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STATE EDUCATION POLICY-2024-25

(SEP□2024)

BOTANY SYLLABUS

of 5th and 6th Semester

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Submitted

to

Davangere University

Davangere-577 007

Registrar
Davangere University
Shivagangotri, Davangere

Prof. M. Govindappa
Dean-Science & Technology
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The Chairman BOS
Department of Studies in Botany
Davangere University, Davanagere-577 007

Bachelor of Science (B.Sc.) Semester Scheme
Curriculum Structure for Undergraduate Programme for 2024-25

Sl. No.	Course/ Paper Code	Title of the paper	Subject Category	Teaching Hours/week	Semester End Exam.	Internal Assessment	Total Marks	Credits	Exam Duration
Semester-I									
1.	MC-I	Diversity of Microorganisms and Thallophytes	MC-T	04	80	20	100	03	3 Hours
	Practical-I	Diversity of Microorganisms and Thallophytes	MC-P	04	40	10	50	02	3 Hours
			Total	**08**	**120**	**30**	**150**	**05**	---
Semester-II									
2.	MC-II	Diversity of Non-flowering Plants	MC-T	04	80	20	100	03	3 Hours
	Practical-II	Diversity of Non-flowering Plants	MC-P	04	40	10	50	02	3 Hours
			Total	**08**	**120**	**30**	**150**	**05**	--
Semester-III									
3.	MC-III	Histology, Plant Anatomy, Embryology and Palynology	MC-T	04	80	20	100	03	3 Hours
	Practical-III	Histology, Plant Anatomy, Embryology and Palynology	MC-P	04	40	10	50	02	3 Hours
	Elective/ Optional-I*	Landscaping and Gardening	EL/OP-I	02	40	10	50	02	2 Hours
			Total	**10**	**160**	**40**	**200**	**07**	---
Semester-IV									
4.	MC-IV	Ecology and Environmental Biology	MC-T	04	80	20	100	03	3 Hours
	Practical-IV	Ecology and Environmental Biology	MC-P	04	40	10	50	02	3 Hours
	Elective/ Optional-II*	Medicinal Plants in Healthcare	EL/OP-II	02	40	10	50	02	2 Hours
			Total	**10**	**160**	**40**	**200**	**07**	---
Semester-V									
5.	MC-VA	Morphology and Systematics of Angiosperms	MC-T	04	80	20	100	03	3 Hours
	MC-VB	Plant Breeding and Biotechnology	MC-T	04	80	20	100	03	3 Hours
		Elementary Research Methodology		02	40	10	50	02	2 Hours

	Practical-V	Systematics of Angiosperms, Plant breeding and Biotechnology	MC-P	04	40	10	50	02	3 Hours
			Total	**14**	**240**	**60**	**300**	**10**	---
Semester-VI									
6.	MC-VA	Cytology and Genetics	MC-T	04	80	20	100	03	3 Hours
	MC-VB	Plant Physiology	MC-T	04	80	20	100	03	3 Hours
		Project/ Dissertation		04	40	10	50	02	2 Hours
	Practical-VI	Cytology, Genetics and Plant Physiology	MC-P	04	40	10	50	02	3 Hours
			Total	**14**	**240**	**60**	**300**	**10**	---
			Grand Total	**68**	**1040**	**260**	**1300**	**44**	

MC: Major Course, MC-T: Major Course Theory, MC-P: Major Course Practical, EL/OP: Open Elective/Optional

15/05/2018

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Subject	**Morphology and Systematics of Angiosperms**	Semester	V
		Paper	V
Number hr/week	4hours	Total hours	56
Duration of the exam	3 hours	Credits	3

Course objectives:

- To study the morphological variations & modifications in vegetative and floral plants
- To understand knowledge and plant identification
- To study the methods of identification, classification, and nomenclature of angiosperms.
- To understand the principles of nomenclature of plants

Course outcome:

After the successful completion of the course, the student will be able to:

