



VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005.
Dated: 05.07.2019.

No: AC10/759/2019-20

NOTIFICATION

Sub: Minor modifications in the Syllabus Clinical Embryology and Pre-Implantation genetics from the academic year 2019-20-Reg.

- Ref: 1. Decision of the Faculty of Science and Technology Meeting held on 01.04.2019.
2. Decision of the Academic Council meeting held on 07.06.2019.

The Board of Studies in **Clinical Embryology and Pre-Implantation genetics (PG)** which met on **31.12.2018** has resolved and recommended to minor modifications in the Syllabus of **Clinical Embryology and Pre-Implantation genetics (PG)** from the academic year 2019-20.

The Faculty of Science & Technology and the Academic Council at their meetings held on 01.04.2019 and 07.06.2019 respectively have also approved the above proposal.

The contents are uploaded in the University Website i.e., www.uni-mysore.ac.in , the concerned may be download it.

DRAFT APPROVED BY THE REGISTRAR.

Lingaraj 08/7/19
DEPUTY REGISTRAR (ACADEMIC),
UNIVERSITY OF MYSORE,
MYSORE.

To:

1. Registrar (Evaluation), University of Mysore, Mysuru.
2. The Dean, Faculty of Science Department of Studies in Zoology, Manasagangotri, Mysuru.
3. The Director, Asia Pacific Institute of Embryology, No. 149, 50ft Road, Nandi Circle, Dattagali 3rd Stage, Mysore-570009.
4. The Director, PMEB, Pareeksha Bhavan, University of Mysore, Mysuru.
5. The Director, College Development Council, MoulyaBhavan, Manasagangotri, Mysuru.
6. The Deputy Registrar/ Assistant Registrar/ Superintendent, AB and EB, University of Mysore, Mysuru.
7. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
8. Office Copy.

SP(S-1)/Approved.

New Syllabus
MSc in Clinical Embryology and Preimplantation Genetics Regulations and Syllabus

I Semester (18 Credits)-Proposed Changes

Sl. No.	Code	Title of the Paper	Credit pattern			Total Credits
			L	T	P	
1		Introduction to Embryology Introduction to Reproductive system	2	0	0	2
2		Introduction to infertility	2	0	0	2
3		Introduction to Embryology Introduction to embryology laboratory	0	0	6	6
4		Standard Operating Protocols in the IVF and cell culture laboratory. Andrology laboratory Techniques	0	0	8	8
			4	0	14	18

II Semester (20 credits)-PROPOSED CHANGES

Sl. No.	Code	Title of the Paper	Credit pattern			Total Credits
			L	T	P	
1		Principles of genetics and Reproductive Endocrinology	2	0	0	2
2		Assisted Reproduction	2	0	0	2
3		Human Andrology Clinical Embryology Techniques	0	0	8	8
4		Clinical Embryology Techniques Cryopreservation Techniques	0	0	8	8
			4	0	16	20

III Semester (20 credits)-PROPOSED CHANGES

Sl. No.	Code	Title of the Paper	Credit pattern			Total Credits
			L	T	P	
1		Research methodology and Preimplantation Genetic Diagnosis	2	0	0	2
2		Principles of Cryopreservation	2	0	0	2
3		Micromanipulation Intracytoplasmic sperm injection (ICSI)	0	0	8	8
4		cryopreservation techniques Micromanipulation & Embryo Biopsy Techniques	0	0	8	8
			4	0	16	20

IV Semester (20 credits)-NO CHANGES

Sl. No.	Code	Title of the Paper	Credit pattern			Total Credits
			L	T	P	
1		New developments in ART	2	0	0	2
2		Regulation and ethics in assisted reproduction	2	0	0	2
3		Research Seminar	0	4	0	4
4		Project Work	0	0	10	10
			4	4	10	18

I Semester

Theory Paper 1:- ~~Introduction to embryology~~

2 Credits

Lecture (2 Credits 2 hours / week)

