

SHRI GOVIND GURU UNIVERSITY

**Syllabus on the bases of Choice Based Credit System (CBCS)
As Proposed by University Grant Commission**

For

Semester - III & IV (S.Y.B.Sc.)

BOTANY

Semester – III

Paper: CC 201.

Plant Pathology; Anatomy and Ethnobotany.

Paper: CC 202.

Fossils; Plant Physiology and Nursery & Gardening.

Semester – IV

Paper: CC 204.

Angiosperm Embryology; Plant Taxonomy and Plant Tissue Culture.

Paper: CC 205.

Cell Biology; Biochemistry; Genetics and Economic Botany.

IN FORCE FROM JUNE 2017

SHRI GOVIND GURU UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Theory Syllabus
Effective from June 2017
(Credits: Theory-4, Practicals-2)
Total Lectures: 48
Semester – III (Paper: 201)

Paper – CC 201: [Plant Pathology, Anatomy and Ethnobotany]

Unit – 1: Plant Pathology (14 Marks) [10 Lectures]

Introduction, Symptoms and modes of infections in Plants, Control of plant diseases types, mode of action, application of Fungicides- chemotherapy, Immunization and Disease cycle of the following;

Wart Disease of Potato (*Synchytrium endobioticum*)

Tikka Disease of Ground Nut (*Cercospora personata*; *C.arachidicola*)

Green ear Disease of Bajra (*Sclerospora graminicola*)

White Rust of Crucifers (*Albugo candida*)

Wilt of Cotton (*Fusarium oxysporum*; *F. vasinfectum*)

Unit – 2: Plant Anatomy (14 Marks) [14 Lectures]

Meristems

Characteristics of Meristems

Classification of Meristem

Theories of Apical organization- Shoot Apex & Root Apex

Simple and Complex Tissue system

Dermal Tissue System

Epidermal outgrowths (Types of Epidermis, Epidermal Hairs & glands,
-Monocot and Dicot stomata)

Root- Stem Transition

Nodal Anatomy

Unit – 3: Plant Anatomy (14 Marks)**[14 Lectures]**

The Cambium- Types & Functions

Normal Secondary Growth in Sunflower Root and Stem

Anomalous Secondary Growth in- Boerhaavia stem; Achyranthes Stem

Abnormal secondary growth in fleshy Root- Radish & Beet

Unit – 4: Ethnobotany (14 Marks)**[10 Lectures]**

History and Development of Ethnobotany in India

Introduction, Concept, Scope, Objectives and Branches of Ethnobotany

Methods of Ethnobotanical Research

Significance of the following plants used by local tribes in Ethnobotanical Practices (along with their habitat and morphology):

Azadirachta indica, *Madhuca indica*, *Enicostema hyssopifolium*, *Holarrhena antidysenterica*,
Aristolochia indica, *Helicteris isora*, *Aegle marmelos*, *Hemidesmus indicus*, *Butea monosperma*, *Acacia nilotica*, *Achyranthus aspera*, *Pterocarpus marsubium*, *Dendrocalamus strictus*.

Role of ethnobotany in modern medicine

Examples: *Rauwolfia serpentina*, *Withania somnifera*, *Aloe vera*, *Adhatoda vasica*, *Asparagus racemosus*,

Suggested Readings:

Padey, BP, 2009. Plant Pathology, S Chand Publishers., NewDelhi.

Sharma, PD. 2004. Plant Pathology, Rastogi Publication, NewDelhi.

Mehrotra, RS. 2003. Plant Pathology, Tata McGraw Hill Publishing co. Ltd., NewDelhi.

Mauseth, JD, 1988. Plant Anatomy. The Benjamin/ Cummings Publishers, USA.

Eames, AJ and Mac Daniels, LH. 1981. An Introduction to Plant Anatomy, Tata McGraw Hill Publishing co. Ltd., NewDelhi.

SK Jain (ed), 1990. Contributions of Indian Ethnobotany, Scientific Publishers, Jodhpur.

