Semester	PG SEM 1
Course	**Major**
Paper Code	M2C4MB26013C
Paper Title	**Inheritance biology and Organogenesis**
No. of Credits	**4**
Theory / Practical / Composite	**Composite**
Minimum No. of preparatory hours per week a student has to devote	4 hours/week
Number of Modules	No modules
Syllabus	**Inheritance biology** **Unit 1: Characteristics of Chromosomes**: Structural organization of chromosomes, concept of euchromatin, heterochromatin, Karyotypes of human chromosome, chromosome banding. **Unit 2: Structural variations:** Variation in chromosome structure and number and structural abnormality in human; Klinefelter, Turner and Down's syndrome. **Unit 3: Mendelian and extra chromosomal Inheritance:** Mendel's Laws, Chromosomal theory of inheritance, Concept of dominance, epistasis, suppressors, penetrance and expressivity. Concept of extra nuclear inheritance with examples. **Unit 4: Linkage and recombination:** Homologous Recombination-function of RecA, RecBCD, Role of Resolvosome; Site Specific Recombination-functions of Recombinase, Integrase, XerCD system, Immunoglobulin gene rearrangement, gene knock out. Cytological basis and molecular mechanism of crossing over, concept of linkage and mapping of genes. **Unit 5: Human genetics and polygenic inheritance:** Pedigree analysis and basics of polygenic inheritance. **Organogenesis** **Unit 6:** Life cycle of model organisms, Cell division, differentiation, determination, cell fate specification. **Unit 7: Embryogenesis in plants:** Production of gametes, embryo sac development and double fertilization in plants;

	zygote formation, cleavage, establishment of symmetry in plants; seed formation and germination. **Unit 8: Morphogenesis and organogenesis in plants:** Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in *Arabidopsis* and *Antirrhinum.* **Unit 9: Embryogenesis in animals:** Fertilization in Sea urchin and mammals-production of gametes, sperm-egg recognition, block to polyspermy, Cleavage, blastulation and formation of germ layers in chick embryo. **Unit 10: Morphogenesis and organogenesis in animal**: Axis specification and pattern formation in *Drosophila*, development of tetrapod limb. **Practical:** 1. Studying Barr Body with temporary mount of human cheek cells. 2. Variation of chromosome structure after mutagenesis. 3. Study of polytene chromosomes using temporary mounts of salivary glands of *Drosophila* larvae. 4. Identifying different chromosomes using fly genetics. 5. Identification of different stages of life cycle and organ development in *Drosophila.* 6. Study of meiotic chromosomes. 7. Study of banding pattern using Giemsa and other dyes. 8. Preparation of artificial seeds using somatic embryogenesis.

Learning Outcomes	• Understanding basics of eukaryotic genetics • Introduction to Mendelian genetics and extra chromosomal inheritance • Understanding and analysis of linkage, recombination and linkage mapping • Understanding human genetics, pedigree analysis and polygenic inheritance patterns • Basic introduction to plant and animal developmental biology from embryonic stage till the formation of organs

<table>
<tr><td>Reading/Reference Lists</td><td colspan="2">Gardner EJ, Simmons, Snustad- Principles of genetics Wiley-India
Weaver, Hedrick Genetics 3 rd Ed MacGraw-Hill Education
Griffith, Wessler, Lewontin, Carroll Introduction to Genetic Analysis WH Freeman and Co
Klug, Cummins, Spencer, Palladino, Concepts of Genetics
Developmental Biology (13th Edition) by Michael J.F. Barresi and Scott F. Gilbert. Oxford University
Press
Principles of Development (7th Edition) by Lewis Wolpert, Cheryll Tickle, and Alfonso Martinez Arias.</td></tr>
<tr><td>Evaluation</td><td>Theory
60 (45+15)
CIA-10+3+2</td><td>Practical
40
CA (38+2)</td></tr>
<tr><td>Paper Structure for
Theory Semester Exam</td><td colspan="2">Full Marks: 45
Short questions: 5 (each 1 mark) from 7 (5x1=5)
Long questions: 4 (each 10 marks) from 6 (4x10=40)</td></tr>
</table>