Introduction to Reproductive System

2 Credits

Existing syllabus	Proposed Changes
Introduction to Embryology	Introduction to Reproductive System
<p>Primordial germ cells. Gonadogenesis, Male Reproductive system and male anatomy; development of testes; spermatogenesis and spermiogenesis</p> <p>Female reproductive system and female anatomy: development of ovary, oogenesis, folliculogenesis, and oocyte development, Fertilization and zygote formation, gamete transport, early development of embryos, implantation.</p> <p>Andrology: Seminal plasma and its composition, Biochemical analysis of semen sample, importance of fructose determination, microbiological analysis of semen sample, sperm agglutination and antisperm antibodies, Structure and function of spermatozoa, comprehensive semen assessment, classification of semen sample morphology assessment, motility assessment and grading, semen function tests- sperm survival test, sperm DNA fragmentation test, Different methods of separation of motile spermatozoa; swim up and gradient methods</p> <p>Preparation of embryology lab and personnel for oocyte retrieval, selection of culture media and disposables, Equilibration of culture tubes and dishes, composition of culture media, use of</p>	<p>Introduction to Evolution, Cell biology, Anatomy Physiology, Genetics and development of vertebrates</p> <p>Embryology; history and concepts</p> <p>Primordial germ cells. Gonadogenesis; Female reproductive system and female anatomy: development of ovary, oogenesis, folliculogenesis, and oocyte development, gamete transport, Fertilization, zygote formation & Cleavage, early development of embryos, Blastulation & gastrulation, Germ layer formation, implantation.</p> <p>Male Reproductive system and male anatomy; development of testes; spermatogenesis and spermiogenesis</p> <p>Seminal plasma and its composition, Biochemical analysis of semen sample, microbiological analysis of semen sample, Antisperm antibodies, Structure and function of spermatozoa, Preparation of embryology lab and personnel for oocyte retrieval, selection of culture media and disposables, Equilibration of culture tubes and dishes, composition of culture media, use of culture media for different purposes, Insemination procedures, Denudation and fertilization check, zygote, cleavage and blastocyst development assessment, Embryo</p>

culture media for different purposes, Insemination procedures, Denudation and fertilization check, zygote, cleavage and blastocyst development assessment, Embryo Transfer	Transfer
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Theory Paper 2: Introduction to Infertility

2 Credits

Lecture (2 Credits 2 hours / week)

Existing	Proposed changes-No changes
Incidence of infertility, Causes of male infertility; anatomical causes and varicocele, hormonal causes, genetic causes, environmental causes Female infertility: Anatomical causes, hormonal causes, polycystic ovary syndrome, anovulation Investigation of male: Physical examination, semen examination and hormonal assessment Investigation of the female: Physical examination, hormonal evaluation	Reproductive health, Infertility; definition, history, Incidence of infertility; global fertility rates and declining birth rates, society and infertility. Age and declining fertility, Causes of male infertility; anatomical causes and varicocele, hormonal causes, genetic causes, environmental causes Female infertility: Anatomical causes, hormonal causes, polycystic ovary syndrome, anovulation Investigation of male: Physical examination, semen examination and hormonal assessment Investigation of the female: Physical examination, hormonal evaluation

~~Introduction to embryology~~

Introduction to Embryology Laboratory Techniques

Practical Paper 1: (6 Credits, 12 hours / week)

Existing	Proposed Changes
Introduction to embryology	Introduction to Embryology Laboratory Techniques
Microscopy: Phase contrast microscope, stereo	Embryology Laboratory: Standard Operating

<p>zoom microscope and inverted microscope</p> <p>Female anatomy model; male anatomy model;</p> <p>Sheep testes dissection and processing, identification of stages of sperm development, identification of sperm and its morphology</p> <p>Sheep Ovary dissection: identification of follicles on the ovary, isolation of oocyte cumulus complex and separation of oocytes, identification of granulosa cells, cumulus cells, corona cells and zona pellucida.</p>	<p>Protocols (SOPS); Various SOPS and work instructions in the embryology lab, Functions of IVF Centre and the laboratory, Personnel involved and workflow, Maintenance of lab and monitoring equipment, Personnel proficiency, inventory management, Quality control and Quality assurance.</p> <p>Familiarization and calibration of digital thermometer, Temperature monitoring of incubators, Laminar Flow, heating block and refrigerator, Familiarization of CO2 analyzer and CO2 measurement, Preparation of 70% alcohol, cleaning of CO2 incubator, Laminar Flow, Bench top incubators, Monitoring of CO2 and Triple gas cylinder pressures, Monitoring the level of liquid nitrogen in the liquid nitrogen Dewar of sperm and embryo storage tank</p> <p>Good laboratory practice, Tissue culture laboratory, Designing and layout of embryology laboratory, Requirements of embryology laboratory, clean air system, Embryology lab equipment, disposables, culture media used in the laboratory</p> <p>Sterilization methods; autoclave, dry heat sterilization, gas sterilization and gamma radiation, Handling of hazardous and biological samples, Cleaning and maintenance of embryology laboratory, Common lab contaminants-bacteria, fungi and viruses; identification of bacilli and cocci, Gram stain</p> <p>Tissue culture techniques, culture media and formulation, familiarization of embryology lab</p>
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	<p>equipment, embryology lab attire, sterile practice in the embryology laboratory</p> <p>Microscopy: Phase contrast microscope, stereo zoom microscope and inverted microscope</p> <p>Sheep Ovary dissection: identification of follicles on the ovary, isolation of oocyte cumulus complex and separation of oocytes, identification of granulosa cells, cumulus cells, corona cells and zona pellucida.</p> <p>Mitosis, Meiosis, Identification of cells in stained blood smear, blood grouping</p>
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Standard Operating Protocols in the IVF and cell culture laboratory.