Colton CM, 1997. Ethnobotany- Principles and applications. John Wiley and Sons- Chichester

Sinha RK, Sinha S, 2001. Ethnobiology, Surabhi Publications, Jaipur

Bendre Ashok and Kumar Ashok. 1997-98. 7th Edition. A Textbook of Practical Botany vol. I & II.

Rastogi Publication, Meerut.

SHRI GOVIND GURU UNIVERSITY
BOTANY

Choice Based Credit System (CBCS) Theory Syllabus

Effective from June 2017

(Credits: Theory-4, Practicals-2)

Total Lectures: 48

Semester – III (Paper: 202)

Paper No. – 202: [Fossils, Plant Physiology, Nursery & Gardening]

Unit – 1: Fossils (14 Marks)

[12 Lectures]

Condition and Formation of Fossils

Types of Fossils

Geological Time Scale

Pteridophytes:

Psilophytales: General characters RHYNIA

Lepidodendrales: General characters LEPIDODENDRON, LEPIDOCARPON

Calamitales: General characters CALAMITES

Gymnosperms:

Cycadofilicales: General characters LYGENOPTERIS & *LYGENOSTOMA LOMAXI* (Seed)

Cordaitales: General characters CORDAITES & CORDAINTHUS.

General account of Pentoxylales

Unit – 2: Plant Physiology (14 Marks)

[14 Lectures]

Plant-Water relations; Diffusion, Osmosis, Plasmolysis, Imbibition.

Transpiration: Types, its Significance, Mechanism of stomatal movements,

Factors affecting rate of Transpiration; Guttation.

Translocation of organic solutes in Phloem.

Photosynthesis: Photosynthetic Pigments (Chl a, b, Xanthophyll, Carotene), Photosystem I and II,

Electron transport and Mechanism of ATP synthesis, C₃ and C₄ pathway of carbon fixation.

Respiration: Glycolysis, TCA cycle, Oxidative Phosphorylation, Electron Transport System

Unit – 3: Advanced Plant Physiology (14 Marks)

[12 Lectures]

Growth: Phases of Growth and Growth Correlations.

Plant response to light and temperature- Photoperiodism and Vernalization.

Enzymes- Classification, Structure, Properties, Mechanism of enzyme action and factors affecting rate of enzymatic reactions.

pH and Buffer solutions and its significance.

Plant Growth Regulators: Biosynthesis, Physiological role of Auxins, Gibberellins, ABA and Ethylene

Unit – 4: Nursery and Gardening (14 Marks)

[10 Lectures]

Nursery: Definition, Objectives and scope and Nursery development/ Planning.

Seed: Structure, Types- Seed dormancy; Causes and methods of breaking dormancy.

Seed storage and Factors affecting seed viability.

Gardening: Definition, objective and scope of different types of gardens, Landscaping.

Gardening operations- soil laying, manuring, watering, management of pests, Gardening tools & equipments.

Suggested Readings:

Pandey, BP. 1993, College Botany vol. I,II, S Chand & Co. Ltd., NewDelhi.

Pandey, BP. 2013, Publishers College Botany vol. II, S Chand Publishers, NewDelhi

Sharma, OP. 1980. Gymnosperms, Pragati Prakashan, Meerut (India)

Kumar, A. & Purohit, SS. 1997-98, Plant Physiology, Agro Botanical Publishers (India), Bikaner.

Noggle RG. & Fritz, GJ, 1989. Introductory Plant Physiology, 2nd ED. Prentice Hall of India Private Ltd. NewDelhi.

Devlin, RM. & Witham, FH, 1997. Plant Physiology, 4th Ed., CBS Publishers & Distributers, Delhi.

Taiz, L. & Zeiger, E. 2010. Plant Physiology. Sinauer Associate Inc. USA, 5th Edition

Hopkins, WG. & Hunter, NP. 2009. Introduction to Plant Physiology, John Wiley & Sons, USA, 4th Edition.

Bose, TK. & Mukherjee, D, 1972, Gardening in India, Oxford & IBH Publishing Co., NewDelhi.

Kumar, N. 1997. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.

Agrawal, PK. 1993. Hand Book of Seed Technology. McGraw Hill Book Co., NewDelhi.

