

**GOVT. BILASA GIRLS P.G.
COLLEGE**

(Accredited by 'A' NAAC)

BILASPUR



SYLLABUS

B.Sc.

BOTANY

Semester - I to VI

2019-2020

Govt. Bilasa Girls P.G.(Autonomous) College Bilaspur (C.G.)
DEPARTMENT OF BOTANY
2019-2020

Description of Courses for Choice Based Semester System

Course – 5 Credits (75 Hours)

[Theory Paper – 3 Credits (45 Hours) and Lab Work – 2 Credits (30 Hours)]

| Section | Core Courses | Choice based courses |
|-----------------|--|--|
| Sem. I | CCB – 01 <i>Biodiversity (Microbes, Algae, Fungi and Archegoniate)</i> | XXXX |
| Sem. II | CCB - 02 <i>Cytology, Genetics and Molecular Biology</i> | XXXX |
| Sem. III | CCB - 03 <i>CHOICE BASED Elective course</i> | CBCB – 03(E1): <i>Ethno botany and Herbal medicine</i> CBCB – 03(E2): <i>Agro-services and Bio Farming</i> CBCB – 03(E3): <i>Computer basic and Bioinformatics</i> |
| Sem. IV | CCB - 04 <i>Ecology and Systematic Botany</i> | XXXX |
| Sem. V | CCB - 05 <i>Anatomy, Embryology and Economic Botany</i> | XXXX |
| Sem. VI | CCB - 06 <i>Plant Physiology and Biotechnology</i> | XXXX |

B. Sc. First Semester: **BOTANY**

Core Course -CCB – 01

[*Biodiversity (Microbes, Algae, Fungi and Archegoniate)*]

(Credits: Theory-3, Practicals-2)

THEORY: Lectures – 45 Hours / 68-70 Periods

Unit 1: Microbes

(09 Hours / 14 Periods)

Viruses – Discovery, general structure, multiplication, DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – General characters and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); General account of Actinomycetes; Economic importance.

Unit 2: Algae

(09 Hours / 14 Periods)

General characteristics; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: *Volvox*, *Oedogonium*, *Chara*, *Vaucheria*, *Sargassum*, *Polysiphonia*. General account of Cyanobacteria; Economic importance of algae

Unit 3: Fungi

(09 Hours / 14 Periods)

General characteristics, range of thallus organization, nutrition, reproduction and classification; life cycle of *Rhizopus*, *Penicillium*, *Puccinia*, *Agaricus*, *Alternaria* & *Colletotrichum*; Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

Unit 4: Amphibious and Early land plants (09 Hours / 14 Periods)

Bryophytes: General characteristics, adaptations to land habit, Classification, Range of thallus organization. Morphology, anatomy and reproduction of *Riccia*, *Marchantia*, *Anthoceros* and *Funaria* (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of *Sphagnum*.

Basic concept and types of fossil; modern techniques; Early land plants (*Rhynia* & *Cooksonia*)

Unit 5: Pteridophytes and Gymnosperms (09 Hours / 14 Periods)

Pteridophytes: General characteristics, classification, concept of heterospory, seed habit and stelar evolution. Morphology, anatomy and reproduction of *Lycopodium*, *Selaginella* and *Equisetum* (Developmental details not to be included).

Gymnosperms: General characteristics, classification. Classification, morphology, anatomy and reproduction of *Cycas* and *Pinus*. (Developmental details not to be included).

Economic importance of Gymnosperms.

Practical: Lab work (2 Credits=30 Hours /45 Periods)

Suggested Readings

1. Kumar, H.D. (1999). Introductory phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.

Core Course -CCB – 02

[*Cytology, Genetics and Molecular Biology*]

(Credits: Theory-3, Practicals-2)

THEORY: Lectures – 45 Hours / 68-70 Periods

Unit 1: Cytology: Plant cell structure(09 Hours/ 14 Periods)

The Cell Theory; Prokaryotic and eukaryotic cells; Cell size and shape; Ultra structure- Plant Cell components Cell Organelles – Mitochondria, Chloroplast, ER, Golgi body & Lysosomes Peroxisomes and Glyoxisomes (Structure, Function and Biogenesis). Cell Membrane and Cell Wall – Chemical composition, latest concept of structure and function.