Andrology Laboratory Techniques

Practical Paper 2 (8 Credits 12 hours / week)

8 credits (12h/week)

Existing	Proposed changes
Standard Operating Protocols in the IVF and cell culture laboratory.	Andrology Laboratory Techniques (shifted from Semester 2)
<p>What are SOPs; Various SOPs and work instructions in the embryology lab, Function of IVF Centre, Personnel involved and workflow, Maintenance of lab and monitoring equipment, Personnel proficiency, inventory management, Quality control and Quality assurance.</p> <p>Familiarization of digital thermometer, calibration of digital thermometer</p> <p>Temperature monitoring of incubators, Laminar Flow, heating block and refrigerator</p> <p>Familiarization of CO2 analyzer and CO2 measurement</p>	<p>Male anatomy model; Sheep testes dissection and processing, identification of stages of sperm development, identification of sperm and its morphology</p> <p>Semen analysis; normospermic and oligospermic semen samples, calculation of spermatozoa concentration, motility grading, morphology assessment in stained and neat semen samples, assessment of viability, examination for sperm agglutination, differentiation of immature spermatogenic cells and pus cells (peroxidase test), Fructose test to</p>

<p>Preparation of 70% alcohol, cleaning of CO2 incubator, Laminar Flow, Bench top incubators, Monitoring of CO2 and Triple gas cylinder pressures</p> <p>Monitoring the level of liquid nitrogen in the liquid nitrogen Dewar of sperm and embryo storage tank</p> <p>Good laboratory practice, Tissue culture laboratory, Designing and layout of embryology laboratory, Requirements of embryology laboratory, clean air system, Embryology lab equipment, disposables, culture media used in the laboratory</p> <p>Sterilization methods; autoclave, dry heat sterilization, gas sterilization and gamma radiation</p> <p>Handling of hazardous and biological samples</p> <p>Cleaning and maintenance of embryology laboratory</p> <p>Common lab contaminants-bacteria, fungi and viruses; identification of bacilli and cocci, Gram stain</p> <p>Tissue culture techniques, culture media and formulation, familiarization of embryology lab equipment, embryology lab attire, sterile practice in the embryology laboratory</p>	<p>rule out obstructive azoospermia, Tests for antisperm antibodies (Mar test), Sperm DNA fragmentation test, HOST test, Sperm survival test, Hyaluronan binding assay</p> <p>Sperm separation methods; classical swim up method, standard swim up method, gradient method, SEPD method</p> <p>Semen Cryopreservation</p>
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Semester 2

Principles of Genetics and Reproductive endocrinology

2 Credits

Lecture (2 Credits, 2 hours / week)

