**‘The ESHRE Embryology Certification Preparatory Course’-Curriculum**

**The curriculum has been divided into two parts.**

**Applicants are expected to have a good knowledge of the following aspects of the curriculum and will have to undertake a**

**Pre-assessment on-line exam**

**Part 1 - SELF TAUGHT CURRICULUM**

**Block 1: Basic concepts: cell biology, molecular biology and genetics**

1.1 The cell

 Internal organization

 Cell cycle control, checkpoints

 Mitosis and meiosis

 The reproductive cells: spermatozoa and oocytes

1.2 Cell-cell interaction

 Membrane receptors: function, type, regulation

 Signaling

 Junctions

1.3 Basic genetics of the cell

 DNA chromatin and chromosomes

 Concept of a gene

 Mutations

 Epigenetics

**Block 2: Male Reproduction**

2.1 The foetal testis

 Factors regulating development

 Primordial cells

 Cell migration

 Time scale (days / week)

2.2 Anatomy and function of the male reproductive system

 Including accessory systems

 Including function of the organs

2.3 Spermatogenesis

 Regulating factors

 CNS, pituitary

 FSH, LH, testosterone, endocrine feedback

 Leydig & Sertoli cells

 Maturation

 Biochemistry and metabolism of the sperm cell

 Sperm morphology/structure

 Function of each structure

**Block 3: Female reproduction**

3.1 The foetal ovary

 Factors regulating development

 Primordial cells

 Cell migration

3.2 Anatomy and function of the female reproductive system

 Including accessory systems

 Including function of the organs

3.2 Anatomy and function of the female reproductive system

 Including accessory systems

 Including function of the organs

 Primordial cells

 Cell migration

 Time scale (days / week)

**Block 5:** **Infertility reasons, work-up and treatment**

5.1 The infertile couple

 Reasons, medical, genetic, hormonal, physical

 Causes and effects

 Definitions, primary infertility, secondary infertility, female vs. male

5.2 Patient screening

 Physical / Serological

 What tests are used? What to look for?

 Screening of donors

5.3 Type and choice of treatment

 Surgical

 Hormone stimulation

 Insemination IVF / ICSI

 Sperm donation

 Egg donation

5.4 Ovarian hyperstimulation

 Basic principles

 Types of medication

 Stimulation regimes (types, rationales)

 OHSS

5.5 Outcome

 The health of the children

 Risk factors

 Maternal factors

 Paternal factors

 Multiple pregnancies

 Chromosomal factors

 Malformations

 Imprinting

Block 8: Legislation, EU Tissue Cell Directives, Non Routine methods

8.4 Legislation

 National legislation (what is allowed in your country)

 Ethical consideration

 Code of practice

8.5 The EU Tissue and Cells Directives (EUTCDs)

 Examples of what the EUTCDs cover

 Implementation in own country

8.6 Non-routine methods

Examples of non-routine methods, e.g. in vitro maturation, pre-genetic screening, assisted hatching

**Part -2 TAUGHT BY LECTURES**

 **Block 1: Basic Gene regulations, Genetics, Genetic analysis,**

1.4 Basic gene regulation

 Translation

 Transcription

 Expression

 Imprinting

1.5 Basic genetics

 Genotype and phenotype

 Basic Mendelian inheritance patterns

 Monogenic diseases

 Chromosomal abnormalities: numerical, structural

 Interpretation of an inheritance / family tree / pedigree

1.6 Genetic analysis

 How and why is it performed?

Basic methods: cytogenetics (e.g. karyotyping, FISH), molecular genetics (e.g. PCR)