SHRI GOVIND GURU UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Practical Syllabus
Effective from June 2017
Semester – III
Practicals (Paper: 203A)
Base on Theory Paper – 201
[Plant Pathology, Anatomy and Ethnobotany]

- (1) Study of Plant diseases (pathogens) as per theory syllabus
Mounting (W.M.) and Permanent Slide (P.S.) of
 - (a) Wart Disease of Potato (*Synchytrium endobioticum*)
 - (b) Tikka Disease of Ground Nut (*Cercospora personata*; *C.arachidicola*)
 - (c) Green ear Disease of Bajra (*Sclerospora graminicola*)
 - (d) White Rust of Crucifers (*Albugo candida*)
 - (e) Wilt of Cotton (*Fusarium oxysporum*; *F. vasinfectum*)
- (2) Study of Meristematic tissue from given material and through P.S.
 - (a) Root apex: Onion root tip
 - (b) Shoot apex: Hydrilla shoot tip
- (3) Study of simple tissue (parenchyma, collenchyma, sclerenchyma) through P.S.
- (4) Study of complex tissue and its component from L.S. of plant material and through P.S.
- (5) Study of Dermal tissue system through permanent Slides:
 - (a) Types of epidermis- Uniseriate: Cucurbita/ Sunflower stem T.S.;
Multiseriate: Nerium/ Ficus leaf T.S. OR Orchid root T.S.
 - (b) Epidermal outgrowths: Through P.S.
 - Stellate hairs: Gossypium/ Abutilon leaf
 - Branched hairs: Tectona/ Ashwaghandha leaf
 - Stinging hairs: Mucuna/ Urtica leaf
 - Peltate hairs: Fern rachis (Ramenta)
 - Peltate glands: Avicinnia/ *Ipomea biloba* leaf
 - Glandular hairs: Martynia/ Jetropa leaf
 - Stomata: Monocot, Dicot leaf
- (6) Study of Normal and Anomalous secondary growth using double staining
(Fast green and Safranin only) temporary preparation technique:
 - (a) Normal secondary growth: Sunflower Root & Stem T.S.

(b) Anomalous secondary growth: Achyranthes Stem, Boerhaavia stem

(c) Abnormal secondary growth in fleshy Root- Radish & Beet

(7) Study of Nodal anatomy from given plant material.

(a) Clerodendron

(b) Nerium

(c) Polyalthia

(8) Study of Ethnobotanical plants as per theory syllabus.

SHRI GOVIND GURU UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Practical Syllabus
Effective from June 2017
Semester – III
Practicals (Paper: 203B)
Base on Theory Paper No. – 202
[Fossils, Plant Physiology, Nursery & Gardening]

- (1) Study of following plant Fossils from specimen/ P.S. / chart.
Pteridophytes: Rhynia stem T.S., Lepidodendron T.S, Cast, Impression,
Lepidocarpon V.S. Slide, Calamites stem T.S., Impression.
Gymnosperms: Cordaites Stem T.S., Cordainthus Cone L.S.
- (2) To study the rate of Photosynthesis under different wavelength of Light.
- (3) To study the rate of Photosynthesis under different concentrations of CO₂
- (4) To Study the various stages of Plasmolysis using Tredescantia/ croton bicolor leaf
- (5) To study the phenomenon of Osmosis using Potato Osmoscope & Colocasia petiole
- (6) Study of Transpiration rate by Four Leaf Experiment.
- (7) To study the enzymatic activity of Amylases, Catalases and Dehydrogenases from plant material.
- (8) To study the anatomical features of C₃ and C₄ plants using drop of Iodine on leaf T.S.
- (9) Separation of viable and non- viable (poor quality seed-lots) seeds using TTZ screening test.
- (10) Demonstration of various Gardening Tools:
- | | |
|-----------------|----------------|
| a. Shovel | f. Hand Trowel |
| b. Digging Fork | g. Hoe |
| c. Watering Can | h. Scissors, |
| d. Hose | i. Pruners |
| e. Spade. | |

SHRI GURU GOVIND UNIVERSITY, GODHRA

BOTANY

B.Sc., Semester- III, Practical (Paper- 203A)

