ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

IV SEMESTER **BOTANY** TIME: 4Hrs/WEEK

B 4104(3) **CELL BIOLOGY, GENETICS AND PLANT BREEDING Max** MARKS: 100

w.e.f. 20AH **SYLLABUS**

**OBJECTIVES**: To be able to

* Understand the ultra-structure of plant cell, and cell organelles
* Understand the ultra-structure of plant cell, nucleus chromosomes
* Understand and comprehend the basic principles of heredity
* Acquire the knowledge on the important insights of molecular biology.
* Knowledge is gained on the concepts, methods and recent trends of Plant Breeding

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

CO 1: Distinguish prokaryotic and eukaryotic cells and design the model of a cell.

CO2: Explain the organization of a eukaryotic chromosomeand the structure of geneticmaterial.

CO3: Discuss the basics of Mendelian genetics, its variations,role of extra-chromosomal genetic material and interpretinheritanceoftraits in livingbeings.

CO 4: Evaluate the structure, function and regulation of genetic material.

CO5: Understand the application of principles and modern techniques in plant breeding.

CO 6: Explain the procedures of selection and hybridization for improvement of crops.

# UNIT– I: THECELL

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra-structure of a plant cell.
2. Ultra-structureofcellwall.
3. Ultra-structureofplasma membraneandvarioustheoriesonitsorganization.
4. Polymorphic cell organelles (Plastids); ultra structure of chloroplast. Plastid DNA.

# UNIT–II: CHROMOSOMES

1. Prokaryotic eukaryotic chromosome. Morphology of a eukaryotic chromosome.
2. Euchromatin and Hetero chromatin; Karyo type and ideogram.
3. Brief account of chromosomal aberrations-structural and numerical changes
4. Organization of DNA in a chromosome(solenoid and nucleo some

# UNIT–III: MENDELIAN AND NON-MENDELIAN GENETICS

1. Mendel’s laws of inheritance. Incomplete dominance and co-dominance; Multipleallelism.
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 Mirabilisjalapa);Mitochondrial DNA.

# UNIT–IV: STRUCTURE AND FUNCTIONS OF DNA

1. Wats on 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 and genetic code and Translation.
3. Regulationof geneexpressioninprokaryotes- LacOperon.

# UNIT–V: PLANT BREEDING

1. Plant Breeding and its scope; Genetic basis for plant breeding. Plant Introductionandacclimatization.
2. Definition, procedure; applications and uses; advantages and limitations of :(a)Massselection, (b)Purelineselectionand (c) Clonal selection.
3. Hybridization–schemes, and technique; Heterosis (hybridvigour).
4. A brief account on Molecular breeding – DNA markers in plant breeding. RAPD,RFLP.

# TEXTBOOKS:

* 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
* Chaudhary, R. C. (1996) Introduction to Plant Breeding, Oxford & IBH Publishing Co. Pvt.Ltd.,New Delhi

# REFERENCE BOOKS:

* S. C. Rastogi (2008)Cell Biology,New Age International (P) Ltd. Publishers, NewDelhi
* P.K.Gupta(2002)CellandMolecularbiology,RastogiPublications,New Delhi
* B.D.Singh (2008)Genetics,KalyaniPublishers,Ludhiana
* A.V.S.S.Sambamurty(2007)MolecularGenetics,NarosaPublishingHouse,NewDelhi
* Cooper, G.M. & R.E. Hausman (2009)The Cell – A Molecular Approach, A.S.M.Press,Washington
* Becker, W.M., L.J. Kleinsmith& J. Hardin (2007)The World of Cell, PearsonEducation,Inc., New York
* DeRobertis, E.D.P. &E.M.F. DeRobertis Jr.(2002)Cell and MolecularBiology,
  + - LippincottWilliams&WilkinsPubl.,Philadelphia
* Robert H. Tamarin (2002)Principles of Genetics,Tata McGraw –Hill PublishingCompanyLimited, NewDelhi.
* Gardner, E.J., M. J. Simmons & D.P. Snustad (2004)Principles of Genetics, JohnWiley&SonsInc.,NewYork
* Micklos, D.A., G.A.Freyer& D.A. Cotty(2005) DNA Science: A First Course,
  + - I.K.
    - InternationalPvt. Ltd.,NewDelhi
* Chaudhari,H.K.(1983)ElementaryPrinciplesofPlantBreeding,TMHpublishersCo.,NewDelhi
* 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, Biotech Books, Delhi.

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