

## DISCIPLINE SPECIFIC CORE COURSE –15 :

### Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
<b>Growth and Reproduction (BS-DSC-503)</b>	<b>4</b>	<b>2</b>		<b>2</b>	Class XII pass with Biology and chemistry	<b>Understanding of animal and plant physiology</b>

### Learning Objectives

The Learning Objectives of this course are as follows:

- To allow students to explore the development of plants and animals from juvenile to mature phase.
- To enthuse students to explore the myriad ways in which plants produce fruits and seeds, and encourage them to pursue further studies in plant reproductive biology and its genetic regulation.
- To explore the fundamentals of reproduction and development in animals particularly vertebrates, from fertilization to organogenesis, primarily for understanding of tissue differentiation and molecular mechanisms fundamental to development of animals.

### Learning outcomes

By the end of the course, the student will be able to:

- Students will understand the development of plants from juvenile to senescent stage with the associated genetic, cellular, anatomical and morphological changes.
- Students will appreciate the role of pollinators and get hands-on experience of observing patterns on pollen grains, pollen germination, embryo and endosperm dissection, and collecting seeds with different dispersal mechanisms.
- Students will understand the reproductive system in animals and human beings so as to relate with the control of population and environmental threats in the current scenario.
- Students will be able to explain how errors in development can lead to congenital defects.
- Students will visualize and appreciate concepts learnt in theory and apply experimental approaches to understand these developmental events in the laboratory

## SYLLABUS OF DSC-15

### Theory

**Credits: 2**

**Total**

**Hours: 30**

#### **Unit 1: Introduction to Growth and Reproduction**

**No. of hours: 5**

Vegetative and Reproductive phases of growth in plants, senescence and abscission. Functional anatomy of male and female reproductive systems in humans.

#### **Unit 2: Fertilization**

**No. of hours: 10**

Sexual reproduction in angiosperms: Structure and organisation of flower, organization of typical tetrasporangiate anther and eight nucleate embryo sac (Polygonum type), pre-fertilization events in plants, microgametogenesis and megagametogenesis, anther dehiscence, pollination, pollen- pistil interaction, pollen germination, double fertilization.

Gametogenesis- Spermatogenesis and Oogenesis with reference to human, Estrus and menstrual cycle, Types of eggs in animals, capacitation, fertilization and development of an embryo from zygote, Causes of Infertility.

#### **Unit 3: Embryogenesis in Plants and Animals**

**No. of hours: 10**

Post fertilization events in plants: Types of embryogenesis (with special emphasis on dicot embryogenesis), endosperm development, types of endosperm, seed formation, seed dispersal: mechanisms and agents. Embryogenesis; Types of cleavages, Morphogenetic movements, Gastrulation in humans; Extra Embryonic membranes, Mechanism of Implantation, Placentation: Endocrine functions and types based on chorionic villi distribution and histology. feto-placental unit

#### **Unit 4: Differentiation**

**No. of hours: 5**

Post-embryonic meristem in plants with special reference to *Arabidopsis* embryogenesis. Role of meristem in differentiation, shoot and root apical meristems, lateral meristem (vascular and cork cambium), floral meristem, ABC model of flowering. senescence and abscission

Formation of organs Organogenesis during development, critical windows of development in humans during pregnancy. Teratogens and Ageing.

### **PRACTICALS**

**CREDITS: 2**

**TOTAL HOURS: 60**

1. Luteinizing Hormone (LH) Levels and HCG based test.
2. Vaginal smear preparation to examine estrous cycle.
3. Preparation and histological study of mammalian testis and ovary or Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina; Study different types of mammalian placenta on the basis of histology and morphology.

4. Case studies on teratogens.
5. Study different stages of micro and mega-gametogenesis in angiosperms-through permanent slides.
6. To study percent pollen germination using different media.
7. To study embryo development in flowering plant /slides.
8. To dissect out endosperm and embryo from angiosperm seeds.
9. Study of apical and lateral meristem by permanent slides.
10. Survey of dispersal mechanisms of seeds/ pollination agents
11. To study Polyembryony/ Types of Embryo sacs through permanent slides/ photographs/temporary preparations/chart
12. Project report on visit to animal house facility/ IVF lab.

### **Essential Readings:**

1. Bhatnagar, S. P., Dantu, P. K., & Bhojwani, S. S. (2018). The Embryology of Angiosperms, 6th Edition. Vikas
2. Raghavan, V. (2000). Developmental Biology of Flowering Plants. New York: Springer.
3. Tortora, G. J., & Derrickson, B. (2017). *Principles of anatomy & physiology*. Fifteenth edition; Wiley Loose-Leaf Print Companion. Hoboken, New Jersey: John Wiley & Sons, Inc.
4. Regulation of Implantation and Establishment of Pregnancy in Mammals, Editors: Rodney D Geisert, Fuller W. Bazer, ISBN 978-3-319-15856-3, Springer International Publishing, 2015.
5. Gilbert, S. F., & Barresi, M. J. F. (2016).

### *Developmental biology.*

#### **Additional readings:**

1. Kalthoff, K. O. (2000). Analysis of Biological Development (2 edition). Boston: McGraw-Hill Science/Engineering/Math.
2. William. J. Larsen. (2001). Human Embryology (3 edition). New York: Churchill Livingstone.

**Note:** Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.