- Understand the different systems of plant classification
- Identify, classify, and describe a plant in scientific terms, thereby, identification of plants using dichotomous keys, skill development in identification and classification of flowering plants.
- Interpret the rules of ICN in botanical nomenclature
- Recognize the importance of herbarium and digital herbarium,

Unit	Content	Hours
I	**Morphology of Angiosperms:** study of vegetative organs or external structure of forms of flowering plants (roots, stems, trichomes and leaves), Reproductive structures (flowers, inflorescence, fruits and seeds) with characteristic functions types and modifications.	14
II	**Significance of Plant Systematics:** Introduction to concepts, components and methods; taxanomic hierarchy, concept of taxa (family, genus, species) Taxanomic Evidences from palynology, cytology, phytochemistry and molecular data. Herbaria & herbarium techniques: methods of plant collection, Documentation, preparation and preservation of herbarium species, Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora;: Flora, Monographs, Journals; Keys:Single access and Multi-access importance of botanical survey of india (BSI).	14
III	**Botanical nomenclature:** Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids. **Modern trends in Taxanomy**: Brief introduction to cyto-taxonomy, chemo-taxonomy, numerical taxonomy and molecular taxonomy, DNA barcoding of plants **Systems of classification:** Major contributions of Theophrastus, Linnaeus, de Candolle, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG IV) classification.	14
IV	**Study of vegetative and floral characters of the following families**	14

	(Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Magnoliaceae, Brassicaceae, Malvaceae, Fabaceae: - (Papilionaceae, Caesalpinaceae and Mimoceae) Apiaceae, Rutaceae, Myrtaceae, Cucurbitaceae, Solanaceae, Verbinaceae, Lamiaceae, Euphorbiaceae, Rubiaceae, Apocyanaceae, Scrophulariaceae, Asteraceae, Liliaceae, Orchidaceae, Poacceae etc	

Suggested References:

1. Jain, S. K. (2010). Manual of ethnobotany (2nd rev. ed.). Scientific Publishers
2. Datta, S. C. (1989). Systematic botany. New Age International.
3. Singh, G. (2019). Plant systematics: Theory and practice (3rd ed.). CBS Publishers & Distributors Pvt. Ltd.
4. Soundar Rajan, S. (2007). College botany Vol. V, Part 1: Taxonomy and economic botany. Himalaya Publishing House.
5. Mukherjee, S. K. (2004). College botany (Vol. III). New Central Book Agency.
6. Pandey, B. P. (1999). Economic botany (5th ed.). S. Chand Publication.
7. Bhat, K. G. (2014). Flora of South Kanara: Dakshina Kannada and Udupi districts of Karnataka. Taxonomy Research Centre.
8. Bhat, K. G. (2014). Flora of Udupi. Taxonomy Research Centre.
9. Singh, V. (1981). Taxonomy of angiosperms. Rastogi Publications.
10. Kochhar, S. L. (2011). Economic botany in the tropics (4th ed.). Macmillan Publishers India Ltd.
11. Singh, (2012). Plant Systematics: Theory and Practice Oxford & IBH Pvt. Ltd., New Delhi. 3rdedition.
12. Jeffrey, C. (1982). An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge.
13. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics-A Phylogenetic Approach. Sinauer Associates Inc., U.S.A. 2nd edition.
14. Maheshwari, J.K. (1963). Flora of Delhi. CSIR, New Delhi.

Subject	**Plant Breeding and Biotechnology**	Semester	V
		Paper	VI
Number hr/week	4hours	Total hours	56
Duration of the exam	3 hours	Credits	3

Course objectives:

- To study the plant breeding techniques, methods, significance and mutation plant breeding.
- To understand the vegetative propagation and hybridization.
- To know the biotechnology and its applications and genetically modified organisms.
- To understand the different types plant tissue culture and their applications.

Course outcome:
After the successful completion of the course, the student will be able to:

- Understand the significance of plant breeding techniques, methods, significance and mutation plant breeding
- Analyze the vegetative propagation methods and their applications and hybridization techniques.
- Understand the plant biotechnology and their applications. Study also focuse on genetically modified organisms.
- Analyze the different types of plant tissue culture and applications.