Unit 2: Cytology: Nucleus and Cell Cycle:(09 Hours/ 14 Periods)

Nucleus: Nuclear Envelope- structure of nuclear pore complex; chromatin; molecular organization, DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure (brief). DNA as a Genetic material: Miescher, Watson and Crick Experimental evidences. Overview of Cell cycle, Mitosis and Meiosis; Molecular controls.

Unit 3: Genetics -I:(09 Hours/ 14 Periods)

Brief life history of Mendel, Terminologies; Laws of Inheritance; Modified Mendelian Ratios: 2:1-lethal Genes; 1:2:1- Co- dominance, incomplete dominance; 9:7; 9:4:3; 13:3; 12:3:1. Cytoplasmic Inheritance: Shell Coiling in Snail, Kappa particles in Paramecium, leaf variegation in *Mirabilis* Male sterility. Linkage: concept & history, complete & incomplete linkage, bridges experiment, coupling & repulsion, recombination frequency, linkage maps based on two and three factor crosses. Crossing over: concept and significance.

Unit 4: Genetics -II: Mutations and Chromosomal Aberrations:(09 Hours/ 14 Periods)

Structural chromosomal changes: Deletions, Duplications, Inversions & Translocations. Numerical chromosomal changes: Euploidy, Polyploidy and Aneuploidy; Mutation – concept and molecular basis. Types of mutations, effects of physical & chemical mutagens. Role of mutation and polyploidy in evolution.

Unit 5: Molecular biology: (09 Hours/ 14 Periods)

DNA structure, types of DNA, DNA replication (Prokaryotes and eukaryotes). Transcription (Prokaryotes and Eukaryotes); Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Translation (Prokaryotes and eukaryotes), genetic code. Regulation of gene expression: Prokaryotes: Lac operon and Tryptophan operon ; and in Eukaryotes.

Practical: Lab work (2 Credits=30 Hours /45 Periods)

Suggested Readings

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

Core Course -CCB – 03

[CHOICE BASED COURSES: Elective - E1/ E2/E3]

(Credits: Theory-3, Practicals-2)

THEORY: Lectures – 45 Hours / lectures

CHOICE BASED CORE COURSE (BOTANY) – Elective 1:

CBCCB – 03(E1)

Ethno botany and Herbal medicine

CHOICE BASED CORE COURSE (BOTANY) – Elective 2:

CBCCB – 03(E2)

Agro-services and Bio Farming

CHOICE BASED CORE COURSE (BOTANY) – Elective 3:

CBCCB – 03(E3)

Computer basic and Bioinformatics

B. Sc. Third Semester: BOTANY
Choice Based Course -CBCB – 03(E1)
[Ethnobotany and Herbal Technology]

THEORY: Lectures – 45 Hours / 68-70 Periods (Credits: Theory-3, Practicals-2)

Maximum Marks: 75

Internal assessment marks: 15 Term end examination marks: 60

Unit 1: Ethnobotany (concept and Studies):(09 Hours / 14 Periods)

Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups (Tribals of India, and their life styles). Plants used by the tribal: a) Food plants b) Intoxicants and beverages c) Resins and oils and other uses.

Methodology of Ethno-botanical studies: a) Field work b) Herbarium c) Archaeological findings d) Ancient Literature e) temples and sacred places.

Unit 2: Ethnobotany (Role in modern Medicine and Legal aspect)(09 Hours / 14 Periods)

Medico-ethnobotanical sources in India; Significance and ethno botanical practices (with habitat and morphology) i. *Azadirachta indica* ii. *Ocimum sanctum* iii. *Vitex negundo* iv. *Gloriosa superba* v. *Tribulus terrestris* vi. *Pongamia pinnata* vii. *Cassia auriculata* viii. *Indigofera tinctoria*. Role of ethnobotany in modern medicine with special example *Rauwolfia serpentina*, *Trichopus zeylanicus*, *Artemisia*, *Withania*. Role of ethnic groups in conservation of plant genetic resources. Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge.

Unit 3: Ethnobotany and Folk medicines.(09 Hours / 14 Periods)

Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.

