- | | |
|--|----|
| Q.1 Identify and classify giving reasons of given Specimen A. | 05 |
| Q.2 Identify and classify giving general characters of the given family from specimen B & C. | 14 |
| Q.3 Identify and describe specimen D & E (Pteridophyte, Gymnosperm and Physiology) | 06 |
| Q.3 Viva voce | 10 |

Session-II

Date: _____

Total Marks: 35

Time: 3 Hours

- | | |
|---|----|
| Q.1 Expose reproductive structure from specimen F. | 08 |
| Q.2 Identify and describe Morphology of specimen G, H & I | 12 |
| Q.3 Herbarium | 10 |
| Q.4 Journal | 05 |

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV

Course **BOT-206**

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Exam Duration: 3hours

UNIT I: ANATOMY

1. Complex tissue (Xylem and Phloem).
2. Epidermal tissue system including Periderm and Lenticels.
3. Anamalous primary structures in *Nyctanthes stem*.
4. Anamalous Secondary growth in *Bignonia stem*.
5. Anamalous Secondary growth in *Ficus aerial root*.

Suggested Readings:

1. Roy, Piyush. *Plant Anatomy*, New Central Book Agency, Calcutta
2. Das, Dutta, Gangulle and Kar., 1959. *College Botany Vol. I and 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. Mcdaniels, Eanes. *Plant Anatomy*. Publications, John Willey & Sons Inc.

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV

Course BOT-206

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Duration: 3hours

UNIT II Economic Botany

A brief introduction of medicinal plants and their chief constituents:

Turmeric, *Ephedra*, *Adhatoda*, *Terminalia chebula*, *Tinospora*, *Isaphgul*.

Firewood species:

- a. *Prosopis* spp.
- b. *Holoptelia integrifolia*
- c. *Zizyphus jujuba*
- d. *Acacia nilotica*.
- e. *Salvadora persica*.

A concise account of Tobacco

Suggested Readings:

1. Sen, S. 1992. *Economic Botany*, New Central Book Agency, Calcutta.
2. Verma, V. 1974. *A Textbook of Economic Botany*, Emcay Publication, New Delhi.
3. Kochar, S.L. 2011. *Economic Botany in the Tropics*, 4th edition, Mcmillan Pub, New Delhi.
4. Hiil, A. 1976. *Economic Botany*, Tata Mc Graw Hill Publishing Co., Ltd., New Delhi.
5. Bendre, A., Kumar, A. *Economic Botany*, Rastogi Publication, New Delhi.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV

Course BOT-206

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Exam Duration: 3hours

UNIT III: GENETICS

1. Mendelian genetics (Monohybrid, Dihybrid ratio).
2. Gene interactions (Complementary and Supplementary genes).
3. Cytoplasmic inheritance : (Mirabilis, male sterility in maize)
4. Sex determination in plants.

Suggested Readings:

1. Powar. *Genetics* Vol. I & II
2. Strickberger, M.W. 2008. *Genetics*. PHI Learning Pvt. Ltd. New Delhi.
3. Arumugon, N. *Cell Biology, Genetics, Evolution*. Saras Publication, Kanyakumari.
4. Stent, G.S. 1971. *Molecular Genetics*. W.H. Freeman. San Francisco.
5. Russel, P.J. 1992. *Genetics*. Harper Collins College.

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Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV

Course BOT-206

Detailed Curriculum has been designed as per semester system. There shall be one theory paper having four units.

Contact Hours per week: 4

Exam Duration: 3 hours

UNIT IV: BIOCHEMISTRY

1. pH and Buffer.
2. Protoplasm as a colloidal system.
3. Classification & types Carbohydrates and Lipids.
4. Enzymes:
 - a. Definition
 - b. Nomenclature and classification of enzymes
 - c. Chemical nature of enzymes
 - d. Properties of enzymes
 - e. Mechanism of enzyme action
 - f. Factors affecting enzyme activity

Suggested Readings:

1. Verma, S.K. *Plant Physiology*. S. Chand & Co.
2. Verma, S.K. *Plant Physiology*. Emkay Publication.
3. Sundararjan, S. *College Botany vol. I to IV*. Himalaya Publishing House.
4. Witham, F.H., Delvin, R.M. 1983. *Plant Physiology*. Willard Grant. Boston, MA.
5. Salisbury, F.B. & Ross, C.W. 1992. *Plant Physiology*. Wadsworth Publishing Co. California, USA.
6. Kumar, A. & Purohit, S.S. 2001. *Fundamentals & Application 2nd edition*. Agrobios.

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV (Practical)

Course BOT-208

Unit-I Anatomy

- (i) Permanent slides of Xylem and Phloem
- (ii) Epidermal tissue system (a) Types of hairs and glands,
(b) Types of stomata, (c) Types of Epidermis (Uniseriate and
Multiseriate) (d) Periderm and Lenticell
- (iii) Make a temporary double stained preparation of *Nyctanthus* stem, *Bignonia* stem
and *Ficus* aerial root.

Unit-II Economic Botany

As per the theory syllabus.