[Practical Examination Based on Theory Paper - 201]

Date:

Place:

Time: 05 Hours

Total Marks: 35

Instruction:

1. Expose and identify the Pathogen from the given material A. Make a labeled sketch and Show your preparation to the Examiner. (04)
2. Make a temporary double stained preparation from given material B. Draw a labeled diagram and show your slide to the Examiner. (05)
3. Identify and describe the Nodal anatomy- including from given plant material C. Draw a labeled sketch and comment on structural peculiarities. (03)
4. Identify and describe (15)
 - D. Plant pathology
 - E. Anatomy (Root/Shoot apex/Simple & Complex Tissue)
 - F. Secondary growth
 - G. Ethnobotany
 - H. Ethnobotany
5. Submission/Project. (05)
6. Journal. (03)

SHRI GURU GOVIND UNIVERSITY, GODHRA

BOTANY

B.Sc., Semester- III, Practical (Paper- 203B)

[Practical Examination Based on Theory Paper - 202]

Date:

Place:

Time: 05 Hours

Total Marks: 35

Instruction:

Major Experiment

1. Perform the Physiological Experiment [Photosynthesis(CO₂ Conc./ Wavelength)]
tabulate your observation with conclusion and Show your results to the Examiner. (05)
2. Perform the Physiological Experiment [Potato osmoscope/Edosmosis-Exosmosis using
Colocasia petiole / Four leaf Exp.Transpiration)]
and Show your results and record to the Examiner. (05)

Minor Experiment

3. Perform the experiment Plasmolysis/ Enzyme activity of Amylases/ Catalase/ Dehydrogenases.
OR check the anatomical features C₃ and C₄ plant. /Check the viability of poor quality
seed-lots using TTZ screening test. And show your results to the Examiner. (03)
4. Identify and describe: (12)
 - D. Fossil
 - E. Fossil
 - F. Nursery & Gardening
 - G. Nursery & Gardening
6. Viva (07)
6. Journal. (03)

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BOTANY
Choice Based Credit System (CBCS) Theory Syllabus
Effective from June 2017
(Credits: Theory-4, Practicals-2)
Total Lectures: 48
Semester – IV (Paper: 204)

Paper No. – 204: [Angiosperm Embryology, Taxonomy and Plant tissue culture]

Unit – 1: Angiosperm Embryology (14 Marks) [12 Lectures]

Structure of microsporangium, microsporogenesis and development of male gametophyte.

Structure of megasporangium, megasporogenesis and development of female gametophyte (monosporic, bisporic and tetrasporic- Fritillaria type).

Structure of Ovule and its types.

Fertilization: Double fertilization

Unit – 2: Embryology (14 Marks) [12 Lectures]

Pollination: Definition and significance of self pollination and cross pollination.

Endosperm: Types, structure and function.

Apomixis: Definition, types, Causes and its practical applications.

Embryology in relation to taxonomy- General account.

Unit – 3: Taxonomy (14 Marks) [12 Lectures]

Merits and Demerits of the system of classification of Bentham & Hooker.

Taxonomic evidences from palynology, phytochemistry and molecular data.

Classification of the following families as per Bentham & Hookers' system of classification including examples of economic important plants from each family.

Dicotyledons:

Polypetalae: Cruciferae (Brassicaceae), Papilionaceae.

Gemopetalae: Asteraceae (Compositae), Asclepiadiaceae.

Apetalae: Nyctagianaceae.

Monocotyledons: Palmae, Poaceae.

Unit – 4: Plant Tissue Culture (14 Marks) [12 Lectures]

Tools and organization of plant tissue culture facilities:

pH meter, Laminar Air Flow hood, Autoclave, Electric oven, Shaker- gyrator.

Laboratory requirement for Plant Tissue Culture:

General Account of Lab space, Washing & Sterilization, Media & their composition, Media selection & Preparation.

Technique of Plant Tissue Culture (Nutrient medium, Useful Organs of Plant for Tissue culture, Aseptic transfer, Aeration, Incubation)

Production of Plantlets from Callus (Organogenesis & Embryogenesis)

Micropropagation; Cell Suspension Culture & its importance; Somatic embryogenesis.

