Scheme of Examination and Syllabus

Affiliated Colleges

(2018-19)

B. Sc. General (Medical Group) Botany
(1st and 2nd Semester)

Based on
Choice Based Credit System

Department of Bio and Nanotechnology

Guru Jambheshwar University of Science & Technology

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Course Curriculum of B. Sc. General (Medical Group) Botany

Semester	Nature of the Course	Name of the Course	Paper Code	Credits
I	**Ability Enhancement Compulsory Course-I**	**Environmental Science**		**4**
	Core course - Botany Paper I	**Biodiversity of Microbes, Algae and Fungi**	**BOT 101 L**	**2**
	Core course - Botany Paper II	**Biodiversity of Archegoniate**	**BOT 102 L**	**2**
	Core Course – Practical- Paper III	**Laboratory Practical- Paper III (Biodiversity of Microbes, Algae, Fungi and Archegoniate)**	**BOT 103 P**	**4**
	Discipline- 2 Paper I	DSC- 2 Paper I		
	Discipline- 2 Paper II	DSC- 2 Paper II		
	Discipline- 2 Paper III Practical	DSC- 2 Paper III Practical		
	Discipline 3 Paper I	DSC 3 Paper I		
	Discipline 3 Paper II	DSC 3 Paper II		
	Discipline 3 Paper III Practical	DSC 3 Paper III Practical		
II	**Ability Enhancement Compulsory Course - II**	**English/MIL Communication**		**2**
	Core course-Botany Paper IV	**Plant Ecology**	**BOT201 L**	**2**
	Core Course- Botany Paper V	**Plant Taxonomy**	**BOT 202 L**	**2**
	Core Course- Botany Paper VI Practical/Tutorial	**Laboratory Practicals - Paper VI (Plant Ecology and Taxonomy)**	**BOT 203 P**	**4**
	Discipline- 2 Paper II	DSC- 2 Paper II		
	Discipline- 2 Paper I Practical	DSC- 2 Paper II Practical		
	Discipline 3	DSC 3 Paper II		
	Discipline 3 Paper I Practical	DSC 3 Paper II Practical		

Semester I

Botany Paper I (Credits: 2+0)
Biodiversity of Microbes, Algae and Fungi
(BOT 101 L)

Max. Marks: 40
Internal Assessment: 10
Time: 3 Hours **Total Marks: 50**

Note: Total 9 questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the entire syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question carries equal marks.

Unit 1: Viruses

Viruses – Discovery, general characteristics, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV), Economic Importance of Viruses.

Unit 2: Bacteria

Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance of bacteria.

Unit 3: Algae

General characteristics; Range of thallus organization and reproduction; Classification of algae upto classes (Lee, 1980); Morphology and life-cycles of the following: *Nostoc*, *Volvox, Oedogonium*, *Ectocarpus* and*Polysiphonia*; Economic importance of algae.

Unit 4: Fungi

Introduction- General characteristics, economic importance, reproduction and classification upto Classes (Ainsworth, 1966); Morphology and life cycles of *Rhizopus, Penicillium, Puccinia*, *Agaricus,*and*Colletotrichum*. Causal organism, symptoms andcontrol of following plant diseases; Rustof wheat, white rust of crucifers, late blight of potato, and red rot of sugarcane.Lichens: General account and significance.

Semester I

Botany Paper II (Credits: 2 + 0)
Biodiversity of Archegoniate
(BOT 102 L)

Max. Marks: 40
Internal Assessment: 10
Time : 3 Hours **Total Marks: 50**

Note: Total 9 questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the entire syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question carries equal marks.

Unit 1:**Archegoniates**

Unifying features of archegoniates, Transition to land habit, Alternation of generations,

General account of Paleobotany; Types of fossils and process of fossilization. Study of fossil plants: *Rhynia* and *Lyginopteris*

Unit 2: Bryophytes

General characteristics, Range of habitat and thallus organization. Classification up to classes (Smith), morphology, anatomy and reproduction of *Marchantia, Anthoceros* and *Funaria*. (Developmental details not to be included). Ecology and Economic importance of Bryophytes

Unit 3: Pteridophytes

General characteristics, Classification up to Classes (Smith), morphology, anatomy and reproduction of *Selaginella, Equisetum* and *Pteris*. (Developmental details not to be included). Heterospory and seed habit. Economic importance of Pteridophytes

Unit 4: Gymnosperms

General characteristics, Classification up to Classes (Pilger and Melchior, 1954), morphology, anatomy and reproduction of *Cycas*, and *Pinus*. (Developmental details not to be included). Ecological and Economic importance of Gymnosperms.