Unit-III Genetics

Genetics problems (as per appendix)

Unit-IV Biochemistry

- (i) Determination of pH of Four various solutions.
- (ii) Agar-agar (Sol & Gel)
- (iii) Histochemical test of Carbohydrate (starch, glucose and Lignin) &
Lipid.
- (iv) Enzyme activity- amylase and Catalase

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BOTANY

Choice Based Credit System (CBCS) Theory syllabus

Effective from June-2012

SEMESTER-IV (Practical)

Course BOT-208

Session-I

Date: _____

Total Marks: 35

Time: 3 Hours

- | | |
|---|----|
| Q.1 Take T. S. and prepare a double stained slide of given specimen A. | 10 |
| Q.2 Identify and describe the specimens F, G, H with its family, Botanical name, its Chemical constituents and economic importance. | 15 |
| Q.3 Viva voce | 10 |

Session-II

Date: _____

Total Marks: 35

Time: 3 Hours

- | | |
|--|----|
| Q.1 Perform the Histochemical test of given specimen A | 05 |
| Q.2 Perform the enzyme activity amylase or Catalase. | 05 |
| Q.3 Determine pH value of given solution with the help of universal indicator and show your results to examiner. | 05 |
| Q.4 Solve the genetic problem | 05 |
| Q.5 Project (Genetics, Economic Botany or Biochemistry) | 10 |
| Q.6 Journal | 05 |

**Gujarat University
Ahmedabad**

**Semester - V and VI
Syllabi for Botany, Theory and Practical
Academic Year 2013-2014**

Gujarat University
Ahmedabad
B. Sc. Botany Semester - V
Syllabi for Botany Theory and Practical
Academic Year 2013-2014

Unit	Botany Theory Bot-301 4 credits Total 100 marks Internal 30 Marks External 70 marks 4 hrs/week	Botany Theory Bot-302 4 credits Total 100 marks Internal 30 Marks External 70 marks 4 hrs/week	Botany Theory Bot-303 4 credits Total 100 marks Internal 30 Marks External 70 marks 4 hrs/week	Botany Theory Bot-304 4 credits Total 100 marks Internal 30 Marks External 70 marks 4 hrs/week	Botany subject elective Bot-305 2 credits Total 100 marks Internal 30 Marks External 70 marks 3 hrs/week	Botany Practical Bot-306 5 credits Total 200 marks Internal 60 Marks External 140 marks 12hrs/week
I	Algae	Systematic Botany	Plant Physiology	Ecology	Student has to select one subject elective course from the University approved Subjects of elective courses. Production Horticulture	There are two Practicals: i.e. Practical I and II. Each practical has 2 sessions (I & II), each of 3 hours
II	Fungi	Angiosperms	Biochemistry	Plant Geography		
III	Bryophytes	Embryology	Cell Biology	Economic Botany		
IV	Pteridophytes	Anatomy	Genetics	Biostatistics		

Instructions :

- Students **must be taken on a Botanical excursion for studying vegetation in natural state.**
- **Project report, Excursion 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 various respective examinations :**
- Students **are expected to submit Cryptogamic specimens, Gymnospermic specimens, Angiospermic specimens, Herbarium sheets of angiospermic plants (Minimum 10), Specimens, wood Products and herbarium sheets of Economic botany and Ethnobotany, Permanent slides of anatomy**
- **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**

GUJARAT UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory syllabus
Effective from June-2013
SEMESTER V
BOTANY
BOT 301
(Algae, Fungi, Bryophytes, Pteridophytes)

301/1

UNIT: I

ALGAE:

[10 Lect.]

Structure, Reproduction (excluding development) and life history:

CYANOPHYTA: Rivularia, Scytonema

CHLOROPHYTA: Coleochaete, Chara

PHAEOPHYTA: Sargassum,

RHODOPHYTA: Polysiphonia

Role of Algae in human welfare (Industrial utilization, Pollution indicators)

301/2

UNIT: II

FUNGI:

[10 Lect.]

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

ASCOMYCOTINA: Peziza and Aspergillus

(Eurotium) BASIDIOMYCOTINA: Ustilago

General account of Mycoplasma and Actinomycetes

General Account of Mushroom cultivation

301/3

UNIT: III

BRYOPHYTES:

[10 Lect.]

Adaptation in Bryophytes and land plants

Comparative account of morphology, anatomy, reproduction and adaptation in Riccia, Marchantia, Pellia, Notothylas, Polytricum and Funaria.

Evolution of Sporophyte

Structure, Reproduction and life history (excluding development): HEPATICOSPODIA: Pellia

ANTHOCEROTOPSIDA: Notothylas

BRYOPSISIDA: Polytrichum, Sphagnum

301/4 UNIT: IV

PTERIDOPHYTES: (including Fossils)

[10 Lect.]

Classification of Pteridophytes by Reimer (1954)

Structure, Reproduction and life history (excluding development):

PSILOTOPSIDA: Psilotum

SPHENOPSISIDA: Equisetum

Stelar evolution in Pteridophytes

GUJARAT UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory
syllabus Effective from June-2013
SEMESTER V
BOTANY
BOT 302
(Systematic Botany, Angiosperms, Embryology and Anatomy)

302/1

UNIT: I

SYSTEMATIC BOTANY:

[10 Lect.]

