SRI VENKATESWARA UNIVERSITY
B.Sc. DEGREE COURSE IN BOTANY
SEMESTER SYSTEM WITH CBCS
SEMESTER IV
W.E.F. 2021-2022

Core Course-4-Plant Physiology and Metabolism

(Total hours of teaching – 60 @ 04 Hrs/ Week)

Theory:

Learning outcomes:

On successful completion of this course, the students will be able to:

- Comprehend the importance of water in plant life and mechanisms for transport of water and solutes in plants.
- Evaluate the role of minerals in plant nutrition and their deficiency symptoms.
- Interpret the role of enzymes in plant metabolism.
- Critically understand the light reactions and carbon assimilation processes responsible for synthesis of food in plants.
- Analyze the biochemical reactions in relation to Nitrogen and lipid metabolisms.
- Evaluate the physiological factors that regulate growth and development in plants.
- Examine the role of light on flowering and explain physiology of plants under stress conditions.

Unit -1: Plant-Water relations **10 Hrs.**

1. Importance of water to plant life: physical properties of water, diffusion, imbibition, osmosis. Water potential, osmotic potential, pressure potential.
2. Absorption and lateral transport of water: Ascent of sap.
3. Transpiration: structure of stomata and mechanism of stomata movements (K^+ ion flux).
4. Mechanism of phloem transport: Pressure Flow Hypothesis.

Unit - 2: Mineral nutrition, Enzymes and Respiration 14 Hrs.

1. Essential macro and micro mineral nutrients and their role in plants: symptoms of mineral deficiency.
2. Absorption of mineral ions: passive and active processes.
3. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.
4. Respiration: Aerobic and Anaerobic,Glycolysis, Krebs cycle, electron transport system, mechanism of oxidative phosphorylation, Pentose Phosphate Pathway (HMP shunt).

Unit - 3: Photosynthesis and Photorespiration 12 Hrs.

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra, Red drop and Emerson enhancement effect.
2. Structure of two photosystems: mechanism of photosynthetic electron transport and evolution of oxygen, photophosphorylation.
3. Carbon assimilation pathways: C3 cycle, C4 cycle and CAM pathway.
4. Photorespiration - C2 pathway.

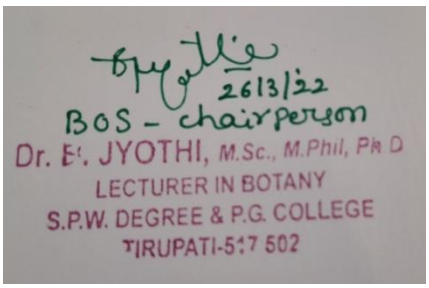
Unit - 4: Nitrogen and lipid metabolism 12 Hrs.

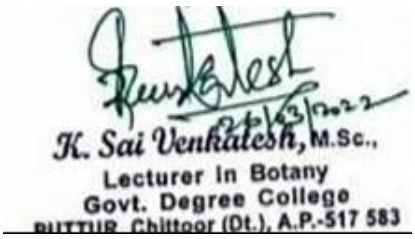
1. Nitrogen metabolism: Biological nitrogen fixation - asymbiotic and symbiotic nitrogen fixing organisms. Nitrogenase enzyme system.
2. Lipid metabolism:Classification of plant lipids, saturated and unsaturated fatty acids.
3. Anabolism of triglycerides, β-oxidation of fatty acids, Glyoxylate cycle.

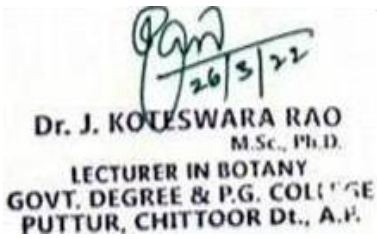
Unit - 5: Plant growth - development and stress physiology 12 Hrs.

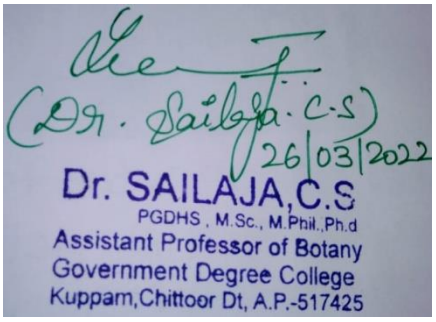
1. Growth and Development: Definition, phases and kinetics of growth.
2. Physiological effects of Plant Growth Regulators (PGRs) - auxins, gibberellins,cytokinins, ABA, ethylene and brassinosteroids.
3. Physiology of flowering: Photoperiodism, role of phytochromes in flowering.

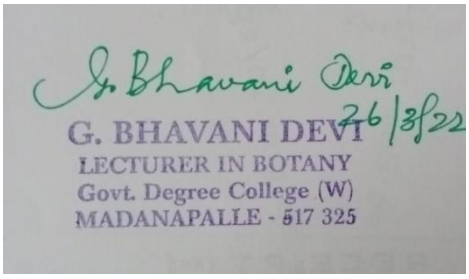
4. Seed Dormancy:Importance, types and causes, methods of breaking seed dormancy.Seed germination and senescence.

