Curriculum Planner 2024-25
Dr. Monika Keisham
(Department of Botany, Kalindi College)

Course: B. Sc. Botany (H) 3rd Year
Semester: V
Paper: Plant Pathology (DSE)

<table>
<tr><td colspan="3">THEORY</td></tr>
<tr><td>Topic</td><td>Essential and Suggested Readings</td><td>Approximate schedule (2024)</td></tr>
<tr><td>Unit 1: Introduction 04 Hours

Definition of disease and its components (disease pyramid); Classification of diseases (on the basis of pathogens; geographical distribution; extent of occurrence); History and significance of Phytopathology (with special reference to India); Eminent plant pathologists and their contributions (Anton de Bary; E.J. Butler; Louis Pasteur; PMA Millardet; E.F. Smith; Adolf Mayer; K.C. Mehta, J.F. Dastur ; B.B. Mundkur; R.N. Tandon).

Unit 2: Basic concepts of Plant Pathology 04 Hours

Definitions (Pathogenesis; Pathogen; symptoms; etiology); Types of pathogens and their Symptoms (Fungus, Oomycetes, Bacteria, Virus, Nematode, Phytoplasma); Koch's Postulates; Disease cycle (Components) - Epidemiology and forecasting of Plant diseases.</td><td rowspan="2">Essential/ Recommended readings:
1. Singh, R.S. (2021). Plant Diseases 10th revised edition, Medtech, New Delhi.
2. Schumann, G.L. and D’Arcy C.J. (2009). Essential Plant Pathology 2nd edition, AmericanPhytopathological Society, U.S.A.
3. Agrios, G.N. (2005). Plant Pathology 5th edition, Elsevier Academic Press, Amsterdam.
4. Gupta, R. and Chugh, G. (2022). Plant, Microbes and Diseases. I.K. International Pvt. Ltd., Delhi.
5. Oliver, R. (2023). Agrios’ Plant Pathology 6th edition, Academic Press.
Suggestive readings:
1. Sharma, P.D. (2014). Plant Pathology Rastogi Publications, Meerut, U.P.
2. Ownley B.H. and Trigiano R.N. (2016. Plant</td><td>August</td></tr>
<tr><td>Unit 3: Host- -Pathogen relationship 04 Hours
How pathogens attack plants (brief concept on mode of penetration; post-penetration and colonization). Plant defence mechanisms (Constitutive and induced, structural and biochemical).

Unit 4: Fungal diseases 05 Hours
Causal Organism, Symptoms, Disease</td><td>September</td></tr>
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Cycle and control: Powdery mildew of Pea; Ergot of Rye; Apple scab, Early blight of potato, red rot of sugarcane, Black, Yellow and Brown rust of Wheat; Smut of Barley (Loose and Covered Smut).	*Pathology Concepts and Laboratory Exercises* 3rd edition, CRC Press. 3. Singh, R.S. (2017). Introduction to Principles of Plant Pathology, *5*th edition, Medtech, New Delhi. 4. Tronsmo A.M., Munk L., Anika D., Tronsmo A., Yuen J and Collinge D.B. (2020). Plant Pathology and Plant Diseases. CABI Publishing, U.S.A.	
Unit 5: Oomycete Diseases 03 Hours Causal organism, symptoms, disease cycle and control: Late Blight of Potato; White Rust of Crucifers; Downy mildew of Grapes. **Unit 6: Bacterial Diseases 01 Hours** General symptoms; Disease cycle and Control measures - Citrus canker; Angular leaf spot of Cotton. **Unit 7: Viral Diseases 01 Hours** General symptoms; Mode of transmission and Control measures-Tobacco mosaic disease; Vein Clearing of Bhindi **Unit 8: Nematode Diseases 01 Hours** General symptoms, Disease cycle and Control measures-Root knot disease of Brinjal. **Assignment topics given and assessment of submitted assignments**		October
Unit 9: Plant Disease Control 07 Hours Plant quarantine and its significance; Methods of disease control: Physical (Heat treatment, drying, radiation and regeneration); Chemical methods (foliar spray; dust, seed treatment; soil treatment; treatment of wounds). Types of fungicides - Inorganic (Bordeaux mixture, Fixed copper; Sulphur, Lime Sulphur); Organic (Dithiocarbamates, quinones); Systemic fungicides and their mode of action (Oxanthin, Strobilurins, Benzimidazole, Pyrimidine). Cultural practices (Host eradication, sanitation, crop rotation, Polythene traps, Mulches) Biological Control (Antibiosis, hyper - parasitism, Hypovirulence, Predation, Induced systemic Resistance).		November