Principles of taxonomy, merits and demerits of systems of classification of Bentham and Hooker,
Engler and Prantle
ICBN: Principles and rules
Typification
Priority
Effective and valid publications
Herbarium techniques: Plant collection and preparation of Herbarium
Some important Herbaria of India
Role of Herbaria and Botanical Gardens

302/2

UNIT: 2

ANGIOSPERMS:

[10 Lect.]

Classification as per Bentham and Hooker with economic importance

DICOTYLEDONS:

Polypetalae: Menispermaceae, Capparidaceae, Sterculiaceae, Rhamnaceae

Gamopetalae: Asclepiadaceae, Boraginaceae, Bignoniaceae

Apetalae: Chenopodiaceae

MONOCOTYLEDONS: Commelinaceae, Cyperaceae

302/3

UNIT: 3

EMBRYOLOGY:

[10 Lect.]

Palynology

Exine ornamentation, concept of palynogram

Application of Palynology in Taxonomy, coal, oil exploration and forensic science
Germination of pollen tube and factors affecting pollen germination

Endosperms: Types and functions of Endosperms

Embryo development in Dicotyledons

Crucifer type of embryo development

Embryo development in Monocotyledons

Sagittaria, Sagittifolia type of embryo development

Apomixis

302/4

UNIT: 4

ANATOMY

[10 Lect.]

Mechanical tissue system

Secretory tissue system (excluding Laticiferous)

Absorbing tissue system

Root development: lateral roots; root hairs; root-microbe interaction.

Leaf – fall

Root – stem transition

GUJARAT UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory syllabus
Effective from June-2013
SEMESTER V
BOTANY
BOT 303
(Plant Physiology, Biochemistry, Cell Biology, Genetics)

303/1 **UNIT: 1**
PLANT PHYSIOLOGY: [10 Lect.]

- Dormancy: Causes of dormancy
Methods of breaking dormancy
- Germination : Different phases of germination
Factors affecting germination
- Growth : Some aspects of overall growth and its modifications
Growth correlations
- Respiration: Pentose phosphate pathway (PPP)
R.Q. and Factors affecting respiration

303/2 **UNIT: 2**
BIOCHEMISTRY: [10 Lect.]

- Amino acids: Classification, structure, protein and non-protein amino acids
- Protein: Classification of protein on the basis of structure
- Lipids: Synthesis, alpha & Beta -oxidation
- Nitrogen metabolism and Nitrogen fixation
- General account of structure and functions of vitamins

303/3 **UNIT: 3**
CELL BIOLOGY: [10 Lect.]

- [10 Lect.]
- Ultra structures and functions:
 - Plasma membrane: Structure, Unit membrane concept, Sandwich model, Greater membrane concept, Fluid-mosaic model
 - Chromosomes: Morphology and structure of Polytene chromosome, Lamp brush chromosome
- Cell differentiation
- Cell-cell interaction
- Cell Cycle:
 - Interphase
 - Mitosis
 - Meiosis
- Programmed Cell Death (PCD) in plants

303/4

UNIT: 4

GENETICS:

[10 Lect.]

DNA finger printing and its importance
DNA damage and repair

Linkage: Coupling & Repulsion hypothesis; Linkage groups

Crossing over: Chromosome mapping. Three point test cross; interference and coincidence
Introns and their significance

Gene mutations- Types- somatic/germ line, spontaneous/induced, gross/point- base pair substitutions-transversion, transition; effect of substitution mutation on phenotype- Missense, Nonsense, Neutral, Silent mutations

Eukaryotic genome organization: structure of chromatin, coding and noncoding sequences, satellite DNA

GUJARAT UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory syllabus
Effective from June-2013
SEMESTER V
BOTANY
BOT 304
(Ecology, Plant Geography, Economic Botany, Biostatistics)

304/1 **UNIT: 1**
ECOLOGY: [10 Lect.]
Vegetation development: Causes and types of succession: Mechanism of ecological succession;
Changes in ecosystem properties during succession; Hydrosere, Xerosere.
Structure of Plant Communities; Methods of studying plant communities: Analytical and Synthetic
characters of plant community; Raunkiaer's life forms, Biological Spectrum.
Plant community as Plant indicators
Principles of limiting factors

304/2 **UNIT: 2**
PLANT GEOGRAPHY: [10 Lect.]
Phytogeography: definition, aims, objectives, scope and relation with other disciplines
Major and minor biomes of the world
Soil and climate of India
Botanical regions of India
Vegetation of Gujarat
Endemism
Continuous and discontinuous distribution; continental drift theory; centres of origin.