Unit 4: Herbal medicines and Pharmacognosy (09 Hours / 14 Periods)

Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation -harvesting -processing -storage -marketing and utilization of medicinal plants. **Pharmacognosy:** systematic position medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka. Medicinal plant banks, micro propagation of important species (*Withania somnifera*, neem and tulsi- Herbal foods-future of pharmacognosy).

Unit 5: Phytochemistry and Analytical pharmacognosy (09 Hours / 14 Periods)

Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster).

Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds)

Suggested Readings:

- 1) S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
- 2) S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
- 3) S.K. Jain, 1990. Contributions of Indian ethnobotany. Scientific publishers, Jodhpur.
- 4) Colton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons –Chichester
- 5) Rama Rao, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in A. P., India. Bot. Survey of India. Howrah.
- 6) Rajiv K. Sinha – Ethnobotany The Renaissance of Traditional Herbal Medicine – INA –SHREE Publishers, Jaipur-1996
8. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
9. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH pub. Co.
10. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
11. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
12. Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan.

Practical: Lab work (2 Credits=30 Hours /45 Periods)

SESSION -2019-2020

B. Sc. Third Semester: BOTANY

Choice Based Course -CBCB – 03(E2)

[Agro-services and Organic farming]

THEORY: Lectures – 45 Hours / 68-70 Periods (Credits: Theory-3, Practicals-2)

Maximum Marks: 75

Internal assessment marks: 15 Term end examination marks: 60

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Unit 1: General Concept of Agro-services and Agro-soil : (09 Hours / 14 Periods)

Scope and importance of Agro-services in India. Land and Water resources for agriculture. Soil, classification soil formation, soil composition, physical and biological properties of soil and use pattern- a brief account, major soil types of India. Rapid tests for analysis of soil and water samples. Concept of soil productivity and fertility. Sources of water for agriculture, water harvest techniques, utilization of water for irrigation.

Unit 2: Soil Management and Irrigation (09 Hours / 14 Periods)

Concept of total and available nutrients. Soil testing and sampling; Visual diagnosis of deficiency symptoms in plants; Management practices for nutrient elements, nutrients toxicity especially minor nutrients elements. Methods of application of irrigation water and irrigation channels, surface and sub-surface irrigation method, Sprinkler and drip irrigation methods.

Unit 3: Irrigation Management: (09 Hours / 14 Periods)

Irrigation management- terminology, concept and importance towards Crop production. Water resources- surface and ground water resources. Factors affecting Water resources- climatic factors. Quality of irrigation water, management of poor quality irrigation water. Conductive use of poor and good quality water and influence of poor quality water on soil properties. Concept of irrigation scheduling Time of irrigation based on phenological stages and soil moisture status of the crop. Amount of water to be irrigated Irrigation schedules for different important crops.

Unit 4: Fertilizers and Organic Manures: (09 Hours / 14 Periods)

Macro and Micro-elements essential for plant growth. Fertilizers - importance and types (simple, complex and mixed fertilizers). Available forms of nitrogen, phosphorous and potassium in soil, types of N.P. and K. fertilizers used for increasing production of crops and fruit in the orchards. Fertilizer application techniques in the field. Importance of soil organic matter on soil humans. Organic manures and their method of application. Preparation of organic manures- composting rapid composition, phosphor compost, vermi compost. Green-manuring and biofertilisers- a general account.

Unit 5: Organic Farming: (09 Hours / 14 Periods)

Scope, definition and Concept of organic farming. Objectives of organic farming. Importance of organic farming. Component of organic farming and their role in sustainable crop production. Principles of organic farming. Organic farming in relation to soil health and quality production. Nutrient management in organic farming. Disease and pest management in organic farming. Certification and accreditation process of organic product.

