# PH.D. PRE-COURSE WORK EXAMINATION SYLLABUS

## Paper II: Recent Advances in Clinical Embryology

| Sr. No. | Topic | Details | Hours |
|---|---|---|---|
| 1 | Advanced Reproductive Technologies | - Time-lapse embryo monitoring systems<br>- Artificial intelligence in embryo selection<br>- Microfluidics in IVF<br>- Novel ovarian stimulation protocols<br>- Advanced sperm selection methods | 3 |
| 2 | Genetic Screening in ART | - Preimplantation genetic testing for aneuploidy (PGT-A)<br>- Non-invasive PGT techniques<br>- Expanded carrier screening<br>- Mosaic embryo transfer considerations | 3 |
| 3 | Gamete Biology and Cryopreservation | - Oocyte in vitro maturation techniques<br>- Sperm selection methods for ICSI<br>- Vitrification advancements<br>- Long-term effects of gamete cryopreservation | 3 |
| 4 | Stem Cells in Reproductive Medicine | - Induced pluripotent stem cells in fertility preservation<br>- Stem cell-derived gametes<br>- Therapeutic applications in reproductive disorders<br>- Ethical considerations in stem cell research | 3 |
| 5 | Endometrial Receptivity and Implantation | - Transcriptomics in endometrial receptivity assessment<br>- Immunological factors in implantation<br>- Endometrial microbiome<br>- Novel approaches to improve implantation rates | 3 |
| 6 | Male Infertility Diagnostics and Treatment | - Advanced sperm function tests<br>- Genetic causes of male infertility<br>- Surgical sperm retrieval techniques<br>- Novel therapies for male factor infertility | 3 |
| 7 | Embryo Culture Systems | - Sequential vs. single-step media<br>- Embryo co-culture techniques<br>- Microenvironment optimization<br>- Impact of culture conditions on epigenetics | 3 |

| Sr. No. | Topic | Details | Hours |
|---|---|---|---|
| 8 | Fertility Preservation | - Ovarian tissue cryopreservation and transplantation<br>- In vitro follicle growth and artificial ovary<br>- Testicular tissue cryopreservation<br>- Oncofertility advancements | 3 |
| 9 | Reproductive Genetics | - Gene editing technologies in embryos<br>- Mitochondrial replacement therapy<br>- Epigenetic reprogramming in early embryos<br>- Imprinting disorders and ART | 3 |
| 10 | Laboratory Quality Management | - Key performance indicators in IVF labs<br>- Risk assessment and management<br>- Lean management in embryology labs<br>- Automation in embryology procedures | 3 |
| 11 | Emerging Technologies in ART | - Piezo-ICSI and other micromanipulation techniques<br>- 3D/4D ultrasound in folliculometry<br>- Robotic systems in embryology<br>- Nanotechnology applications in ART | 3 |
| 12 | Ethics and Regulation in Clinical Embryology | - Cross-border reproductive care<br>- Ethical issues in embryo research<br>- Regulatory frameworks for novel ART techniques<br>- Counselling and informed consent in ART<br>- Third Party Reproduction | 3 |

Total Hours: 36