304/3 **UNIT: 3**
ECONOMIC BOTANY: [10 Lect.]
General account, Methods of cultivation, climate and uses:
CEREALS: Maize, Bajra
PULSES: Tuber
PLANTATION CROPS: Tea, Coffee
COMMERCIAL CROPS: Sesamum, Groundnut
Botanical name, family, useful part, chemical constituents and uses:
Condiments and Spices Cardamom, Chilies
Medicinal and Aromatic plants: Lemon grass, Cumin
General account of dyes: Henna, Indigofera, Butea

304/4 **UNIT: 4**
BIOSTATISTICS: [10 Lect.]
Biometrics: Aims and objectives as applicable to biological science. Methods of data collection and
graphical representation. Measures of central tendency, Mean, median and mode
Measures of Dispersion: Range, mean deviation, standard deviation, standard error and 't' test. Chi-
square and goodness of fit. Simple Linear regression. Frequency of distribution;
Normal, binomial, Poison distribution.

GUJARAT UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory syllabus
Effective from June-2013
SEMESTER VI
BOTANY
BOT 305
Elective Paper: Production Horticulture

Unit-I: Fundamentals of Horticulture

Definition, branches, importance and scope, Classification of Horticultural Crops, Special horticultural practices

Unit-II: Soil and water considerations

Formation of soil, classification, physical and chemical properties. Soil media, nutrients and manuring. Symptoms of excesses and deficiencies of nutrients. Plant growth regulators.

Unit-III: Plant Propagation and Plant Protection

Propagation by specialized structures, nursery based propagation, Role of Biotechnology, pest management, Weed management

Unit-IV: Production, Packaging, Marketing and Conservation

Greenhouse cultivation, Floriculture, Root and tuber crops, Vegetable production, Organic gardening, Containers and packaging techniques, Local and international demand, export standards and potential.

Suggested readings:

Text book of horticulture – K. Manibhushan Rao , MACMILLAN India Ltd.

Basic Horticulture – Victor R. Gardner, The MACMILLAN Company, New York 1.

GUJARAT UNIVERSITY
SEMESTER V BOTANY
PRACTICALS: 306
(Algae, Fungi, Bryophytes, Pteridophytes)
Practical I : Session-1

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

(a) Identify and classify following types:

ALGAE: Rivularia, Scytonema,
Coleochaete, FUNGI: Aspergillus
BRYOPHYTA: Riccia, Pellia, Sphagnum.
PTERIDOPHYTA: Psilotum (Stem), Equisetum
(Stem).

(b) Structure and Reproductive organs:

ALGAE Chara, Sargassum, Polysiphonia
FUNGI: Phytophthora, Peziza, Ustilago
BRYOPHYTA: Notothylas, Funaria &
Polytrichum: Sex organs & Capsule
PTERIDOPHYTA: Equisetum: Cones

(c) Types of Stele: chart and Permanent slides

(d) Submissions.

GUJARAT UNIVERSITY
SEMESTER V BOTANY
PRACTICALS: 306
(Systematic Botany, Angiosperms, Embryology and Anatomy)
PRACTICAL I: Session - II

ANGIOSPERMS: Study of families as per theory syllabus including floral formula and floral diagram.

EMBRYOLOGY:

- (a) Exposition and mountings of
 - a. Endosperm haustoria : Cucumis, Cassia.
 - b. Developing embryo : Mustard, Cassia
- (b) Study of permanent slides
 - a. Pollen germination on stigma
 - b. V.S. of ovule (Typical)
 - c. Embryo sac with megaspore mother cell (M M C)
 - d. Embryo sac with 2 – nucleate
 - e. Embryo sac with 4 – nucleate
 - f. Embryo sac with 8 – nucleate

ANATOMY:

1. Study of mechanical tissues and distribution of mechanical tissue through fresh / preserved material.

- A. (i) Types of Collenchyma
 - (ii) Sclerenchyma and sclereids
- B. Distribution of mechanical tissues from followings:
 - (i) Sunflower Stem
 - (ii) Nyctanthes Stem
 - (iii) Maize still root
 - (iv) Maize leaf

2. To study secretory tissue system through fresh material or permanent slides:

- (1) Orange rind
- (2) Lemon leaf
- (3) Eucalyptus leaf
- (4) Pinus needle (Resin Duct)
- (5) Cycas rachis (Mucilage Duct)

3. Study of Tracheary elements by maceration technique:

- (1) Nephrolepis rachis
- (2) Cycas rachis
- (3) Cucurbita Stem
- (4) Maize Stem

4. Study of leaf fall (Abscission layer) through permanent slide.

5. Study of Absorbing tissue system through fresh / preserved material or permanent slides.

- (1) Absorbing tissue: Orchid root
- (2) Haustorial organ: Scutellum maize grain.
- (3) Haustoria in Cuscuta.

GUJARAT UNIVERSITY
SEMESTER V BOTANY
PRACTICALS: 306
(Plant Physiology, Biochemistry, Cell Biology, Genetics)
PRACTICAL II: Session-I

PLANT PHYSIOLOGY & BIOCHEMISTRY:

1. Major experiments:

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

- (i) To determine the water potential of given tissue (Any tuber)
- (ii) Separation of amino acids in a mixture by paper chromatography & their identification by comparison with standard R_f value.
- (iii) Determine R.Q. of the given plant material of bud and or seedling.

