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

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

B 4104(3) **CELL BIOLOGY, GENETICS AND PLANT BREEDING**  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 chromosome and the structure of genetic material.

CO3: Discuss the basics of Mendeli an genetics, its variations, role of extra-chromosomal genetic material and interpret in heritance traits in living beings.

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

CO5: Understandtheapplicationofprinciplesandmoderntechniquesinplantbreeding.

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 aplantcell.
2. Ultra-structure of cell wall.
3. Ultra-structure of plasma membrane and various theories on its organization.
4. Polymorphiccellorganelles(Plastids);ultrastructureofchloroplast.PlastidDNA.

# UNIT–II: CHROMOSOMES

1. Prokaryotic eukaryotic chromosome. Morphology ofa eukaryotic chromosome.
2. Euchromat in and Heterochromatin; Karyotype and ideogram.
3. Brief account of chromosomal aberrations - structural and numerical changes
4. Organization of DNA in achromosome (solenoid and nucleosome

# UNIT–III: MENDELIAN AND NON-MENDELIAN GENETICS

1. Mendel’s laws of inheritance. Incomplete dominance and co-dominance; Multipleallelism.
2. Complementary,supplementaryandduplicate gene interactions(plant-basedexamples areto be dealt).
3. Abriefaccountoflinkageandcrossingover;Chromosomalmapping-2pointand3point test cross.
4. Conceptofmaternalinheritance(Corren’sexperimentonMirabilisjalapa);MitochondrialDNA.

# UNIT–IV:STRUCTUREANDFUNCTIONSOF DNA

1. WatsonandCrickmodelofDNA.BriefaccountonDNAReplication(Semi-conservativemethod).
2. BriefaccountonTranscription,typesandfunctionsofRNA.Geneconceptandgeneticcodeand Translation.
3. Regulationof geneexpressioninprokaryotes- LacOperon.

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# 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,andtechnique;Heterosis(hybridvigour).
4. A brief account on Molecular breeding – DNA markers in plant breeding. RAPD,RFLP.

# TEXTBOOKS:

* Pandey, B.P.(2013)CollegeBotany,Volume-III, S.ChandPublishing,NewDelhi
* Ghosh,A.K.,K.Bhattacharya&G.Hait(2011)A TextBookofBotany,Volume-III,NewCentralBookAgencyPvt.Ltd.,Kolkata
* Chaudhary, R. C. (1996) Introduction to Plant Breeding, Oxford & IBHPublishingCo. 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)DNAScience:AFirstCourse,
  + - 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,BiotechBooks,Delhi.

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

IV SEMESTER **BOTANY** TIME: 2Hrs/WEEK

B 4154(2) **CELL BIOLOGY, GENETICS, PLANT BREEDING Max** MARKS: 50

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

**OBJECTIVES:** The student is able to

* Know the structure of plant cell, and cell organelles
* Know the cytochemical methods of fixation and nuclear staining.
* Make suitable cytological preparations for study of mitosis, meiosis and karyotype.
* Solve problems in genetics.
* Understand principles and techniques of Plant Breeding

**COURSEOUTCOMES:** After successful completion of this practical course the student shall be able to:

CO1: Show the understanding of techniques of demonstrating Mitosis and Meiosis in the laboratory and identify different stages of cell division.

CO2: Identify and explain with diagram the cellular parts of a cell from a model or picture and prepare models.

CO 3: Solve the problems related to crosses and gene interactions.

CO 4: Demonstrate plant breeding techniques such a semasculation and bagging

# PRACTICALSYLLABUS:

1. Study of ultra-structure of plant cell and its organelles using Electron microscopic Photographs/models.
2. Demonstration of Mitosis in Allium cepa/Aloe vera roots using squash technique; observation of various stages of mitosis in permanent slides.
3. Demonstration of Meiosis in P.M.C.s of Allium cepa flower buds using squashtechnique; observation of various stages of meiosisin permanent slides.
4. Study of structure of DNA and RNA molecules using models.
5. Solving problems monohybrid, dihybrid, back and testcrosses.
6. Solving problems on gene interactions (at least one problem for each of the geneinteractions in the syllabus).
7. Chromosome mappingusing3-point test cross data.
8. Demonstration of emasculation, bagging, artificial pollination techniques forhybridization.

**REFERENCE BOOKS:**

1. Text book of Practical Botany (Vol. II) – Ashok Bendra& Kumar, Rastogi Publications, Meerut – 2001-2002
2. Practical Botany (Vol.II) – H.N. Srivastava, Pradeep Publications, Jallandhar – 200.
3. Modern Practical Botany – B.P.Pandey – S.Chand & Co., New Delhi – 1988.
4. Practical Book of Botany (BSc-Second Year) – Dr. M. Raghuram & M. V. Rao; Technical Publishers (P) Ltd.;Guntur, India; 2010.
5. College Botany Practical (Vol.1) – S. C. Santra, T. P. Chatterjee & A. P. Das; New Central Book Agency (P) Ltd, Kolkata, India.

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