Unit	Content	Hours
I	**Plant breeding**: Introduction, principles & objectives of Plant breeding. Important achievements & undesirable consequences of Plant breeding. **Methods of Plant breeding**: Mass Selection, Pure line Selection, Clonal Selection, Progeny Selection, Recurrent Selection. **Significance of Plant breeding-** Increasing in yield, resistance to disease & insect pests. Plant Breeding in producing new & improved varieties of medicinal plants & its industrial importance **Mutation Breeding:** Principles, methods, application of physical & chemical mutagens to induced genetic variation for crop improvement-heterosis & plant viguor, Breeding for disease resistance.	14
II	**Vegetative propagation**: Introduction, definition, procedure, advantages & its limitations, stock, scion, simple layering, compound layering, Gooty, Grafting & its types. **Hybridization:** Introduction, definition, objectives, technique, selection of parents, emasculation, Self-Pollination, self-pollination, cross-pollination, intraspecific & intragenic crosses with examples, pedigree analysis.	14
III	**Biotechnology:** Introduction, scope of biotechnology. A brief account of tools used in genetic engineering, recombinant DNA technology, DNA fingerprinting & its application. **Application of Biotechnology:** in agriculture, pharmaceutical & industries. **Sustainable agriculture:** Bio fertilizer, bio pesticides, bio patent, bio war,	14

	bio piracy, bio ethics & its advantages. **Genetically modified crops** : Golden rice, BT Cotton ,B T Brinjal.	
IV	**Plant tissue culture:** Introduction, history& importance of Tissue culture lab organization, Totipotency, sterilization , preparation of media & types of media. **Methods of Plant Tissue Culture:** **Callus culture**: Nutrient medium, Method, Development & Nature of callus culture & its significance. **Root Culture:** Methods, culture of roots of legumes & its significance. **Shoot tip culture & leaf culture:** Methods & its significance. **Culture of Flower:** Flower culture, Ovary & Ovule culture, Seed culture, Nucellus culture. **Embryo culture**: methods, factors influencing embryo culture, culture of embryo of root & stem parasites in absence of hosts its Significance. **Anther & Pollen Culture:** methods, factors influencing Anther & Pollen culture & its significance. **Organogenesis**: Definition, Factors influencing organogenesis & its significance. **Somatic Embryogenesis**: methods, factors influencing somatic embryogenesis & its significance. Single cell clone: methods & its significance. **Isolation of Protoplasts & Protoplast culture:** methods, isolation of protoplast from leaves, isolation of protoplast from pollen grains, protoplast culture, significance. **Protoplast fusion & Somatic hybridization:** methods, isolation of hybrids, significance.	14

Suggested References:

- Singh, B.D. (2022). Plant breeding principles & methods. 12th edition. MedTech Science press, A Division of Scientific International.
- Prakash reddy, R.V. (2026). Key note on Genetics & Plant breeding. 3rd edition. Daya publication.
- Ramandeep kaur & Baljinder singh. (2024). Manual fundamentals of Plant breeding. Akinik publications.
- Acquaah, G. (2007). Principles of Plant Genetics & Breeding. New Jearsey, U.S: Blackwell Publishing.
- Chaudhari, H.K. (1984). Elementary principles of Plant breeding. 2nd edition. New Delhi, Delhi: Oxford-IBH.
- Singh, B.D. (2005). Plant Biotechnology. 4th edition. MedTech publishers.
- Chawla, H.S. (2024). Introduction of Plant Biotechnology. 4th edition. New Delhi. Oxford-IBH.
- Roberta, H.S. (2012). Plant Tissue Culture. Techniques & Experiments. 3rd edition. Academic Pr Publishers.

- Razdan, M.K. (2021). Introduction to Plant Tissue Culture. 3rd edition. New Delhi, Delhi: Oxford-IBH.