2. Minor experiments:

The following experiments to be performed by the students:

- (i) Qualitative tests for proteins from plant material.
- (ii) Test for the presence of fats from oil seeds.
- (iii) To detect the seed viability.

Biochemistry charts as per theory syllabus.

CELL BIOLOGY:

- 1. To study mitosis in onion root tip by squash method
- 2. Histochemical localization of DNA, RNA and total protein
- 3. Electron micro photographs of following cell organelles:
 - a. Plasma membrane
 - b. Chromosome
 - c. Golgi complex

GENETICS:

Genetics problems.

GUJARAT UNIVERSITY
SEMESTER V BOTANY
PRACTICALS: 306
(Ecology, Plant Geography, Economic Botany, Biostatistics)
Practical II : Session - II

ECOLOGY:

1. Determination of Frequency (%), Density and Abundance.
2. Study of Biological Spectrum and prediction of vegetation of a given area by comparing it's biological spectrum to the normal .
3. To study following ecological instruments:
 - i. Anemometer
 - ii. Psychrometer
 - iii. Hygrometer

PLANT GEOGRAPHY:

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

ECONOMIC BOTANY:

Study of various specimens as prescribed in theory syllabus.

BIOSTATISTICS:

Statistical Problems.

Submissions: Economic Botany

GUJARAT UNIVERSITY
B. Sc. Sem - V BOTANY PRACTICAL SYLLABUS
BOT 306
PRACTICAL I: Session I
(Algae, Fungi, Bryophytes, Pteridophytes)

(Maximum marks – 35)

Date:

Time: 3 hours

Q.1 Identify, classify and describe giving reasons. Draw the labeled diagrams of the peculiarities observed in Specimen A , B and C. (15)

Q.2 Expose the reproductive structure from the Specimen D. Make a sketch and show your preparation to the Examiner. (05)

Q.4 Identify and describe briefly the Slides / Specimens (08)

(E) Algae

(F) Fungi

(G) Bryophytes

(H) Pteridophytes

Q.5 Journal (02)

Q.6 Sumissions (05)

GUJARAT UNIVERSITY
B. Sc. Sem - V BOTANY PRACTICAL SYLLABUS
BOT 306
PRACTICAL I: Session II
(Systematic Botany, Angiosperms, Embryology and Anatomy)

Maximum marks – 35

Date:

Time: 3 hours

Q.1 Refer the Specimens A and B to their respective families. Giving reasons, including floral formula and floral diagrams. Draw labeled diagrams (10)

Q.2 Expose and mount _____ from the given Material C. Stain if necessary. Show your Preparation to the Examiner (05)

Q.3 Prepare a slide of Treachery elements of the given macerated material D. Describe the maceration technique. Stain if necessary . Draw the labeled diagram & show the slide to the Examiner.

OR

Make a Section of the given Plant Material D and show the distribution of mechanical tissue to the Examiner. (05)

Q.4 Identify and describe (08)
(E) Embryology
(F) Embryology
(G) Anatomy
(H) Anatomy

Q.5 Journal (02)

Q.6 Herbarium (05)

GUJARAT UNIVERSITY
B. Sc. Sem - V BOTANY PRACTICAL SYLLABUS
BOT 306
PRACTICAL II: Session I
(Plant Physiology, Biochemistry, Cell-biology, Genetics)

Maximum marks – 35

Date:

Q.1 Perform the physiological experiment assigned to you. Tabulate your observations and calculate. Show your experiments and records to the Examiner. (08)

Q.2 Perform the experiments per slip and show your results to the Examiner. (05)

Q.3 Solve the genetic problem as per the slip. (05)

Q.4 Prepare a slide showing cell division from the given specimen A. Stain if necessary & show the slide to the Examiner. Draw the labeled sketch. (07)

Identify & Describe.

Q.5 (08)

(B)Chart from Cell-Biology

(C)Chart from Biochemistry

(D)Physiology

(E)Genetics

Q.6 Journal (02)

GUJARAT UNIVERSITY
B. Sc. Sem - V BOTANY PRACTICAL SYLLABUS
BOT 306
PRACTICAL II: Session II
(Ecology, Plant Geography, Economic Botany, Biostatistics)

Maximum marks – 35

Date:

Time: 3 hours

- Q.1 To determine Abundance / Density of any five species occurring in a given area. Tabulate your observations and result show your records to the Examiner. (Draw graphs if necessary) (08)
- Q.2 Compare the Biological spectrum of the given area with the normal and predict the type of vegetation. (05)
- Q.3 Solve the statistical problem as per the slip. (04)
- Q.4 Identify & Describe: (06)
(A) Economic Botany.
(B) Economic Botany.
(C) Economic Botany.
- Q.5 Journal (02)
- Q.6 Tour report, Viva and Submissions (10)

Gujarat University
Ahmedabad
B. Sc. Botany Semester - VI
Syllabi for Botany Theory and Practical
Academic Year 2013-2014