Secondary metabolites obtained using plant tissue culture techniques and its extraction method from higher Plants.

Somatic hybridization.

A brief account of Anther culture (Haploid production) and its Importance in Higher Plants.

Suggested Readings:

Bhojwani, SS. & Bhatnagar, SP. 2011. Embryology of Angiosperms, Vikas Publication House Pvt. Ltd. NewDelhi. 5th Edition.

Simpson, MG. 2006. Plant Systematics. Elsevier Academic Press, San Diego, CA, USA.

Singh, G. 2012. Plant Systematics: Theory & Practice. Oxford & IBH Pvt. Ltd. NewDelhi.

Bhojwani, SS. & Razdan, MK. 2006. Plant Tissue Culture: Theory & Practice, Elsevier India Pvt. Ltd. NewDelhi.

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Effective from June 2017
(Credits: Theory-4, Practicals-2)
Total Lectures: 48
Semester – IV (Paper: 205)

Paper No. – 205: [Cell biology, Biochemistry, Genetics and Economic botany]

Unit – 1: Cell biology (14 Marks)

[12 Lectures]

Ultra structure of plant cell

Structure & functions of following cell organelles;

Cell wall, Endoplasmic reticulum, Ribosome, Nucleus, Lysosome, Dictyosome.

Cell cycle and cell division- Mitosis & Meiosis, its significance.

Chromosome: morphology and structure of Polytene and Lampbrush chromosome.

Unit – 2: Biochemistry (14 Marks)

[12 Lectures]

Structure and classification of carbohydrates and Lipids.

Classification of Protein on the bases of structure.

Structure of Nucleic acids- DNA (Watson & Crick) & Types of structures of RNA (mRNA, rRNA, tRNA), DNA replication.

Symbiotic Nitrogen fixation.

Unit – 3: Genetics (14 Marks)

[14 Lectures]

Mendelian Genetics- Laws of inheritance

Modified Mendelian Ratios (Gene interactions): Complementary Factors;

Supplementary Factors, Inhibitory Factors, Epistasis

Sex Determination in Plants (Types of sex expression in plants &

Sex Determination in *Cocconia indica* and *Melandrium album*)

Cytoplasmic (Extra nucleus) inheritance (Mirabilis jalapa, Male sterility).

Genetic code and its properties.

Structural Chromosomal aberrations: Deficiencies, Deletions, Duplication,
-Inversions, Translocation

Unit – 4: Economic botany (14 Marks)

[10 Lectures]

General account, methods of cultivation, climate and uses of the following plants:

Cereals: Maize and Rice

Pulses: Tur and Gram

Oil seeds: Ground nut and Castor

Fiber yielding: Cotton, Jute and Coir

Dyes yielding: Heena, Indigofera, Butea.

General account of selected regional (Gujarat) Timber & Fire wood plant species:

Timber plant species:

Tectona grandis, *Dalbergia sisoo*, *Azadirachta indica*, *Madhuca indica*.

Fire wood plant species:

Holoptelia integrefolia, *Zyziphus jujube*, *Acacia nilotica*, *Salvadora persica*

Suggested Readings:

DeRobertis, EDP and DeRobertis, EMF. 2006. Cell and Molecular Biology, 8th Edition, Lippincott Williams and Wikins, Philadelphia.

Sundara Rajan, S. 2000. Cytogenetics, Anmol Publications Pvt. Ltd., NewDelhi.

Nelson, DL. and Michael, M. Cox, 2008, Lehninger Principles of Biochemistry, 5th Edition, WH Freeman and Company, New York, NY.

Gupta, PK. 2003-04. Genetics, Rastogi Publications, Meerut.

Kochhar, SL. 2011. Economic Botany in the Tropics, 4th Edition, MacMillan Publishers India Ltd., NewDelhi.