Semester I

Laboratory Practical- Paper III
(Biodiversity of Microbes, Algae, Fungi and Archegoniate)
BOT: 103P **(Credits: 0+4)**

Max. Marks: 40
Internal Assessment: 10
Time: 6 Hours **Total Marks: 50**

Note:

1. Students should draw Figures or diagrams and write related descriptions/ notes in their practical note books.
2. Report on excursion tours with photographs, collection, preservation and preparation of herbarium sheets and/ or specimens related to Algae, Fungi, and Archegoniates.

List of Practicals

1. Electron Micrographs/Models of viruses – T-Phage and TMV, Photograph/ Line drawing of Lytic and Lysogenic Cycle. Types of bacteria from permanent slides/photographs.
2. Study of vegetative and reproductive structures of *Nostoc, Volvox, Oedogonium, Ectocarpus* and *Polysiphonia* through temporary preparations and permanent slides.
3. Gram Staining and serial dilution technique of bacteria.
4. ***Rhizopus, Penicillium, Puccinia,AgaricusandColletotrichum***: Asexual and sexual stage (temporary mounts / permanentslides).
5. Study of plant disease specimens as per theory syllabus.
6. **Lichens**: Study of growth forms of lichens (crustose, foliose and fruticose).
7. ***Marchantia***- morphology of thallus, W.M. rhizoids and scales, V.S. thallus with gemma cup, W.M.gemmae, V.S. of antheridiophoreandarchegoniophore, L.S. sporophyte (temporary/permanent slides).
8. ***Anthoceros***- morphology of thallus, W.M. rhizoids, V.S. thallus, VS Antheridia and Archegonia, L.S. sporophyte (temporary/permanent slides).
9. ***Funaria***- morphology, W.M. leaf, rhizoids, operculum, peristome, annulus, spores, slides showingantheridial and archegonial heads, L.S. capsule (temporary /permanent slides).
10. ***Selaginella***- morphology, W.M. leaf with ligule, T.S. stem, W.M. strobilus, W.M. microsporophyllandmegasporophyll, L.S. strobilus (temporary/ permanent slide).

11. ***Equisetum***- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry)(temporary slides); t.s rhizome (permanent slide).
12. ***Pteris***- morphology, T.S. rachis, V.S. sporophyll, W.M. sporangium, W.M. spores, T.S. rhizome,W.M. prothallus with sex organs and young sporophyte (temporary/ permanent slide).
13. ***Cycas***- morphology (coralloid roots, bulbil, leaf), T.S. coralloid root, T.S. rachis, V.S. leaflet, V.S.microsporophyll, W.M. spores, L.S. ovule, T.S. root (temporary/ permanent slide). LS Seed.
14. ***Pinus***- morphology (long and dwarf shoots, W.M. dwarf shoot, male and female), W.M. dwarf shoot,T.S. needle, T.S. stem, L.S./T.S. male cone, W.M. microsporophyll, W.M. microspores (temporary slides), L.S. female cone (temporary/ permanent slide). LS Seed.

Suggested Readings

1. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
2. Plant Pathology. 3rd Ed. 2017. R.S. Mehrotra and Ashok Aggarwal. McGraw Hill Education India Pvt Ltd. New Delhi.
3. Fundamentals of Plant Pathology .2013. R.S. Mehrotra and Ashok Aggarwal. McGraw Hill Education India Pvt Ltd. New Delhi.
4. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
5. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
6. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
7. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
8. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
9. Thakur, A.K. and Bassi, S.K. (2008). Diversity of Microbes and Cryptogams. S. Chand & Co., Delhi.
10. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
11. Willey, J.M., Sherwood, L., Woolverton, C.J, Prescott, L.M. and Willey, J.M. (2011). Prescott's Microbiology. New York, McGraw-Hill.
12. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India

Semester II

Botany Paper IV (Credits: 2+0)
Plant Ecology
(BOT 201 L)

Max. Marks: 40
Internal Assessment: 10
Time : 3 Hours **Total Marks: 50**

Note: Total 9 questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the entire syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question carries equal marks.