Practical: Lab work (2 Credits=30 Hours /45 Periods)

Suggested Readings:

1. ICAR Handbook of Manures and Fertilizers
2. Tarnhune, R. V. Motiamani, D. P. Soils: Their Chemistry and Fertility in Bali, Y. P. and Donahue, R. L. Tropical Asia.
3. Miller, R. W. and Donahue, R. L. Soils- An introduction to soils and Plant Growth
4. Das, P. K. Introduction to Soil Science
5. Brady, N. C. The nature and properties of soil
6. Mukherjee, S. K. and Biswas, T. D. An introduction to soil science
7. Mostara, M. R. Bhattacharya, P. Biofertilizers Technology, Marketing And Srivastava, D. and usage
8. ICAR Handbook of Manures and Fertilizers
9. Subha Rao, N. S. Biofertilisers in Agriculture and Forestry
10. Tandon, H. L. S. (ed.) Fertilizers Organic Manures, Recyclable Wastes and biofertilizers
11. Tilak, K. V. B. R. Bacteria Fertilizers

SESSION -2019-2020

B. Sc. Third Semester: BOTANY

Choice Based Course -CBCB – 03(E3)

[Basic Computers and its Application]

THEORY: Lectures – 45 Hours / 68-70 Periods (Credits: Theory-3, Practicals-2)

Maximum Marks: 75

Internal assessment marks: 15 Term end examination marks: 60

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Unit 1: (09 Hours / 14 Periods)
Characteristics of computers, basic applications. Components of computer system; central processing unit, VDU, keyboard and mouse, input and output devices, computer memory, concepts of hardware and software. Concept of file, folder and directories, commonly used command.

Unit 2: (09 Hours / 14 Periods)
Number System: Binary, Octal, and Hexadecimal; Fixed and Floating Point Number Representations, Complements, Binary Arithmetic: Addition, Subtraction, Multiplication and Division, Binary Codes.

Unit 3: (09 Hours / 14 Periods)
Computer fundamentals: Basic concept of computer organization, generations of computer, basic data and information, basic data types, flow chart and basic of operating system (windows, unix), Classification of computers; mainframe computers and super computers, computer language. Introduction in MS office software concerning word processing, spreadsheets and presentation software.

Unit 4: (09 Hours / 14 Periods)
Internet & Web: internet - introduction, importance, requirements for internet, LAN, WAN, www. Electronic mailing, chatting, search engine, web pages. Application of Computers in the field of Biology

Unit 5: (09 Hours / 14 Periods)
Applications of computers; Protein structure prediction, drug designing, evaluation by ramachandran plot, domain and motifs. Cluster analysis; phylogenetic clustering by simple matching coefficient, sequence comparison

Practical: Lab work (2 Credits=30 Hours /45 Periods)

Suggested Readings:

- V Rajaraman, Fundamentals of Computers, Fourth Edition, PHI.
- Anita Goel, Fundamentals of Computers; Forthcoming title in Pearson-Education
- ❖ Note: Use of Open Office/Star Office is recommended, as they are freely downloadable.
- ❖ Reference manual for Open Office available at: <http://www.openoffice.org>
- ❖ Reference manual for Star Office available at: <http://www.sun.com/software/staroffice/>

Core Course -CCB – 04

[*Ecology and Systematic Botany*]

(Credits: Theory-3, Practicals-2)

THEORY: Lectures – 45 Hours / 68-70 Periods

Unit 1: Ecological factors and Ecosystem(09 Hours/ 14 Periods)

Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes. Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous.

Unit 2: Plant communities, Phyto geography and Pollution (09 Hours/ 14 Periods)

Community concept; community Characters – Qualitative and quantitative; Ecotone and edge effect; Succession; Processes and types.Principle of Phyto geography;Endemism; Hotspot; Phyto - geographical zones in India; Pollution –Air, Water and Soil –cause and remedies. Global warming.

Unit 3:Introduction to plant taxonomy (09 Hours/ 14 Periods)

Identification, Classification, Nomenclature. Functions of Herbarium, important herbaria and botanical gardens of the world and India. 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 (upto series), Engler and Prantl (upto series) and its merits and demerits.

Unit 4: Taxonomic description and Identification (09 Hours/ 14 Periods)

Dicotyledonous order and family – Characteristics and economic importance offollowing - Ranales (Rannunculaceae), Parietales(Brassicaceae), Malvales (Malvaceae), Geraniales (Rutaceae), Rosales (Fabaceae), Umbillales(Apiaceae),Gentianales(Apocyanaceae)Unisexuales (Euphorbiaceae), Lamiales (Lamiaceae), Astrales (Astraceae).

Unit 5: Taxonomic description and Modern taxonomy (Systematics) (09 Hours/ 14 Periods)

Monocotyledonous order and family- Characteristics and economic importance offollowing- Microspermae (Orchidaceae), Coronarieae (Lilliacae),Glumales (Cyperaceae and Poaceae).