1.7 Embryonic stem cells

 Origins, definitions, characteristics

 **Block 2: Male Reproduction**

2.4 The sperm sample – assessment

 Functional analysis

 Microscopic analysis

 WHO & ESHRE guidelines

 CASA systems

 **Block3: Female Reproduction**

3.3 Oogenesis

 Regulating factors

 CNS, pituitary

 FSH, LH, Estrogen, feedback

 Theca & granulosa cells

 Maturation biochemistry and metabolism of the oocyte

 Oocyte morphology/structure

 Function of each structure

3.4 The oocyte - markers of competence

 Nuclear maturity

 Cytoplasm

 Polar bodies

 Zona pellucida

 Cumulus cells

**Block 4: Embryo development and early pregnancy**

4.1 Gamete interaction – until 1st cleavage

 Fertilization

 Acrosome reaction

 Sperm- oocyte signalling

 Sperm decondensation

 Oocyte activation

 Meiosis II, pronuclei and spindle formation

4.2 Embryo development - from first cleavage to implantation

 Metabolism, cell positions, embryonic axis

 Kinetics, timing, regulation

 Apoptosis

4.3 Implantation

 Hatching, adhesion, invasion, endometrium

4.4 Post-implantation embryology

 Gastrulation

 Organogenesis

 Sex differentiation

4.5 IVF outcome

 hCG production, pregnancy test

 Implantation rate, ultrasound (sacs, heartbeat)

4.6 Early pregnancy failures

 Extra uterine pregnancies,

 Spontaneous abortions

 Embryo factors vs. uterine factors

**Block 6: Laboratory procedures - practical – from oocyte pick-up to transfer.**

6.1 Strategies for choosing fertilization procedures

 IVF or ICSI, criteria

 IVM

 PESA, TESA, TESE,

Donor sperm in relation to serological tests (different handling and storage)

Why are we doing things in a certain manner / certain order?

6.2 The sperm sample – preparation methods

 Centrifugation, swim-up, ”swim-out”, etc

 Functional

 When to use what, why, differences

6.3 IVF

 Practicalities for IVF and ICSI

 Pick-up, oocyte handling, insemination

6.4 ICSI

 Denudation

 Injection procedure

6.5 Embryo scoring, Day 1 - 6

 PN scoring,

 Morphology criteria

Kinetics, genetics, physiology (e.g. amino acids, oxygen metabolism)

 Consequences (freeze, transfer)

6.6 Culture conditions

 Media

 Culture systems

 Requirements for consumables

 Physiochemical parameters (temperature, pH, osmolality)

 Stage specific requirements

6.7 Equipment

 Calibrations

 Validation, monitoring, logbooks, maintenance and control

6.8 Microscopes

 Principals of optical system, calibrations, maintenance and control

6.9 Embryo transfer

 Identity check

 Number of embryos

 Catheter loading and checking

6.10 Cell biopsy

 Zona opening (pros and cons)

 Different biopsy types, number of cells

**Block 7: Cryopreservation**

7.1 Principles for freezing and thawing of cells

 Basic cryobiology

 Cryoprotectants, additives

 Slow freezing, timing

 Vitrification, timing

 Advantages/disadvantages with different methods

7.2 Sperm freezing /thawing

 Theory and practice

7.3 Oocyte freezing/thawing

 Theory and practice

7.4 Embryo freezing/thawing

 Theory and practice

7.5 Ovarian freezing/thawing

 Theory and practice

7.6 Testicular freezing/thawing

 Theory and practice

7.7 Equipment

 Machines

 Straws/ampoules

 Media, contamination from storage medium (what and why)

 Minimal safety requirements

 Security

7.8 The frozen-thawed embryo treatment cycle

 Monitoring and timing of the thawing cycle

 Controlled and natural cycles

**Block 8: Quality assessment, statistics, handling data, ethics.**

8.1 Patient data

 Identity check

 Confidentiality

 Keeping records

 Safety

 Coding

8.2 Quality assurance

 Identification procedures

 Monitoring of performance, index variables

 Standard operating procedures

 Traceability

 Validation

 Monitoring and use of key performance indicators

 Logbooks

 If/ how/when to bring in new methods

8.3 Statistical analysis

 Sample size evaluation

 Study design

 Statistical variance

 Interpretation of results

**Block 9: Risks**

9.1 Contaminated samples

Processing and storage of sample known/suspected to be contaminated with contagious agents

9.2 Staff protection

 Hygiene

 Rules and regulations

 Protective measures (gloves, masks, etc.)

 Actions upon injury

9.3 Adverse events, back-up strategies

 How to avoid, what to do?

 Risk of mix-up of gametes, loss or damage during handling

 Transfer of wrong embryos

 Breakdown of equipment, back-up strategies

9.4 Troubleshooting