SEMESTER-V: PRACTICAL PAPER V
MORPHOLOGY AND SYSTEMATICS OF ANGIOSPERMS & PLANT BREEDING AND BIOTECHNOLOGY
PRACTICAL SYLLABUS

Duration of practical: 4 hours

1. Morphology and types of root, stem, and leaves phyllotaxy and venation, hairs and trichomes, inflorescence and its types; aestivation. Arrangement and types of reproductive parts of flower, placentation and its types.

2. Study of vegetative and floral characters of the following families as per the availability of local specimens
Magnoliaceae-*Michalea champaca* Linn, Brassicaceae *Mustard* spp, Malvaceae *Hibiscus rosa synensis* Linn, (Fabaceae – Papilionaceae- *Clitoria turnatea* Linn, Caesalpinaceae- *Caesalpinia pulcharemia* Linn and Mimoceae-*Mimosa pudica* Linn) Apiaceae – *Coriandrum sativa* Linn, Rutaceae – Citrus spp. Myrtaceae –*Callisteman lanceolatus* Linn Spp, Cucurbitaceae *Luffa cylindrical* Raf, Solanaceae - Ashwagandha, Verbinaceae -*Vitex negundo* Linn, Lamiaceae – *Leucas aspera* Linn, Euphorbiaceae –*Croton sparsiflora* Linn, Rubiaceae - *Ixora coccinia* Linn,, Apocyanaceae –*Catharanthus roseus*, Scrophulariaceae –*Becopa moneri* Linn *i*, Asteraceae – *Tridax procumbens* Linn, Liliaceae –*Allium cepa* Linn, Orchidaceae – *Bulbophyllum* or *Dendrobium* spp, Poacceae – *Zea maize* Linn etc.

3. Isolation of DNA from onion tissue by homogenization method.

4. Preparation of synthetic media.

5. Types of Vegetative propagation: Gooty, Air layering, Grafting & its types.

6. Hybridization technique: Emasculation, bagging, pollination, production of hybrids & pollen fertility.

7. Photography: Genetically Modified crops (GMO) plants.

SEMESTER-V: PRACTICAL PAPER V
MORPHOLOGY AND SYSTEMATICS OF ANGIOSPERMS & PLANT BREEDING AND BIOTECHNOLOGY

Practical I.A.

Attendance = 05 marks	**Practical record=05 marks**

PRACTICAL QUESTION PAPAER

Time :03 Hrs Max.marks :40

Q. 1.Derive and describe the specimen "**A & B**" Taxonomically 2X4 =08marks

Q. 2.Write the floral formula and floral diagram of the given specimen **"C".** 1X5=05marks

Q: 3. Identification of plant modifications **'D, E & F'.** 3×2= 06marks.

Q: 4. Isolation of DNA from onion tissue by homogenization method **'G'.** 1×4= 04marks.

Q: 5. Preparation of Synthetic media **'H'.** 1×4= 04marks.

Q: 6. Identification & performance the technique involved in **'I'** & write on comment. 1×5= 05marks.

Q: 7. Write a critical notes on **'J'** (Gooty, Air layering, Grafting, GMO Plants). 1×3= 03marks.

Q: 8. Viva-voce 05 marks

SEMESTER-V: PRACTICAL PAPER V
MORPHOLOGY AND SYSTEMATICS OF ANGIOSPERMS & PLANT BREEDING AND BIOTECHNOLOGY
PRACTICAL EXAMINATION SCHEME OF EVALUATION

Q: 1. Derivation-01, Family and Botanical name -01, description -02 marks.	3X2=08marks
Q. 2. Floral formula- 02 and floral diagram 03	1X5=05marks
Q: 3. Identification- 01marks, information with diagram 01 marks.	3X2=06 marks
Q: 4. Preparation -02 marks & Reasons -2 marks	1×4= 04marks
Q: 5. Preparation -02 marks & Reasons -2 marks	1×4= 04marks
Q: 6. Identification -01marks, performance -02marks, reasons-02marks.	1×5= 05marks.
Q: 7. Identification – 01 marks & critical notes-02 marks.	1×3= 03marks.
Q: 8. Viva-voce	05 marks

General instructions:

Q: 1. Any local plant species.