Modern trends of taxonomy - Relation with other branches –Embryology, AnatomyBiochemistry and Cytology.

Practical: Lab work (2 Credits=30 Hours /45 Periods)

Suggested Readings

1. Kormondy, E.J. (1996). Concepts of Ecology.Prentice Hall, U.S.A. 4th edition.
 2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India.8thedition.
 3. Simpson, M.G. (2006). *Plant Systematics*.Elsevier Academic Press, San Diego, CA, U.S.A.
 4. Singh, G. (2012). *Plant Systematics: Theory and Practice*. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
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Core Course -CCB – 05

[*Anatomy, Embryology and Economic Botany*]

(Credits: Theory-3, Practicals-2)

THEORY: Lectures – 45 Hours / 68-70 Periods

Unit 1: Tissue, Organ and Apex organization (09Hours/14 Periods)

Meristematic and Permanent - Simple and complex tissues. Internal Structure of dicot and monocot root stem and leaf. Root and shoot apex organization (different theories); Special tissues. General account of adaptations in xerophytes and hydrophytes.

Unit 2: Secondary Growth and protective systems (09 Hours/14 Periods)

Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Periderm; Wood (heartwood and sapwood). Annual ring; Epidermis, cuticle, stomata; Abnormal Sec. Growth (*Achyranthus*, *Nyctanthus*, *Boerhavia*, *Bougainvillea* and *Dracaena*).

Unit 3: Flower, Pollination and fertilization (09 Hours/14 Periods)

Structure of anther and pollen; Structure and types of ovules; different types of embryo sacs, organization of mature typical embryo sac. Pollination mechanisms and adaptations; Self Incompatibility; Fertilization and Double fertilization; Endosperm types, structure and functions;

Unit 4: Embryogenesis, Apomixes and Polyembryony (09 Hours/14 Periods)

Development of embryo -Dicot and monocot embryo; Apomixes - Definition, types, causes and practical applications. Polyembryony – concept, types, causes and practical applications Seed-structure appendages and dispersal mechanisms.

Unit 5: Economic botany (09 Hours/14 Periods)

Cultivation and economic importance of popular cereals (Paddy, wheat, Maize, Barley and Jwar etc.), Pulses (Pea, Gram, Arhar, Moong, Lathyrus etc.), Vegetables (Potato, Brinjal, Tomato, Bitter Gourd, Bottle Gourds etc.) and spices (Turmeric, Ginger, Onion, Garlic, Coriander, Cardamom, Clove etc.) Plants of Chhattisgarh state. Important timber yielding plants. Common medicinal plants (Amla, Aloe, Adhathoda, Buchh, Sargandha, Tulsi etc.) used in this region.

Practical: Lab work (2 Credits=30 Hours /45 Periods)

Suggested Readings

1. Bhojwani, S.S. & Bhatnagar, S.P. (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Ltd. New Delhi. 5th edition.
2. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.
3. Pandey, B. P. (Lates Edt.). Plant Anatomy

Core Course -CCB – 06

[Plant Physiology and Biotechnology]

(Credits: Theory-3, Practicals-2)

THEORY: Lectures – 45 Hours / 68-70 Periods

Unit 1: Plant-water relations and Mineral nutrition(09 Hours/14 Periods)

Properties and Importance of water; Absorption of water; Translocation of water in plant; Transpiration and its significance; Root pressure and guttation. Essential elements, macro and micronutrients; Role of essential elements; Translocation in phloem-Pressure flow model.

Unit 2: Enzyme concept and Photosynthesis(09 Hours/14 Periods)

Enzyme – Structure, properties and classification; Mechanism of enzyme action, catalysis and enzyme inhibition. Photosynthetic apparatus, Photosystem I and II, Electron transport and Photophosphorylation; C₃, C₄ and CAM pathways of carbon fixation; Photorespiration.

Unit 3: Biological oxidation and Nitrogen metabolism(09 Hours/14 Periods)

Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate cycle; Oxidative Pentose Phosphate Pathway. Biological nitrogen fixation; Nitrate and ammonia assimilation.