Unit	Botany Theory Bot-307 4 credits Total 100 marks Internal 30 Marks External 70 marks 4 hrs/week	Botany Theory Bot-308 4 credits Total 100 marks Internal 30 Marks External 70 marks 4 hrs/week	Botany Theory Bot-309 4 credits Total 100 marks Internal 30 Marks External 70 marks 4 hrs/week	Botany Theory Bot-310 4 credits Total 100 marks Internal 30 Marks External 70 marks 4 hrs/week	Botany subject elective Bot-311 2 credits Total 100 marks Internal 30 Marks External 70 marks 3 hrs/week	Botany Practical Bot-312 5 credits Total 200 marks Internal 60 Marks External 140 marks 12hrs/week
I	Pteridophytes	Systematic Botany	Advanced Plant Physiology	Ecology	Student has to select one subject elective course from the University approved subject elective courses. Plant Tissue Culture	There are two practicals i.e. Practical I and II. Each practical has 2 sessions (I & II), each of 3 hours
II	Pteridophyte fossils	Angiosperms	Plant breeding	Gardening		
III	Gymnosperms	Anatomy	Molecular Biology	Ethnobotany		
IV	Gymnosperms fossils	Microbiology	Biotechnology	Forestry		

Instructions :

- Students must go on Botanical excursion for studying vegetation in natural state.
- There must be at least one visit to a public garden to study landscape design principles.
- Project report, Excursion report, garden visit report, Permanent Slides 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 specimens, Gymnospermic specimens, Angiospermic specimens, Herbarium sheets of angiospermic plants (Minimum 10), Herbarium sheets of Ethnobotany, permanent slides(minimum five).
- 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.

GUJARAT UNIVERSITY
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Choice Based Credit System (CBCS) Theory
syllabus Effective from June-2013
SEMESTER VI
BOTANY
BOT 307

(Pteridophytes, Pteridophyte fossils, Gymnosperms and Gymnosperm fossils)

307/1

UNIT: I

PTERIDOPYTES

[10 Lect.]

Comparative account of morphology and reproduction in Psilotum, Isoetes, Selaginella, Equisetum, Marsilea and Adiantum.

Structure, Reproduction and life history (excluding development):

LYCOPSIDA: Isoetes

PTEROPSIDA: Marsilea

Apospory and Apogamy

307/2

UNIT: II

PTERIDOPHYTE FOSSILS:

[10 Lect.]

Geological Time-Scale

Psilophytales: General Characters: Rhynia

Lepidodendrales: General Characters: Lepidodendron and Lepidocarpon

Calamitales: General Characters: Calamites and Calamostachys

307/3

UNIT: III

GYMNOSPERMS:

[10 Lect.]

Structure of microspores and male gametophytes

Morphology, anatomy, reproduction and life history:

GINKGOALES: Ginkgo

GNETALES: Ephedra

307/4

UNIT: IV

GYMNOSPERM FOSSILS:

[10 Lect.]

Fossils, fossilization process, types of fossils: compression, impression, petrification, coal balls, Carbon dating.

Fossil biology of Gymnosperms: General characters:

CYCADOFILICALES

Lygenopteris althamia

Corsotheca (Male organ)

BENNETTITALES

Spore bearing

organs CORDAITALES

Cordaites

Cordaitanthus

PENTOXYLALES (general account)

Economic importance of Gymnosperms

GUJARAT UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory syllabus
Effective from June-2013
SEMESTER VI
BOTANY
BOT 308
(Systematic Botany, Angiosperms, Anatomy, Microbiology)

308/1 **UNIT: I**
SYSTEMATIC BOTANY: [10 Lect.]

Principles of taxonomy, merits and demerits of system of classification of Hutchinson
Outline, merits and demerits of system of classification of Takhtajan
General account: Chemotaxonomy, Numerical taxonomy, Cytotaxonomy, Molecular taxonomy
BSI: its role in conservation of biodiversity.

308/2 **UNIT: 2**
ANGIOSPERMS: [10 Lect.]

Classification as per Bentham and Hooker with economic importance
DICOTYLEDONS:
Polypetalae: Meliaceae, Anacardiaceae, Lythraceae, Umbelliferae
Gamopetalae: Sapotaceae, Boraginaceae, Verbenaceae
Apetalae: Urticaceae, Polygonaceae
MONOCOTYLEDONS: Cannaceae

308/3 **UNIT: 3**
ANATOMY [10 Lect.]

Anomalous secondary growth:
Abnormal behavior of normal cambium
Eg. Achyranthes and Draceana stem
Accessory cambium formation and its activity
Eg. Bougainvillea, Mirabilis and Boerhaavia stem
Abnormal secondary growth in fleshy roots
Eg. Carrot, Raphanus and Beet root

Types of stele – Stellar growth

Nodal Anatomy – Unilacunar, Trilacunar, Multilacunar.

308/4 **UNIT: 4**
MICROBIOLOGY [10 Lect.]