Existing	Proposed changes- (just re-arrangement)
<p>Mitosis, meiosis, Nondisjunction, Molecular basis of inheritance, DNA ,chromosomes, autosomes and sex chromosomes, Karyotype, Indications for performing a chromosome analysis, Inherited and non-inherited chromosome abnormalities, trisomy, monosomy ,numerical chromosome abnormalities, translocation, deletion, structural chromosome abnormalities, sex chromosome abnormalities, , Reasons for analysing for chromosomal diseases, mutation polymorphism, point mutations, Gene deletion, primer, probe, Genetic counselling, Mendelian inheritance: autosomal recessive, autosomal dominant, X-linked recessive, Atypical Mendelian inheritance: mitochondrial inheritance, dynamic mutations, genomic imprinting, somatic mutation</p> <p>General principles of endocrinology- Hormones and their release; Techniques for studying hormones-Immunoassays, The Hypothalamic pituitary system, Thyroid hormones, Physiology of reproductive hormones, Hirsutism, Primary and secondary amenorrhoea</p> <p>Hormonal regulation of spermatogenesis, testicular function and sex differentiation</p> <p>Hormonal regulation of ovarian cycles & luteal phase defect, implantation and pregnancy</p>	<p>Mendelian Inheritance – Autosomal Recessive, Autosomal Dominant</p> <p>Atypical Mendelian Inheritance: Mitochondrial Inheritance; X-linked Recessive</p> <p>Molecular Basis of Inheritance - DNA;</p> <p>Cell Cycle - Mitosis; Meiosis; Nondisjunction</p> <p>Chromosomes; Autosomes and Sex Chromosomes</p> <p>Karyotyping</p> <p>Indications for Performing a Chromosome Analysis</p> <p>Reasons for Analyzing Chromosomal Disorders</p> <p>Inherited and Non-Inherited Chromosome Abnormalities – Trisomy, Monosomy, Numerical Chromosome Abnormalities;</p> <p>Translocation, Deletion, Structural Chromosome Abnormalities, Sex Chromosome Abnormalities</p> <p>Mutations - Dynamic Mutation; Somatic Mutation; Point Mutation; Gene Deletion;</p> <p>Mutation Polymorphism</p> <p>Primer, Probe</p> <p>Genomic Imprinting</p> <p>Genetic Counselling</p> <p>General principles of endocrinology- Hormones and their release; Techniques for studying hormones-Immunoassays, The hypothalamic</p>

	<p>pituitary system, Thyroid hormones, Physiology of reproductive hormones, Hirsutism, Primary and secondary amenorrhea</p> <p>Hormonal regulation of spermatogenesis, testicular function and sex differentiation</p> <p>Hormonal regulation of ovarian cycles & luteal phase defect, implantation and pregnancy</p>
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Assisted Reproduction

2 Credits

Lecture (2 Credits 2 hours / week)

Existing	Proposed (no changes)
<p>History of assisted reproduction, Gonadotrophins, Ovarian reserve test: antral follicle count, CCCT, AMH test</p> <p>Ovulation induction, In Vitro Fertilization, Premature ovulation, Laparoscopy and Transvaginal ultrasound, Oocyte retrieval, variations of IVF: GIFT, ZIFT, Oocyte and embryo donation & third party reproduction, Surrogacy & Gestational carrier</p> <p>Complications of assisted reproduction; OHSS (Ovarian hyperstimulation syndrome), multiple pregnancy, Fertility drugs and ovarian cancer, oocyte retrieval procedure, multiple pregnancy, miscarriage, ectopic pregnancy, risks associated with ICSI</p> <p>Counselling in ART: Clinical, Embryological, Financial and Psychological counselling</p> <p>Sperm retrieval procedures: PESA/MESA,</p>	<p>History of assisted reproduction, Gonadotrophins, Ovarian reserve test: antral follicle count, CCCT, AMH test</p> <p>Ovulation induction, In Vitro Fertilization, Premature ovulation, Laparoscopy and Transvaginal ultrasound, Oocyte retrieval, variations of IVF: GIFT, ZIFT, Oocyte and embryo donation & third party reproduction, Surrogacy & Gestational carrier</p> <p>Agonist and Antagonist protocols, Stimulation protocols, individualized protocols, Complications of assisted reproduction; OHSS (Ovarian hyperstimulation syndrome), multiple pregnancy & complications, Fertility drugs and ovarian cancer, oocyte retrieval procedure, miscarriage, ectopic pregnancy, risks associated with ICSI</p> <p>Counselling in ART: Clinical, Embryological,</p>

TESA/TESE Success in Assisted Reproduction, Reproductive tourism	Financial and Psychological counselling Sperm retrieval procedures: PESA/MESA, TESA/TESE Success in Assisted Reproduction, Data analysis, Reproductive tourism
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Semester 2