Unit 4: Plant growth regulators and response to light & temperature(09 Hours/14 Periods)

Plant growth and Growth-hormones - Discovery and physiological roles of Auxins, Gibberellins, Cytokinins, ABA, Ethylene. Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Vernalization.

Unit 5: Fundamentals of Biotechnology (09 Hours/14 Periods)

Biotechnology – Means, Objectives and scope. Basic concept of Tissue culture; Gene cloning, Cloning vectors, Genomic and cDNA library. Tools, techniques and application of Recombinant DNA technology.

Practical: Lab work (2 Credits=30 Hours /45 Periods)

Suggested Readings

1. Taiz, L., Zeiger, E., (2010). Plant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.
2. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
3. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.

Laboratory work
2019-2020
(B.Sc. – I & II semester)
(CORE COURSE – CCB- 01 & 02)

TIME: 3 Hrs.

Marks – 50

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|---|----|
| 1. Gram Staining of Bacteria / Plant disease symptoms | 04 |
| 2. Algae / Fungi | 07 |
| 3. Bryophyte / Pteridophyta | 07 |
| 4. Gymnosperm ----- | 07 |
| 5. Cytology / Genetics | 05 |
| 6. Spots | 10 |
| 7. Viva – Voce | 05 |
| 8. Sessional | 05 |

Suggested Laboratory Exercises

- EMS / Models of Viruses – T phage and TMV.
- Study of different forms of Bacteria, Gram staining of Bacteria.
- Preparation of temporary slides and study of permanent slides of Algae , mention in syllabus.
- Preparation of temporary slides from culture and study of permanent slides of Fungi mention in syllabus.
- Study of Plant disease symptoms and preparation of suitable slides of infected area of mention in syllabus.
- Lichen: Study of specimens and permanent slides of Foliose, Crustose, and Fruticose Lichens.
- Mycorrhiza :Ectomycorrhiza and endomycorrhiza (photographs).
- Monographic study of Bryophytes mention in syllabus.
- External and internal structure of early land plants: Rhynia&Cooksonia (Photographs).
- Preparation of double stained temporary slides and study of permanent slides of Pteridophyta mentioned in syllabus.
- Preparation of double stained temporary slides and study of permanent slides of Gymnosperms mentioned in syllabus.
- Study different types of Plant cells.
- Techniques of different staining methods of Cell organelles.
- Study different stages of Mitosis.
- Study different stages of Meiosis.
- Exercises on Genetics (Mendelian ratios and Test crosses).
- Karyotypes of Chromosomes.
- Study of bar bodies.
- Study of Polytene Chromosomes and lampbrush chromosome.

Signature of Convener & Members, Board of Studies:

Laboratory work
(B.Sc. – III & IV Semester)
(CORE COURSE – CCB- 03 & 04)

TIME: 3 Hrs.

Marks – 25+25 = 50

| Core Course – CCB 03 ----25 marks | | CCB 04 = Choice courses(CBCB 04 E1)---25 marks | |
|---|----|---|----|
| 1. Ecological experiment | 04 | 1. Description of ethno medical plant | 04 |
| 2. Physico-chemical analysis | 04 | 2. Description of herbal medicinal plant | 04 |
| 3. Plant Description | 04 | 3. Phytochemical screening test | 04 |
| 4. Field Report (Local flora : Rainy / winter/summer season) | 04 | 4. Field report of ethno medicinal / herbal medicinal plant | 04 |
| 5. Spotting | 04 | 5. Spotting | 04 |
| 6. Viva- voce | 05 | 6. Sessional | 05 |

Suggested Laboratory Exercises (CCB- 03)

- Determination of pH, carbonates, chlorides, nitrates and sulphates of the grassland and woodland soils.
- To determine moisture content and water holding capacity of grassland and woodland soils.
- To study the vegetation structure through profile diagram.
- To estimate transparency, pH and temperature of different water bodies.
- To measure dissolved oxygen contained in polluted and unpolluted water sample.
- To estimate slightly or different water samples.
- To determine minimum number of Quadrat size for the study of herbaceous vegetation in the college campus by species area curve method.
- To study the Frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkair's Standards Frequency diagram.
- To study the Frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkair's Abundance Standards Frequency diagram.
- To study the Frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkair's density Standards Frequency diagram.
- To measure the above ground biomass in a grassland.
- To study the vegetative and floral characters of families mention in syllabus.
- Mounting of a properly dried and pressed specimen of local flora of cultivated and wild plants species included in syllabus.