Brief outline; Nomenclature and classification of viruses
Properties of viruses, morphology and ultra structures
(Bacteriophage) Types of bacteria; ultrastructure of bacteria
Basic principles of staining
Industrial application of microorganisms, Alcohol, Food Processing, Milk products, Antibiotics
and Biopesticides
Biofertilizers
Roles of microbes in agriculture- role in Nitrogen fixation
Biodegradation of cellulose, lignin and petroleum wastes and heavy metal waste

GUJARAT UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory syllabus
Effective from June-2013
SEMESTER VI
BOTANY
BOT 310
(Ecology, Gardening, Ethnobotany, Forestry)

310/1

UNIT: 1

ECOLOGY:

[10 Lect.]

Plant Biodiversity: Concepts and levels, IUCN categories of threat, Red data books, Hot spots
Brief account: EIA, International Biological Program; Man and Biosphere Program (MAB)
Climate change: Greenhouse Gases (CO₂, CH₄, N₂), CFCs: Sources, Trends and Role,
Consequences of Climate Change (CO₂, Global warming, Sea level Rise,)
Greenhouse effect and global warming; Ozone depletion;
Effect of Air, Water and Soil pollution on vegetation
Carbon footprint

310/2

UNIT: 2

GARDENING:

[10 Lect.]

Principles and Materials of Garden Design
Garden features: Paths, walkways and avenues, arches, lawn, floral beds, edges, hedges, ground cover
Garden operations: Pruning- principles & kinds.
Plant care: Manuring. Daily care & maintenance, repotting.
Landscape designs in India- Buddhist, Mughals, etc
Nursery management

310/3

UNIT: 3

ETHNOBOTANY

[10 Lect.]

History and development of Ethnobotany
Ethnobotany in India
Methods of Ethnobotanical research
Plants in religious belief
Plants used by tribes of Gujarat:
Achyranthes aspera
Asparagus racemosus
Butea monosperma
Calotropis procera
Ficus religiosa
Jatropha gossypifolia
Tamarandus indica
Vitex negundo

310/4

UNIT: 4

FORESTRY

Forest types of India

[10 Lect.]

Physical properties, structural features and identification of wood

Wood and Paper industries

Social forestry and Agricultural Forestry

Wild life and biosphere reserves

Forest research education and training Institutes

Forest Conservation Act (1980-1982); the Indian Wildlife (Protection) Act 1972 – Amended 1991.

GUJARAT UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory syllabus
Effective from June-2013
SEMESTER VI
BOTANY
BOT 311
Elective Paper: Plant Tissue Culture

Unit-I: Introduction and laboratory organisation

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

Unit-II: 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.

Unit-III: Types of cultures :

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

Unit-IV: Applications of plant tissue culture :

Applications of plant tissue culture in industries, forestry, horticulture, plant breeding and 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.

GUJARAT UNIVERSITY
BOTANY
B. Sc. Sem - VI BOTANY PRACTICAL SYLLABUS
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:

PTERIDOPHYTA: , Isoetes, Marsilea.

GYMNOSPERMS, Ginkgo, Ephedra

(b) Structure and Reproductive organs:

PTERIDOPHYTA: Isoetes: Sporophyll

Selaginella: Cones

Adiantum: Sporophyll

Marsilea: Sporocarp

GYMNOSPERMS: Ginkgo, Ephedra

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

Pteridophytes

PSILOPHYTALES : Rhynia: Stem T.S

LEPIDODENDRALES : Lepidodendron: Stem T.S.

Lepidocarpon: V.S.Slide

CALAMITALES : Calamites: Impression, Stem, T.S.

Calamostachys: Peel / Slide, Cone L.S

Gymnosperms:

CYCADOFILICALES: Lygenopteris althamia – Stem, T.S , Corsotheca (Male

organ) CORDAITALES: Cordaites: Stem T.S

Cordianthus – L.S of Cone.

GUJARAT UNIVERSITY
BOTANY
B. Sc. Sem - VI BOTANY PRACTICAL SYLLABUS
BOT 312 SEMESTER VI
PRACTICAL I: Session II
(Systematic Botany, Angiosperms, Anatomy, Microbiology)

ANGIOSPERMS: Study of families as per theory syllabus including floral formula and floral diagram.

ANATOMY: Study of different types of stele through charts and permanent slides.

Study of abnormal secondary growth:

- (1) Achyranthes stem
- (2) Draceana stem
- (3) Bougainvillea stem
- (4) Mirabilis stem
- (5) Boerhavia stem
- (6) Carrot root
- (7) Raphanus root
- (8) Beet root

Study of nodal anatomy as per syllabus.

MICROBIOLOGY:

- (a) Staining of bacteria through gram staining
- (b) Electron micrograph: Bacteriophage virus & Bacteria

Submissions: Herbarium sheets and Permanent Slides.

GUJARAT UNIVERSITY
BOTANY
B. Sc. Sem - VI BOTANY PRACTICAL SYLLABUS
BOT 312 SEMESTER VI
PRACTICAL II: Session I
(Plant Physiology, Plant Breeding, Molecular Biology, Biotechnology)

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 CO₂.
- (ii) To study of the rate of photosynthesis under different wavelength of light
- (ii) To study of the rate of photosynthesis under different light intensities.