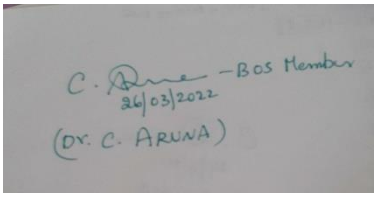












Text books:

- Botany – IV (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-III,* S. Chand Publishing, New Delhi
- Ghosh, A. K., K. Bhattacharya &G. Hait (2011) *A Text Book of Botany, Volume-III,* New Central Book Agency Pvt. Ltd., Kolkata.

Books for Reference:

- Aravind Kumar & S.S. Purohit (1998) *Plant Physiology – Fundamentals and Applications,*AgroBotanica, Bikaner
- Datta, S.C. (2007) *Plant Physiology,*New Age International (P) Ltd., Publishers,New Delhi
- Hans Mohr & P. Schopfer (2006)*Plant Physiology*, Springer (India) Pvt. Ltd., New Delhi
- Hans-Walter heldt (2005) *Plant Biochemistry,*Academic Press, U.S.A.
- Hopkins, W.G. & N.P.A. Huner (2014)*Introduction to Plant Physiology,* Wiley India Pvt. Ltd., New Delhi

- Noggle Ray & J. Fritz (2013)*Introductory Plant Physiology*, Prentice Hall (India),New Delhi
- Pandey, S.M. &B.K.Sinha (2006)*Plant Physiology*, Vikas Publishing House, NewDelhi
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- Sinha, R.K. (2014) *Modern Plant Physiology*, Narosa Publishing House,New Delhi
- Taiz, L.&E. Zeiger (2003)*Plant Physiology*, Panima Publishers, New Delhi
- Verma, V.(2007)*Text Book of Plant Physiology,* Ane Books India, New Delhi

SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN BOTANY

IV SEMESTER - W.E.F. 2021-22

Botany Core Course - 4-Plant Physiology and Metabolism

MODEL QUESTION PAPER

Time: 3 hours Marks: 75 marks

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.
Part B consists of 5 Units. Answer one full question (A or B) from each unit (i.e., Q.No 9 from Unit – I, Q.No 10 from Unit – II, Q.No 11 from Unit – III, Q.No 12 from Unit – IV, Q.No 13 from Unit – V). Each question carries 10 marks.

PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
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(P.T.O)

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

	(A) OR (B)
	(A) OR (B)
	(A) OR (B)
	(A) OR (B)
	(A) OR (B)

SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN BOTANY
SEMESTER SYSTEM WITH CBCS
SEMESTER IV
W.E.F. 2021-2022

Core Course –5 Cell Biology, Genetics and Plant Breeding

(Total hours of teaching – 60 @ 04 Hrs/Week)

Theory:

Learning outcomes:

On successful completion of this course, the students will be able to:

- Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
- Explain the organization of a eukaryotic chromosome and the structure of genetic material.
- Demonstrate techniques to observe the cell and its components under a microscope.
- Discuss the basics of Mendelian genetics, its variations and interpret inheritanceof traits in living beings.
- Elucidate the role of extra-chromosomal genetic material for inheritance of characters.
- Evaluate the structure, function and regulation of genetic material.
- Understand the application of principles and modern techniques in plant breeding.
- Explain the procedures of selection and hybridization for improvement of crops.

Unit - 1: The Cell **12 Hrs.**

1. Cell theory: prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra-structure of a plant cell.
2. Ultra-structure of a cell wall.
3. Ultra-structure of plasma membrane and various theories on its organization. Functions of Plasma membrane with special reference to transportation.
4. Polymorphic cell organelles (Plastids): ultra structure of chloroplast. Plastid DNA.

Unit - 2: Chromosomes **12 Hrs.**

1. Prokaryotic vs eukaryotic chromosome. Morphology of a eukaryotic chromosome.
2. Euchromatin and Heterochromatin; Karyotype and ideogram.
3. Brief account of chromosomal aberrations - structural and numerical changes.
4. Organization of DNA in a chromosome (solenoid and nucleosome models).

Unit - 3: Structure and functions of DNA 12 Hrs.

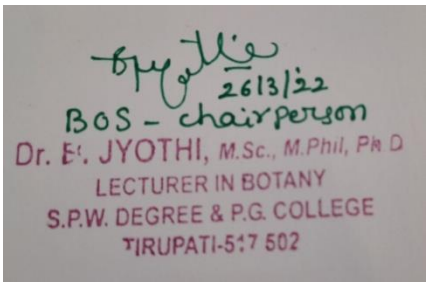
1. Watson and Crick model of DNA. Brief account on DNA Replication (Semi-conservative method).
2. Brief account on Transcription, types and functions of RNA. Gene concept, genetic code and Translation.
3. Regulation of gene expression in prokaryotes - Lac Operon.