Suggested Laboratory Exercises (CBCB- 04 E1)

- To study the vegetative and floral characters of ethnomedicinal plant species especially modern medicine mentioned in syllabus.
- To study the vegetative and floral characters of folk medicinal plant species especially modern medicine mentioned in syllabus.
- To study the vegetative and floral characters of herbal medicinal plant species especially modern medicine mentioned in syllabus.
- Biological testing of herbal drugs.
- Phytochemical screening test for secondary metabolite/alkaloids, phenolic compound, flavonoids, steroids, triterpenoids.
- Vegetative propagation of Ethno medicinal plants.

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Laboratory work

(B.Sc. – V & VI Semester)

[CORE COURSE – CCB- 05 & 06(Credit 2+2)]

TIME: 3 Hrs.

Marks – 50

| Sl. No. | Task Group | Pattern-A | Pattern-B |
|---------|--|-----------|-----------|
| 1 | Ecological adaptations & Anatomy | 05 | 05 + 05 |
| 2 | Embryology & Utilizations of plants | 05 | 05 + 05 |
| 3 | Physiological experiment / Biotechnology | 10 | 05 + 05 |
| 4 | Project work | 10 | 00 |
| 5 | Spotting | 10 | 10 |
| 6 | Viva-voce and Sessional | 05 + 05 | 05 + 05 |

Suggested Laboratory Exercises

- L.S of Shoot tip to study the cyto-histological zonation and origin of leaf primordial.
- Anatomy of primary and secondary growth in monocots and dicots stem using hand sections or permanent slides, structure of secondary phloem and xylem, growth rings in wood microscopic study of wood in T.S, T.L.S. and R.L.S.
- Anatomy of root , primary and secondary structure .
- External and Internal adaptation characteristic feature of xerophytic and hydrophytic plants.
- Examination of a wide range of flowers available in the locality and methods of their pollination .
- Structure of ovule and embryo sac development (using serial sections) .
- Study different types of ovule and embryo sac (using permanent slides/ photographs).
- Nuclear and cellular endosperm embryo development in monocots and dicots (using slides and dissections).
- Study morphological structure and economic importance of crop plants mentioned in syllabus.
- Field study and collection for herbarium dried specimens of crop plants mentioned in syllabus in your locality.
- To study the permeability of plasma membrane using different concentration of organic solvents.
- To study the effect of temperature on permeability of plasma membrane.
- Determining the osmotic potential of vacuoles sap by plasmolytic method.
- Determine the water potential by any tuber.
- Determine the rate of transpiration of various plant parts.
- Demonstration the rate of transpiration by four leaf method.
- Determining the rate of transpiration by different types of photometers.
- Comparison the rate of respiration of various plant parts.
- Determine the rate of plant growth by different types of auxanometer.
- Bioassay of auxin, cytokinin, QA, ABA and ethylene using appropriate plant material.
- Determine the rate of photosynthesis of various methods.
- Separation of chloroplast pigments by solvent methods .
- To study the enzyme activity of catalase and peroxides as influenced by pH and temperature.
- Demonstration of the technique of micro propagation by using different explants e.g. axillary buds, shoot meristem.
- Demonstration of the techniques of anther culture.
- Isolation of protoplast from of different tissues using commercially available enzymes.
- Demonstration of root and shoot formation from apical and basal portion of stem segments in liquid medium containing different hormones.
- Determination of osmotic potential of plant cell sap by plasmolytic method.
- Determination of water potential of given tissue (Potato tuber) by weight method .
- Study the effect of wind velocity & light on the rate of transpiration in excised twig / leaf.
- Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophytes.
- To study the effect of different concentrations of IAA or Avena coleoptile elongation.
- To study the induction of amylase activity in germinating barley grains. Chemical separation of photosynthetic pigments.
- To study the effect of light intensity, wind velocity on the rate of photosynthesis. Effect of Co₂ on the rate of photosynthesis.
- To compare the rate of respiration in different parts of a plant.

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