Q: 2. Any local plant species.

Q: 3.Morphological adaptations (Root, Stem, Leaves etc).

Q: 4. Isolation of DNA from onion tissue by homogenization method

Q: 5. synthetic media preparation.

Q: 6. Hybridization technique.

Q:7. Gooty, Air layering, Grafting, GMO Plants.

Q: 8. Viva-voce

Subject	**Elementary Research Methodology**	Semester	V
		Paper	VII
Number hr/week	2hours	Total hours	32
Duration of the exam	2 hours	Credits	2

Learning Outcomes:
After the completion of this course the learner will be able to:

- Describe the basic concepts of research and its methodologies.
- Identify the appropriate research topics and set up hypothesis.
- Perform literature survey using library (print) and internet (online) sources.
- Design experiments/surveys, collect data and and represent data in table and figure forms.
- Analyze data with appropriate software tools, internet results and draw conclusions.
- Write scientific report/ review and prepare seminar/ conference presentations oral or poster.
- Understand the methods of citations and referencing styles, check plagiarism.
- Identification of lacuna (finding gap-areas), hypothesis formulation, framing objectives, and preparation of questionnaire.

Unit-1	**Scientific Methods and Research**: Concept, Definitions of research; Purpose, importance, steps levels and rigor of research; different paradigms of research. **Types of Research**: Fundamental/Applied research, Descriptive/Analytical research, Quantitative /Qualitative research, Conceptual/Empirical research, Diagnostic/Hypothesis testing research, Conclusion oriented/Decision oriented research, Theoretical / Action research, Longitudinal /Cross sectional research **Research Question**: Introduction, types and identification; ***Research Problem***: Definition, identification of problem, ways of understanding problem, criteria of a good problem, guidelines for selecting meaningful problem; ***Research Objective:*** Definition, broad and specific objectives, goals; **Research Hypothesis**: Meaning of research hypothesis, sources of hypothesis, qualities of workable hypothesis, utilities of hypothesis;	8 h
Unit-2	**Introduction and review of sampling**: Definition, needs, steps; Definitions of population, sample, sampling unit, sampling frame, sampling error and non sampling error; Steps in sampling; Fundamentals, characteristics, advantages and disadvantages of sampling. **Types of sampling**: Probability (simple, stratified, systematic , cluster and multistage –in brief), Process of selecting random sample; non probability sampling (convenience, purposive, quota, snowball, self selecting); Advantages and disadvantages (brief discuss only) **Size of sample**: Factor affecting size of sample, Testing the reliability of sample, Methods of estimating sample size, Process of selecting random sample	8 h
Unit-3	**Designing of research work**: Introduction, Purposes, Characteristics of a research design, Principles of designing a research, conceptual framework and its operationalization, Sectors of research design, Research methods as	8 h

	research designing, similarities and differences between Research design and research method. **Conventional research method**: Principle and Importance conventional methods, Scientific methods as conventional methods, Characteristic of a scientific method; Aspects of scientific Method, Evolution of scientific Studies Steps in scientific methods,	
Unit-4	**Historical Research Method**: Nature and Steps in Historical method, Importance and fundamentals of Historical method, Sources of Historical data, Limitations. **Experimental Research Method**: Introduction, Types of experiments, steps in experimental research, Problems in experimentation; Ex-post facto research: definition and technique. **Survey Research Method**: Introduction, and Importance of survey method, Comparison of survey method with other methods; Objectives of social and survey and technical survey, types of social and technical survey, Steps in social and technical surveys, Pilot survey **Case study**: Introduction, Types of case studies: Exploratory and Hypothesis testing; Steps in case studies, Sources of case data, limitations. **Analysis of data**- introduction, data analysis tools. Project time line, literature review and references, research report structure, plagiarism.	8 h

GENERAL PATTERN OF THEORY QUESTION PAPER

Fifth Semester B. Sc., Degree Examination
(SEP: Semester Scheme-2024-25 Syllabus)
BOTANY
Paper- V: Morphology and Systematics of Angiosperms

Time : 3 Hours Max. Marks: 80

Note: 1) All parts are compulsory
2) Draw labeled diagrams wherever necessary
3) Section-A questions should be answered in first three pages

SECTION-A

1. Answer ALL the following questions. **(10x2=20)**

a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

SECTION-B

Answer any SIX of the following **(6x5=30)**

2.
3.
4.
5.
6.
7.
8.
9.

