**M. Sc. (Zoology)**
**Semester- II**

| Course Code | PS02CZOO21 | Title of the Course | Developmental Biology |
|---|---|---|---|
| Total Credits of the Course | 04 | Hours per Week | 04 |

| Main Focus of the Course outcomes | Employability | Skill Development | Entrepreneurship |
|---|---|---|---|
| | √ | | |

| Course Objectives: | 1. To understand the abnormalities in gametes and defects in embryo<br>2. To learn about early and late development of model animals including humans with reference to growth patterns of embryo and their role indevelopmental obstructions.<br>3. To impart knowledge of axis formationin normal and abnormal conditions<br>4. To provide the information on the role of environment and other epigentic factors like estrogenic agents, pollutants<br>5. Tostrengthen the comprehensive views of evolution and developmental processes |
|---|---|

| Course Content | | |
|---|---|---|
| Unit | Description | Weightage* (%) |
| 1. | Introduction to animal development.<br>Fertilization: Stucture of gametes, Egg-Sperm recognition, Fertilization in sea urchins,<br>Differential gene expression and cell-cell communication in development: Differential gene transcription, RNA processing, Control of gene expression at translation, Cell adhesion and cell signalling | 25 |
| 2. | Early development in invertebrates and vertebrates: Cleavage and pattern of embryonic cleavage; Comparative account of gastrulation; Early development in Sea urchin, C. elegans; Drosophila; Amphibia; Birds; Mammals.<br>Later embryonic development: Development of ectoderm, Neurulation and Central nervous system, Neural crest cell; Development of mesoderm: Paraxial mesoderm, Intermediate mesoderm, Lateral plate mesoderm. Development of endoderm | 25 |
| 3. | Body Axes: Establishment of body axes in C. elegans,. Birds and Mammals, Tetrapod limb development: Tetrapod limb development: Proximo-distal, Anterior-posterior, Dorsal-ventral; Cell death pathway<br>Drosophila axis specification: Dorso-Ventral pattern, Segmentation | 25 |

| | | |
|---|---|---|
| | and Anterior-Posterior body plan, Maternal gradient, Segmentation genes | |
| 4. | Hormones as mediators of development: Amphibian metamorphosis: Morphological and biochemical changes, Hormonal control.<br>Insect metamorphosis: Imaginal discs- Determination of axes in wing/leg imaginal discs. Hormonal control, and Molecular mechanism of action of ecdysone.<br>Birth defects, Endocrine disruptors and cancer.<br>Environmental as a normal agent in producing phenotype: Polyphenisms and Plasticity, Temperature and sex, Environmental induction of behavioural phenotypes and Learning | 25 |

| | |
|---|---|
| Teaching-Learning Methodology | Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos. Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure. Course materials will be provided from primary and secondary sources of information. |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learnerwill be able to | |
|---|---|
| 1. | Understand of gametogenesis and evolving inadequacies |
| 2. | Know about germ layer formation, late development and associated irregularities |
| 3. | Correlate axis specification and congential abnormalities |
| 4. | Get information aboutrole of environment in growth and development |
| 5. | Understand relationship between ontogeny and phylogeny |
| Suggested References: | |

| Sr. No. | References |
|---|---|
| 1. | Barresi, M., J., F., Gilbert, S., F., (2019). Developmental biology. 12thEdn. Sunderland, Mass: Sinauer Associates, United States |
| 2. | Berrill,N., J., Karp, G., (1981). Development. McGraw Hill Inc. New York |
| 3. | Balinsky, B. I., (2012). An introduction to Embryology. 5thEdn. Cenage Learning, India |
| 4. | Wolpert, L., Tickle, C., Arias, A., M., (2015). Principles of Development, Current Biology Ltd., London, New York. |

| On-line resources to be used if available as reference material |
|---|
| On-line Resources |
| Relevant review articles/research papers/handouts of latest development in the subject |