Conduction of tests for internal assessment		

Course: B. Sc. Life Sc. (P) 3rd Year
Semester: V
Paper: Plant Physiology and Metabolism (DSC)

THEORY		
Topic	**Essential and Suggested Readings**	**Approximate schedule (2024)**
Unit 1: Plant-water relations 03 hours Water potential and its components, pathway of water movement, ascent of sap (include root pressure and guttation), transpiration and its significance, stomatal movements – only ion theory. **Unit 2: Mineral nutrition 03 hours** Classification of mineral elements: Essential elements (macro- and micronutrients) and beneficial elements, General role of essential elements, transport of ions across membrane, active and passive transport (brief account of carriers, channels and pumps). **Unit 3: Translocation in phloem 02 hours** Composition of phloem sap, girdling experiments, Pressure Flow Model, phloem loading and unloading.	Suggested Readings: • Taiz, L., Zeiger, E., Moller, I. M., Murphy, A. (2018). Plant Physiology and Development, International 6th edition, Oxford University Press, Sinauer Associates, New York, USA. • Bajracharya, D. (1999). Experiments in Plant Physiology: A Laboratory Manual, Narosa Publishing House, New Delhi. • Hopkins, W. G., Huner, N. P. A. (2009). Introduction to Plant Physiology, 4th edition, Wiley India Pvt. Ltd, New Delhi. Additional Resources: ● Jones, R.,Ougham, H., Thomas,H.,Waaland, S. (2013). *The molecular life of plants.* Chichester, England: Wiley-Blackwell. ● Kochhar, S.L. & Gujral, S.K. 2020. Plant Physiology: Theory and Applications, 2nd Edition. Cambridge University Press, UK. ● Bhatla, S.C., Lal, M.A. (2018). *Plant Physiology, Development and Metabolism.* Singapore: Springer.	August
Unit 4: Plant growth regulators 04 hours Physiological roles and bioassays of auxins, gibberellins, cytokinins, ethylene and ABA. **Unit 5: Plant response to light and temperature 02 hours** Photoperiodism - discovery (SDP, LDP, day neutral plants), concept of florigen; phytochrome (discovery and physiological role), vernalization. **Unit 6: Enzymes 02 hours** Classification, Structure and properties, mechanism of enzyme catalysis and enzyme inhibition.		September
Unit 7: Carbon metabolism 06 hours Photosynthetic pigments (chlorophyll *a* and chlorophyll *b*, xanthophyll, carotene);		October

photosystem I and II, Light reactions (electron transport and photophosphorylation), Dark reactions: C3 pathway; C4 and CAM pathways (no chemical structures); photorespiration. Metabolite pool and exchange of metabolites, synthesis and degradation of sucrose and starch. **Unit 8: Respiration 02 hours** Basic differences in animal and plant respiration, Cyanide resistant respiration. **Assignment topics given and assessment of submitted assignments**		
Unit 9: Nitrogen metabolism 04 hours Nitrate assimilation (NR and NiR), biological nitrogen fixation in legumes (nodulation and role of dinitrogenase) Ammonia assimilation: GS-GOGAT, reductive amination and transamination. **Unit 10: Stress physiology in plants 02 hours** ROS, RNS and anti-oxidative defence strategies. **Conduction of tests for internal assessment**		November

Course: B. Sc. Life Sc. (P) 3rd Year
Semester: V
Paper: Plant Physiology and Metabolism (DSC)

PRACTICAL		
Topic	**Essential and Suggested Readings**	**Approximate schedule (2024)**
1. Determination of osmotic potential of plant cell sap by plasmolytic method. 2. To study the effect of the environmental factor light on transpiration by excised twig. 3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.	Bajracharya, D. (1999) Experiments in Plant Physiology. A Laboratory Manual. Narosa Publishing House, New Delhi	August