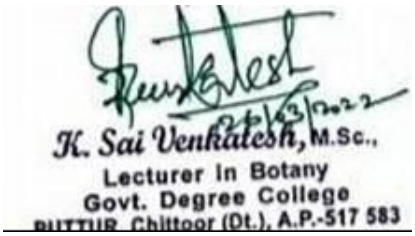
Unit - 4: Mendelian and Non-Mendelian genetics 14Hrs.

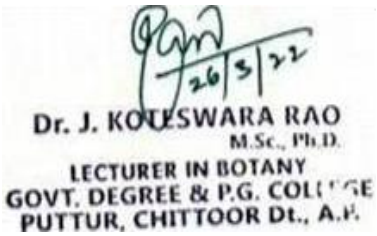
1. Mendel's laws of inheritance. Incomplete dominance and co-dominance, Multiple allelism.
2. Complementary, supplementary and duplicate gene interactions (plant based examples are to be dealt).
3. A brief account of linkage and crossing over: Chromosomal mapping - 2 point and 3 point test cross.
4. Concept of maternal inheritance (Corren's experiment on *Mirabilis jalapa*): Mitochondrial DNA.

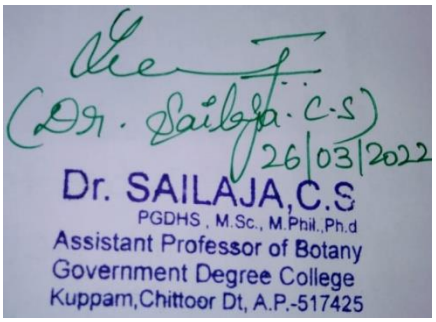
Unit - 5: Plant Breeding 12 Hrs.

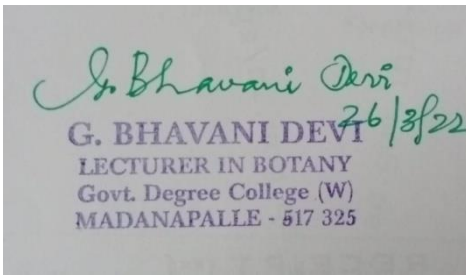
1. Plant Breeding and its scope: Genetic basis for plant breeding. Plant Introduction and acclimatization.
2. Definition, procedure, applications and uses, advantages and limitations of (a) Mass selection (b) Pure line selection and (c) Clonal selection.
3. Hybridization – Types and technique: Heterosis (hybrid vigour).
4. A brief account on Molecular breeding - DNA markers in plant breeding. RAPD, RFLP.

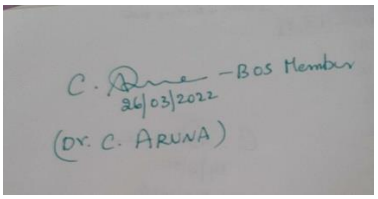












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- P. K. Gupta (2002)*Cell and Molecular biology,*Rastogi Publications, New Delhi
- B. D. Singh (2008) *Genetics,*Kalyani Publishers, Ludhiana
- A.V.S.S. Sambamurty (2007) *Molecular Genetics,*Narosa Publishing House,NewDelhi
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Education, Inc., New York

- De Robertis, E.D.P. & E.M.F. De Robertis Jr. (2002)*Cell and Molecular Biology,* Lippincott Williams & Wilkins Publ., Philadelphia
- Robert H. Tamarin (2002)*Principles of Genetics,*Tata McGraw –Hill Publishing Company Limited, New Delhi.
- Gardner, E.J., M. J. Simmons & D.P. Snustad (2004)*Principles of Genetics,* JohnWiley & Sons Inc., New York
- Micklos, D.A., G.A. Freyer& D.A. Cotty (2005) *DNA Science: A First Course,* I.K. International Pvt. Ltd., New Delhi
- Chaudhari, H.K.(1983)*Elementary Principles of Plant Breeding*, TMHpublishersCo., New Delhi
- Sharma, J.R. (1994)*Principles and Practice of Plant Breeding*, Tata McGraw-HillPublishers, New Delhi
- Singh,B.D. (2001)*Plant Breeding : Principles and Methods* ,Kalyani Publishers, Ludhiana Pundhan Singh (2015) *Plant Breeding for Undergraduate Students,* KalyaniPublishers, Ludhiana.
- Gupta, S.K. (2010)*Plant Breeding : Theory and Techniques,*Agrobios (India), Jodhpur
- Hayes, H.K., F.R. Immer& D.C. Smith (2009) *Methods of Plant Breeding,*BiotechBooks, Delhi.

SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN BOTANY

IV SEMESTER - W.E.F. 2021-22

PAPER-V Core Course - Cell Biology, Genetics and Plant Breeding

MODEL QUESTION PAPER

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PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
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(P.T.O)

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

9.	(A) OR (B)
10.	(A) OR (B)
11.	(A) OR (B)
12.	(A) OR (B)
13.	(A) OR (B)