**GUJARAT TECHNOLOGICAL UNIVERSITY**
**Master of Science (Integrated-Biotechnology)**
**Semester: 2**
**Subject Name: Developmental Biology**
**Subject Code: 1320405**

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | |
| L | T | P | C | ESE (E) | PA (M) | ESE (V) | PA (I) | |
| 4 | 0 | 0 | 4 | 70 | 30 | 0 | 0 | 100 |

**Prerequisite:**
Students should have the knowledge about the plant and animal biology and its growth characteristics.

**Rationale:**

Its course includes study of development, growth and differentiation of plant and animal cells at cellular level. Understanding the mechanism involved in growth and development would address the key challenges involved in population health.

**Course Content:**

| Unit No. | Content | No. of Hours | Weightage (%) |
|---|---|---|---|
| 1 | **Plant development:** Morphology of an Angiosperm plant with the understanding of evolution, compound and simple leaf, apetalae, the gamopetalae and polypetalae, fibrous and tap root system, parallel venation and reticulate venation, herbs, shrubs and trees, annuals and perennials, monocots vrs dicots, Aquatic plants, epiphytes and terrestrial. Development of seeding, shoot apex organisation, vegetative and floral apex, root, shoot and flower development. Life cycle of an angiosperm plant showing alternation of generation | 20 | 33 |
| 2 | **Experimental and Applied Embryology:** Artificial pollination and sexual incompatibility, methods to overcome incompatibility | 6 | 10 |
| 3 | **Plant embryology:** Structure and development of microsporangium and male gametophyte, Structure and development of megasporangium and female gametophyte, Endosperm with types, Embryogeny in Monocot and Dicot, Polyembryony, Apomixis, Parthenocarpy Applications of Embryology in Crop improvement: Haploid production, Nucellus, Ovule, Ovary, Seed culture, Genetic transformation | 14 | 23 |
| 4 | **Animal development** Definition, scope and history of embryology, branches of embryology, phases in ontogenic development, gametogenesis, spermatogenesis, oogenesis, Types of eggs, Egg membranes Fertilization: Encounter of spermatozoa and ova, Capacitation | 10 | 17 |

| | | | |
|---|---|---|---|
| | and contact, Acrosome reaction and penetration, Activation of ovum, Migration of pronuclei and amphimixis. Parthenogenesis | | |
| **5** | **Cleavage**<br>Patterns and Types of cleavage, Brief account on Holoblastic and Meroblastic cleavages Morulation and Blastulation Fate Maps – Construction of fate maps by natural marking Gastrulation (Epiboly and Emboly) Growth and Differentiation Medical implications of Animal Development Biology: Genetic errors of Human development, Infertility, Teratogenesis. | 10 | 17 |
| | **Total Hours:** | 60 | |

**Textbook:**

1. Taxonomy Evolution at Work by M. Daniel. Pub. Narosa Publishing House. 2009.
2. A textbook of Botany (Vol. 1&2) by Bhattacharya, Hait and Ghosh. Pub. New Central Book Agency (P) Ltd., 2011.

**Reference Books:**
1. Developmental Biology by Sastry and Shukal, Rastogi Publications, Meerut

**Course Outcomes:**

| No. | Course Outcomes | RBT Level* |
|---|---|---|
| 1 | Understand morphology and evolution of angiosperms | RM ,UN |
| 2 | Develop concept of animal development like Gametogenesis and spermatogenesis, parthenogenesis | RM, UN |
| 3 | Acquire concept of cleavage, gastrulation process and medical implications of animal development biology | RM, UN,AP |

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

**Suggested Course Practical List:**
Not Applicable

**List of Laboratory/Learning Resources Required**
1. https://onlinecourses.nptel.ac.in/noc20_bt35/preview

2. https://onlinecourses.nptel.ac.in/noc19_bt17/preview