SECTION-C

Answer any THREE of the following **(3x10=30)**

10.
11.
12.
13.

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Subject	**Cytology and Genetics**	Semester	VI
		Paper	VIII
Number hr/week	4hours	Total hours	56
Duration of the exam	3 hours	Credits	3

Course objectives:

- To study the structure and functions of a cell and its organelles.
- To understand cell division and plant growth
- To know the inheritance in plants
- To understand the principles of linkage and crossing over

Course outcome:
After the successful completion of the course, the student will be able to:

- Understand the significance of a cell and its organelles
- Distinguish the two types of cell division and its role in plants growth and development.
- Understand and apply the principles of Mendelian genetics and its extensions to analyze inheritance patterns, genetic crosses, gene interactions and cytoplasmic inheritance.
- Realize the principles of linkage and crossing over, analyze recombination frequencies and construct and interpret chromosome maps using genetic crosses.

Unit	Content	Hours
	Cytology	
I	**Cell Structure and Function:** A study of the internal organization of the eukaryotic plant cell; Cell wall: organization and functions. Cell membranes: structure and functions (Fluid Mosaic Model). Cell Organelles: Structure and functions of Endoplasmic Reticulum, Golgi apparatus, Lysosomes, Peroxisomes, Ribosomes, Mitochondria, Plastids, Vacuole and cell sap. Cytoplasm and Non-living inclusions (ergastic substances). Nucleus – structure and functions, nuclear membrane and nuclear pores, nucleoplasm and nucleolus.	14
II	**Cell Communication, Cell Cycle and Cell Division:** Cell communication and cell interactions: Cell–cell signaling, cell movement and cell adhesion, extracellular matrix, various types of cell–cell interactions and junctions, pit connections. The cell cycle and its regulation: Phases of the eukaryotic cell cycle and regulation of the cell cycle: checkpoints and role of protein kinases. Cell Division: Mitosis in plant cells: karyokinesis and cytokinesis; Meiosis in plant cells, Significance of mitosis and meiosis. Cell Death and Cancer Biology: Programmed Cell Death (Apoptosis), elementary understanding of development and causes of cancer.	14
	Genetics	
III	**Mendelian genetics and its extension**: History, principles / laws of inheritance-Law of dominance, law of segregation, law of independent	14

	assortment. Mendelian crosses and genetic analysis: Monohybrid cross and monohybrid test cross- Di hybrid cross and di hybrid test cross, tri hybrid crosses. Chromosome theory of inheritance; Autosomes and sex chromosomes. Patterns and modifications of Mendelian inheritance: Dominant and recessive traits, incomplete dominance and co dominance, multiple alleles, lethal alleles, gene interactions; epistasis and pleiotropy, penetrance and expressivity and polygenic inheritance.	
IV	**Linkage, crossing over and chromosome mapping:** Linkage and crossing over-Cytological basis of crossing over; Recombination frequency,two factor and three factor crosses; Interference and coincidence; Numerical based on genemapping. Sex Linkage: Inheritance of sex-linked traits. Variation in chromosome number and structure: Gene mutations Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation. Types and significance of DNA repair mechanisms.	14

Suggested References

- Cooper, G.M., Hausman, R.E. (2009). The Cell: A Molecular Approach, 5th edition. Washington, D.C.:ASM Press & Sunderland, Sinauer Associates, MA
- Karp, G. (2010). Cell Biology, 6th edition. New Jersey, U.S.A.: John Wiley & Sons.
- De Robertis, E. D. P. and De Robertis R. E. (2009). Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia.
- Becker W. M., Kleinsmith L.J. and Bertni G. P. (2009). The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Fransisco.
- Reven, F.H., Evert, R.F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H.Freeman and Company.
- Alberts, B., Bray, D., Hopkin, K., Johnson, A. D., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2013).Essential cell biology (4th ed.). Garland Publishing.
- Raven, F.H., Evert, R. F., Eichhorn, S.E. (1992).Biology of Plants. New York, NY: W.H. Freeman and Co.
- Verma, P. S. (2004). Cell Biology, Genetics, Molecular Biology: Evolution and Ecology. India: S. Chand Limited.