Unit 1: Introduction to Ecology and Ecological factors

Introduction to Ecology: Basic concepts, types and Scope of Ecology. Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Effect of light and temperature on plants.Morphological and anatomical adaptation of hydrophytes and xerophytes.

Unit 2: Ecosystem

Structure; energy flow trophic levels; Food chains and food webs, Ecological pyramids; Biogeochemical cycles; Hydrological, Carbon, Nitrogen and Phosphorous

Unit 3: Plant Communities and Phytogeography

Qualitative and quantitative characters; Ecotone and edge effect; Succession; Process and types (Hydrosere and Xerosere).Phytogeographical regions of India. Endemism

Unit 4: Pollution and Environmental Laws

Definition, Types, Sources, Control of Air, Water and Soil Pollution.A basic knowledge of Environment Protection Act, 1986.

Semester II

Botany Paper V (Credit: 2+0)
Plant Taxonomy
(BOT 202 L)

Max. Marks: 40
Internal Assessment: 10
Time : 3 Hours **Total Marks: 50**

Note: Total 9 questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the entire syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question carries equal marks.

Unit 1: Plant Taxonomy

Identification, Classification, Nomenclature.Ranks, categories and taxonomic groups.

Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.

Types of classification- artificial, natural and phylogenetic. Bentham and Hooker system of classification (upto series), Angiosperm Phylogeny Group (APG)- general introduction

Unit 2 Herbarium, Botanical Gardens and Taxonomic Literature

Herbarium: general introduction and importance. Botanical gardens of the world (Royal Botanic Garden, Kew)and India (AcharyaJagdish Chandra Bose Indian Botanical Garden, Kolkata), Introduction to Botanical Survey of India (BSI Dehradun); Documentation: Introduction to Floras,monograph and journals, Keys: single access and multi-access

Unit 3. Modern trends in Taxonomy

Taxonomic evidences from cytology, phytochemistry and molecular dataBiometrics: Characters; variations; OTUs, character weighting and coding; cluster analysis; phenorograms, cladograms (definitions and differences).

Unit 4: Study of Plant Families

Salient features, vegetative, floral characters and economic importance of the following families: **Ranunculace**, **Brassicaceae***;* **Leguminosae**,**Asteraceae***;***Solanaceae***;* **Lamiaceae, Liliaceae*Poace***

Suggested Readings

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Odum, E.P. 1983: Basic Ecology, Saunders, Philadelphia.
3. Mackenzie, A. et al. 1999: Instant Notes in Ecology, Viva Books Pvt. Ltd., New Delhi.

4. Sharma, P.D., 2010 Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.

5. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.

6. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.

Semester II

Laboratory Practical- Paper VI
(Plant Ecology and Taxonomy))
(BOT 203 P) **(Credits: 0+4)**

Max. Marks: 40
Internal Assessment: 10
Time: 6 Hours **Total Marks: 50**

Note:

1. Students should draw Figures or diagrams and write related descriptions/ notes in their practical note books.
2. Report on field visit with photographs, collection, preservation and preparation of wild plants on herbarium sheets and proper herbarium labels.

List of Practicals

1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/ hygrometer, rain gauge and lux meter.
2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates and organic matter by rapid field test.
3. Study of morphological adaptations of hydrophytes and xerophytes (four each).
4. Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (*Orobanchae, Striga*), Epiphytes, Insectivorous plants
5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)
6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law
7. Visit and Preparation of Report on polluting Industry/ polluting site and different Ecosystems
8. Study of floral characters of the following families (Description, V.S. flower, section of ovary, floral diagrams, floral formulae and systematic position according to Bentham & Hooker's system ofclassification):**Ranunculaceae-** Ranunculus/ Delphinium; **Brassicaceae**– *Brassica/ Alyssum / Iberis;* **Leguminosae**- *Pisum, Acacia, Cassia,***Asteraceae** *–Sonchus/ Helianthus/ Ageratum/ Eclipta/ Tridax;***Solanaceae** *-Solanumnigrum/ Datura/Petunia;* **Lamiaceae**–*Salvia/ Ocimum*; **Liliaceae** *-Asphodelus/Lilium/ Allium, Poaceae- Wheat.* Any other available plant species belonging to these families can also be studied.