4. To demonstrate Respiratory Quotient (RQ)		
5. To study the activity of catalase and study the effect of pH on the activity of enzyme. 6. To Study Hill's reaction. 7. To study the effect of light intensity on O_2 evolution in photosynthesis.		September
8. Comparison of the rate of respiration in any two parts of a plant. 9. To separate photosynthetic pigments by paper chromatography. 10. Bolting / Effect of auxins on rooting.		October
11. To demonstrate the delay of senescence by cytokinins/ effect of ethylene on fruit ripening. 12. To study the phenomenon of seed germination (effect of light and darkness). **Conduction of practical mock exam**		November

Course: B. Sc. Life Science (P) 2nd Year
Semester: III
Paper: Plant Cell and Developmental Biology (DSC)

PRACTICAL		
Topic	**Essential and Suggested Readings**	**Approximate schedule (2024)**
1. To study cytoplasmic streaming in *Hydrilla.* 2. a. Study of cell organelles through electron micrographs – nucleus, mitochondria, chloroplast, mitochondria, dictyosomes, endoplasmic reticulum b. Study of cell organelles (through permanent slides/photographs)– nucleus	Suggested Readings: 1. Beck, C.B. (2010). An Introduction to Plant Structure and Development. Second edition. Cambridge University Press, Cambridge, UK. 2. Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA	August

(Feulgen/acetocarmine staining); mitochondria (Janus green B staining); cell wall (PAS staining) 3. Study of plant cells: types of stomata (through peel mounts), trichomes, sclerenchyma, xylem (through maceration).	3. Fahn, A. (1974). Plant Anatomy. Pergamon Press, USA 4. Mauseth, J.D. (1988). Plant Anatomy. The Benjammin/Cummings Publisher, USA 5. Esau, K. (1977). Anatomy of Seed Plants. John Wiley & Sons, Inc., Delhi. Sinauer Associates, Sunderland. USA. 6. Bhojwani, S.S., Bhatnagar, S.P., Dantu, P.K. (2015). The Embryology of Angiosperms, 6th edition. New Delhi, Delhi: Vikas Publishing House. 7. Johri, B.M. (1984). Embryology of Angiosperms. Netherlands: Springer-Verlag. 8. Raghavan, V. (2000). Developmental Biology of Flowering plants. Netherlands: Springer. 9. Shivanna, K.R. (2003). Pollen Biology and Biotechnology. New Delhi, Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.	
4. Study of shoot apical meristem and root apical meristem, parenchyma, collenchyma, phloem, laticifers through permanent slides/micrographs. 5. Study organs structure through temporary preparations- a. Transverse section of dicot stem- *Helianthus/Cicer*, stem with secondary growth – *Helianthus/Cicer* etc., Transverse section of monocot stem - *Zea mays* b. Transverse section of dicot root: primary and with secondary growth- *Cicer/Vigna* etc., monocot root - *Zea mays* c. Vertical section of dicot and monocot leaf 6. Study anomalous secondary growth through permanent slides/photomicrographs: *Salvadora/ Bignonia, Dracaena*		September
7. Study reproductive structures through photographs/ micrographs/permanent slides/specimens: a. Transverse section of anther with wall layers, secretory and amoeboid tapetum b. Microsporogenesis through micrographs of transverse section anther c. Pollen exine patterns (any four types) d. Types of ovule, associated structure (obturator, aril, caruncle) e. Mature Polygonum type of embryo sac and ultrastructure of egg apparatus 8. Study of pollen viability (TTC/FDA).		October
9. Calculation of percent pollen germination in any one medium through sitting drop culture/ /Hanging drop culture. 10. Dissection of embryo/endosperm from developing seeds.		November

Conduction of practical mock exam		

Course: B. Sc. Botany (H) 2nd Year
Semester: III
Paper: Phycology-The World of Algae (DSC)