SHRI GOVIND GURU UNIVERSITY
BOTANY
Choice Based Credit System (CBCS) Practical Syllabus
Effective from June 2017
Semester – IV
Practicals (Paper: 206A)
Base on Theory Paper No. – 204
[Angiosperm Embryology, Taxonomy and Plant tissue culture]

- (1) Exposition and mounting of Endosperm haustoria from Cucumis/ Cassia/ Guar seed.
- (2) To perform the experiment on pollen tube germination from pollen of *Catheranthus rosea*.
- (3) Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):
 - (a) Dicots: Crusiferae (Brassicaceae), Papillionaceae, Asteraceae (Compositae),
Asclepiadiaceae, Nyctagianaceae.
 - (b) Monocots: Palmae, Poaceae.
- (4) Demonstrate the mounting of the germinating pollen tube on stigma of *Catheranthus/ Dhatura / Argimone*
- (5) Demonstrate the instruments useful in plant tissue culture laboratory.
Tools and organization of plant tissue culture facilities:
 - pH meter
 - Laminar Air Flow hood
 - Autoclave
 - Electric oven
 - Shaker- gyrator.
- (6) Demonstrate the T.S. of anther, microspore mother cell, megasporangium, megaspore mother cell, 8- nucleate embryosac, various types of ovule, pollen- stigma interaction , Dicots and Monocots embryo through P.S.

- (7) Mounting of a properly dried and pressed specimen of any ten plant with herbarium label must be submitted to the department.
- (8) Botanical study tour and report preparation.

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Choice Based Credit System (CBCS) Practical Syllabus
Effective from June 2017
Semester – IV
Practicals (Paper: 206B)
Base on Theory Paper No. – 205
[Cell biology, Biochemistry, Genetics and Economic botany]

- (1) To study cell division stages -Mitosis - in Onion root tip by squash method.
Meiosis – Through P.S.
- (2) Histochemical localization of DNA in plant material.
- (3) Histochemical localization of RNA in plant tissue.
- (4) Qualitative tests of Protein from plant material.
- (5) Histochemical localization of Starch, Lignin, Fat and Glucose from plant material.
- (6) Cell organelles : Model/ Charts – Cell wall, Endoplasmic reticulum, Ribosome,
Nucleus, Lysosome, Dictyosome.
- (7) Study of DNA (Watson & Crick), DNA replication & Types RNA (mRNA, rRNA, tRNA)
through model/ charts.
- (8) Giant chromosome: Polytene and Lampbrush chromosome.
- (9) Solve the Genetic problems.
- (10) Economic botany: Specimens and / or their products to be demonstrated as per theory syllabus.
- (11) Students are expected to submit a herbarium sheets (minimum five).

SHRI GURU GOVIND UNIVERSITY, GODHRA

BOTANY

B.Sc., Semester- IV, Practical (Paper- 206A)

[Practical Examination Based on Theory Paper - 204]

Date:

Place:

Time: 05 Hours

Total Marks: 35

Instruction:

1. Expose and mount the Endosperm Haustoria from the given material A. Make a labeled sketch and Show your preparation to the Examiner. (05)
2. Perform the experiment on pollen germination from given material B.
Draw a labeled diagram and show your slide to the Examiner. (03)
3. Identify and classify giving general characters of the given family from Specimen C. (05)
4. Identify and describe (12)
 - D. Embryology
 - E. Embryology
 - F. Plant tissue culture
 - G. Plant tissue culture
5. Submission, Tour report & Viva (07)
6. Journal. (03)

SHRI GURU GOVIND UNIVERSITY, GODHRA

BOTANY

B.Sc., Semester- IV, Practical (Paper- 206B)

[Practical Examination Based on Theory Paper - 205]

Date:

Place:

Time: 05 Hours

Total Marks: 35

Instruction:

1. Prepare the slide showing cell division from the given material A. Make a labeled sketch and Show your preparation to the Examiner. (05)
2. Perform the Histochemical test and localization for Starch/ Lignin/ Fat/ Glucose/ DNA/ RNA and Protein from the given material B. Show your preparation to the Examiner. (05)
3. Solve the Genetical problem. (03)
4. Identify and describe (12)
 - D. Cell biology
 - E. Biochemistry
 - F. Economic botany
 - G. Economic botany
5. Submission & Viva (07)
6. Journal. (03)