Subject	**Plant Physiology**	Semester	VI
		Paper	IX
Number hr/week	4hours	Total hours	56
Duration of the exam	3 hours	Credits	3

Course objectives:

- To understand the various physiological life processes in plants
- To study the importance of the physiological processes and their mechanism
- To study the role of various metabolites and their importance

Course outcome: **After the successful completion of the course, the student will be able to:**

- Compare the various metabolic activities taking place in plants.
- Evaluate the various factors affecting the plant activities.

Unit	Content	Hours
I	**Plant-water relations:** Properties of water, Concepts of imbibition, Diffusion and Osmosis, Water Potential and its components, water absorption by roots, aquaporins, Plasmolysis and Deplasmolysis, the pathways of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap–cohesion-tension theory.Transpiration and factors affecting transpiration, antitranspirants, and mechanism of stomatal movement-(starch hydrolysis theory and proton concept).	14
II	**Mineral nutrition & nutrient Uptake:** Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents. Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, Donnan membrane equilibrium, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.	14
III	**Carbon assimilation & metabolism:** Photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO_2 reduction, photorespiration, C3 & C4-pathways; Crassulacean acid metabolism; Factors affecting CO2 reduction. Respiration: aerobic and anaerobic, glycolysis and Krebs cycle and oxidative photophosphorylation, **Fat metabolism** - General account of fats, synthesis of glycerol, synthesis of fatty acids, and condensation of fatty acid and glycerol, fat degradation, β (Beta) - oxidation, glyoxylate cycle and its significance, plant waxes.	14
IV	**Plant movement**: Nastic movements – nyctinasty, chemo nasty and seismonasty. Tropic movements –phototropic, hydrotropic, geotropic and thigmotropic. Brief account of seed dormancy: Causes and breaking of seed dormancy **Plant growth regulators:** Discovery, chemical nature	14

	(basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid. **Physiology of flowering:** Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy. Phytochrome, crytochromes and phototropins: Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.	

Suggested References

1. Wilson, K. and Walker, J. 1994. Fundamentals of Biochemistry 2nd Ed, John Wiley and Sons Inc.
2. JainV K, 2008. Fundamentals of Plant Physiology. S Chand and Co.
3. Kochhar P L, Krishnamoorthy H N. Plant Physiology. Atmaram and sons, Delhi.
4. Kumar and Purohit. Plant Physiology: Fundementals and Applications. Agrobotanical Publishers.
5. Malik CP, 2002. Plant Physiology. Kalyani publishers.
6. Mukherjii S, Ghosh AK, 2005. Plant Physiology. New Central Book Agency, Calcutta.
7. Noggle GR, Fritz GJ, Introductory Plant Physiology. Prentice Hall of India.
8. Pandey SN, Sinha BK, 2006. Plant Physiology. Vikas Publishing House, New Delhi.
9. Salisbury F B, Ross C W, 1992. Plant Physiology. CBS publishers and Distributers, New Delhi.
10. Verma V, 2007. Text book of plant physiology, Ane books India.
11. Taiz, L. and Zeiger, E., Plant Physiology, 5th edition (Sinauer Associates, USA, 2012).
12. 13. Lambers, H. and Chapin, F. S., Plant Physiological Ecology (Springer, 2000).
14. Mukherji, S. and Ghosh, A.K., Plant Physiology, 1st edition (New Central Book Agency Private Ltd. Kolkata, 2009).