PRACTICAL		
Topic	**Essential and Suggested Readings**	**Approximate schedule (2024)**
1. Study of algal diversity (at least five genera) in different habitats through botanical excursion and submission of digital catalogue/report of various species observed. 2. ***Nostoc*****:** Study of vegetative, reproductive structures from temporary mounts and permanent slides; Ultrastructure of Heterocyst through Electron Micrographs. 3. ***Chlamydomonas/Chlorella*****:** Study of ultrastructure through Electron Micrographs. 4. ***Volvox*****:** Study of vegetative and reproductive structures from temporary mounts and permanent slides.	Suggested Readings: 1. Bold, H.C. and Wynne, M.J. (1985). Introduction to the Algae: Structure and Reproduction, 2nd edition. Prentice-Hall International INC. 2. Kumar, H.D. (1999). Introductory Phycology, 2nd edition. Affiliated East-West Press, New Delhi. 3. Lee, R.E. (2018). Phycology, 4th edition: Cambridge University Press, Cambridge. 4. Sahoo, D. and Seckbach, J. (2015). The Algae World. Springer, Dordrecht. 5. Sahoo, D. (2000).Farming the Ocean: Seaweed Cultivation and Utilization. Aravali Book International, New Delhi. Additional Resources: 1. Van den Hoek, C., Mann, D.G., Jahans H.M. (1995). Algae: An Introduction to Phycology. Cambridge University Press. 2. Sharma, O.P. (2011). Algae. Tata Mc Graw Hill Education Private Limited, New Delhi. 3. Smith, G.M. (1955). Cryptogamic Botany. Vol.1.Algae and Fungi. McGraw-Hill Book Company, New York. 4. Vashishta, B.R., Singh, V.P. and	August
5. ***Oedogonium***: Study of vegetative and reproductive structures from temporary mounts and permanent slides. 6. ***Coleochaete***: Study of vegetative and reproductive structures from temporary mounts and permanent slides. 7. ***Chara***: Study of vegetative and reproductive structures from temporary mounts, specimens and permanent slides.		September
8. ***Vaucheria***: Study of vegetative and reproductive structures from temporary mounts and permanent slides.		October

9. **Diatoms and Dinoflagellates**: Study of morphology from permanent slides/photographs (diatoms – one example each of bilateral and radial symmetry; dinoflagellates – one example and bioluminescence phenomenon). 10. ***Ectocarpus***: Study of vegetative and reproductive structures from temporary mounts and permanent slides.	Sinha, A.K. (2012). Botany for Degree Students: Algae. S Chand Publishing, New Delhi.	
11. ***Sargassum***: Study of morphology and reproductive structures from specimens, permanent slides and photographs. 12. ***Polysiphonia***/***Gracilaria***: Study of vegetative and reproductive structures from temporary mounts and permanent slides. **Conduction of practical mock exam**		November

Course: B. Sc. Botany 3rd Year
Semester: V
Paper: Floriculture (SEC)

PRACTICAL		
Topic	**Essential and Suggested Readings**	**Approximate schedule (2024)**
1. Introduction to floriculture, tools and equipments. 01 Week 2. Study of diversity in shape, size, and colour of flowers (including basic botany, nomenclature, common name and general uses). 01 Week 3. Identification and preparation of an inventory of herbaceous flowering plants, climbers, shrubs, and trees around the campus. 01 Week	Suggested Readings: 1. Randhawa, G.S., Mukhopadhyay, A. (1986). Floriculture in India. New York, NY: Allied Publishers. 2. Larson, R. A. (Ed.). (2012). Introduction to floriculture. Elsevier. Additional Resources: 1. Pal, S. L. (2019). Role of plant growth regulators in floriculture: An overview. J. Pharmacogn. Phytochem, 8, 789-796.	August
4. Study the various physico-chemical soil properties for understanding different soils/soil-types. 02 Weeks 5. Methods of preparation of floral beds, soil preparation, greenhouse design and fumigation methods. 02 Weeks		September

6. Methods of seed sowing and raising flowering plants through seeds, bulbs and through vegetative methods in planters, containers and in outdoor environments. Role of light, plant growth regulators and nutrients in blooming and flowering. 02 Weeks		
7. Bacterial and fungal diseases and pests of ornamental flowers and their management. 01 Week 8. Interior decoration methods, flower arrangements (Japanese, Western and Indian). 01 Week		October
9. Harvesting, methods to increase the shelf life of flowers, post-harvest care and marketing platforms for the floriculture industry. 02 Weeks 10. Field visit to nearby nursery/garden to understand basic aspects of Garden design. 01 Week 11. Project Report on any five flowering plants that are grown commercially, their share in the global market, methods used for selling the products and importance of the floriculture industry in job creation. 01 Week **Continuous assessment throughout the whole semester with tests, assignments etc.**		November