2. Minor experiments:

The following experiments to be performed by the students:

- (i) Hill reactions
- (ii) C₃ & C₄ plants demonstration by anatomical features.
- (iii) Demonstration of respiratory enzymes in plant tissues.
 - (a) Polyphenol Oxidase
 - (b) Dehydrogenase
- (iv) Preparation of solutions:
Molar, Molal, Normal, Percent Concentrations

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.

MOLECULAR BIOLOGY: Charts as per theory syllabus.

BIOTECHNOLOGY: Charts as per theory syllabus.

GUJARAT UNIVERSITY
BOTANY
B. Sc. Sem - VI BOTANY PRACTICAL SYLLABUS
BOT 312
PRACTICAL II: Session II
(Ecology, Gardening, Ethnobotany, Forestry)

ECOLOGY

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

GARDENING

Visit to a garden to study the principles and materials used in landscape design. Report to be submitted during practical exam.

Visit to a Nursery to study its management. Report to be submitted during practical exam.

ETHNOBOTANY

Ethnobotanical specimens as prescribed in theory syllabus.

FORESTRY

Identification and characteristics of following wood samples:

- a. Eucalyptus sp.
- b. Acacia arabica
- c. Mangifera indica
- d. Tectona grandis
- e. Shorea robusta (Sal)

Submissions: Garden and Nursery visit Report, Wood samples

Herbarium of Ethnobotanical plants

GUJARAT UNIVERSITY
BOTANY
B. Sc. Sem - VI BOTANY PRACTICAL SYLLABUS
BOT 312
PRACTICAL I: Session I
(Pteridophytes, Pteridophyte fossils, Gymnosperms and Gymnosperm fossils)

(Maximum marks – 35)

Date:

Time: 3 hours

Q.1 Identify, classify and describe giving reasons. Draw the labeled diagrams of the peculiarities observed in Specimen A, B and C. (15)

Q.2 Expose the reproductive structure from the Specimen D. Make a sketch and show your preparation to the Examiner. (05)

Q.3 Identify and describe briefly the Slides / Specimens (08)

(D) Pteridophytes

(E) Gymnosperms

(F) Pteridophyte fossils

(G) Gymnosperms fossils

Q.4 Journal (02)

Q.5 Submissions (05)

GUJARAT UNIVERSITY
BOTANY
B. Sc. Sem - VI BOTANY PRACTICAL SYLLABUS
BOT 312
PRACTICAL I: Session II
(Systematic Botany, Angiosperms, Anatomy and Microbiology)

Maximum marks – 35

Date:

Time: 3 hours

- Q.1 Refer the Specimens A and B to their respective families. Giving reasons, including floral formula and floral diagrams. Draw labeled diagrams (08)
- Q.2 Prepare a double stained preparation of given Material C. Show your Preparation to the Examiner (07)
- Q.3 D. Gram staining (04)
- Q.4 Identify and describe (04)
(E) Microbiology
(F) Anatomy
- Q.5 Journal (02)
- Q.6 Submission: Herbarium sheets and Permanent slides. (10)

Third B.Sc. BOTANY PRACTICAL SYLLABUS

BOT 312 SEMESTER VI

PRACTICAL 2: Session I

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

Maximum marks – 35

Date:

Time:

- Q.1 Perform the physiological experiment assigned to you. Tabulate your observations and calculate. Show your experiments and records to the Examiner. (10)
- Q.2 Perform the experiments per slip and show your results to the Examiner. (05)
- Q.3 Identify & Describe. (08)
- (A) Physiology
(B) Chart from Plant Breeding
(C) Chart from Molecular Biology
(D) Chart from Biotechnology
- Q.4 Journal (02)
- Q.5 Project report & Viva (10)

Third B.Sc. BOTANY PRACTICAL SYLLABUS

BOT 312

PRACTICAL 2: Session II

(Ecology, Gardening, Ethnobotany, Forestry)

Maximum marks – 35

Date:

Time:

Q.1 Estimate Calcium / Chloride / Carbonate and bicarbonate /Total hardness in terms of p.p.m in a water sample given to you. Tabulate your observations and results and show them to the Examiner.

- Q.2 Test the given soil sample for Carbonate/Nitrate deficiency. (08)
- Q.3 Identify & Describe: (05)
- (A) Ethnobotany. (10)
- (B) Ethnobotany.
- (C) Wood sample.
- (D) Gardening chart
- (E) Garden chart
- Q.4 Journal (02)
- Q.5 Garden & Nursery visit report & Viva (10)

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.

- **Ecology:**

Ecology and Environment (7th Ed.) – P.D.Sharma .

Ecology – N.S.Subramanyam & A.V.S.Samba Murty, 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.Samba Murty, 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.

- **Landscape Gardening and Plant breeding:**

Gardens – Laeeq Futehally 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 Bala Rastogi.

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, Pragati Prakashan,Meerut.

Plant Taxonomy – N.B.Saxena & S. Saxena, Pragati Prakashan, 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