SEMESTER-VI: PRACTICAL PAPER VI
CYTOLOGY AND GENETICS & PLANT PHYSIOLOGY
PRACTICAL SYLLABUS

Duration of practical: 4 hours

1. Study of cell and its organelles with the help of electron micrographs.
2. Study different stages of mitosis and meiosis (Onion/ Rhoeo/ Crinum)
3. Study of different stages of Mitosis & Meiosis (From Permanent Slides)
4. Solve the genetic problems from the given list
    a. Di hybrid Cross (9:3:3:1)
    b. Incomplete Dominance (1:2:1)
    c. Epistasis (12:3:1)
    d. Complementary gene interaction (9:7)
5. Determination of water potential by tissue (potato tuber) by weight method.
6. Demonstration of imbibition pressure using germinating seeds
7. Photographs- Heliotropism, geotropism and hydrotropism

SEMESTER-V: PRACTICAL PAPER VI
CYTOLOGY AND GENETICS AND PLANT PHYSIOLOGY

Practical I.A.

Attendance = 05 marks	**Practical record=05 marks**

PRACTICAL QUESTION PAPAER

Time =03 hrs Marks =40

1. Prepare squash of material '**A**', identify, Sketch and label the stages with reasons. 08 marks
2. Identify the slides **'B'** and **'C'**(one from mitosis and one from meiosis) 06 marks
3. Solve the genetic problem **'D'** 04 marks
4. Conduct Major Experiment **"E"** write the principle, procedure and comment on results 10 marks
5. Conduct minor experiments '**F**' write the procedure and comment on results 05 marks
6. Photographs: **'G'** Geotropism, Heliotropism 02 marks
7. Viva-voce 05 marks

General instructions:

Q1. Give specimen from Onion root tip/ Onion/ Rhoeo flower bud (A)
Q2. Give slide from mitosis (B) meiosis (C)
Q3. Genetic problems (D)
Q4. Give the specimen of potato tubers (E)
Q5. Give fresh flower buds and germinating seeds (F)
Q6. Give instruments (G)
Q7. Viva-voce-

SEMESTER-VI: PRACTICAL PAPER VI
CYTOLOGY AND GENETICS & PLANT PHYSIOLOGY
PRACTICAL EXAMINATION SCHEME OF EVALUATION

Duration: 3 hrs Marks - 40

1. Prepare squash of material **'A'** Identify, sketch, label the stages with reasons. -08 Marks
   Preparation=04 marks
   Identification with reasons=02 marks
   Sketch & label=02 marks

2. Identify the slides **'B'** and **'C'** (one from mitosis and one from meiosis) -06 Marks
   Identification =01 marks, reason=01 marks
   Sketch & label=01 marks

3. Solve the genetic problem **'D'** -04 Marks

Di hybrid/ incomplete dominance/ Epistasis/ Complementary gene interaction/ crossing over

Q.4.Conduct Major Experiment **"E"** write the principle, procedure and comment on results

Requirements – 01 Principle -01 Sketch-01 Procedure-02 Setting-04 Results and Inference-01 = 10marks

Q.5.Conduct minor experiments **'F'** write the procedure and comment on results
Procedure -02 Sketch -01 Results and Inference 02

Q.6. Identification 01 and explanations 01

Q.7. Viva-voce- 05 marks

GENERAL PATTERN OF THEORY QUESTION PAPER

Sixth Semester B. Sc., Degree Examination
(SEP: Semester Scheme-2024-25 Syllabus)
BOTANY
Paper- VIII: Plant Physiology

Time : 3 Hours Max. Marks: 80

Note: 1) All parts are compulsory
2) Draw labeled diagrams wherever necessary
3) Section-A questions
should be answered in first three pages

SECTION-A

1. Answer ALL the following questions. **(10x2=20)**

a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

SECTION-B

Answer any SIX of the following **(6x5=30)**

2.
3.
4.
5.
6.
7.
8.
9.

SECTION-C

Answer any THREE of the following **(3x10=30)**

10.
11.
12.
13.

The Chairman - BOS
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