Clinical Embryology Techniques

8 credits

Practical 1 (8 Credits 16 hours / week)

Existing	Proposed (No changes)
<p>Preparing for oocyte retrieval: Studying patient file, calculating the number of tubes and dishes for IVF and ICSI procedure, Labelling of dishes and tubes, adding culture media into the tubes and dishes, equilibration of culture dishes and tubes</p> <p>Day 1: Checking for equilibration of culture media, preparation of lab for oocyte retrieval, arranging necessary disposables in the laminar flow workstation, screening of follicular fluid, identification of oocyte cumulus complex, identification of granulosa cells, separation of cumulus oocyte complex and further culture of oocytes, assessment of fertilization, assessment of cleavage embryos, stage and grading of cleavage stage embryos, blastocyst culture and grading</p> <p>Embryo loading procedures and transfer techniques</p>	<p>Conventional IVF; short & long coincubation, preparing for oocyte retrieval: Studying patient file, calculating the number of tubes and dishes for IVF and ICSI procedure, Labelling of dishes and tubes, adding culture media into the tubes and dishes, equilibration of culture dishes and tubes</p> <p>Day 1: Checking for equilibration of culture media, preparation of lab for oocyte retrieval, arranging necessary disposables in the laminar flow workstation, screening of follicular fluid, identification of oocyte cumulus complex, identification of granulosa cells, separation of cumulus oocyte complex and further culture of oocytes, assessment of fertilization, assessment of cleavage embryos, stage and grading of cleavage stage embryos, blastocyst culture and grading</p> <p>Embryo loading procedures and transfer techniques</p>

	Embryology laboratory maintenance; data analysis and monitoring laboratory performance Trouble shooting in the laboratory
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Clinical Embryology Techniques 8 credits

Cryopreservation Techniques 8 Credits

Practical 1 (8 Credits 16 hours / week)

Existing	Proposed (shifted from Semester 3)
<p>Preparing for oocyte retrieval: Studying patient file, calculating the number of tubes and dishes for IVF and ICSI procedure, Labelling of dishes and tubes, adding culture media into the tubes and dishes, equilibration of culture dishes and tubes</p> <p>Day 1: Checking for equilibration of culture media, preparation of lab for oocyte retrieval, arranging necessary disposables in the laminar flow workstation, screening of follicular fluid, identification of oocyte cumulus complex, identification of granulosa cells, separation of cumulus oocyte complex and further culture of oocytes, assessment of fertilization, assessment of cleavage embryos, stage and grading of cleavage stage embryos, blastocyst culture and grading</p> <p>Embryo loading procedures and transfer techniques</p>	<p>Preparation of cryopreservation solutions, selection of embryos for cryopreservation, setting up of dishes for vitrification & warming, selection of devices for vitrification, process of vitrification and warming, Trouble shooting in vitrification and warming, documentation of patient details and maintenance of patient records on embryos after warming, safety practice in vitrification, selection of blastocysts for vitrification, collapsing blastocoel for vitrification, method of blastocyst vitrification</p> <p>Vitrification of oocytes: preparation of dishes for vitrification, selection of devices for vitrification of oocytes, preparation of vitrification solutions for vitrification, process of oocyte vitrification</p> <p>Semen cryopreservation, cryoprotectants used, epididymal and testicular sperm cryopreservation</p> <p>Ovarian tissue cryopreservation: Harvesting ovary, preparation and processing of ovarian cortex, Vitrification of ovarian cortex, storage of vitrified ovarian cortex, warming of ovarian cortex.</p>

3 Semester

Theory Paper 1: Research Methodology and Preimplantation Genetic Diagnosis

2 credits

Lecture (2 Credits 2 hours / week)

Existing	Proposed-No changes (re-arranged)
<p>Overview of research process Research hypothesis-study design, Types of studies, analysis of data and interpretation Clinical trials, systematic review Literature search and review Ethics in human and animal research, Ethics and scientific conduct Writing manuscript, publication, journal and impact factor Statistics-Estimation of sample size, Comparison of proportions, comparison of means, confidence interval, normal distribution, Chi-square test, t Test, P value, Regression analysis</p> <p>Preimplantation genetics (PGD), overview, Indications; Sex linked disorders, Single gene defects, chromosomal disorders Technical of Biopsy procedures; Polar body biopsy; Cleavage-stage biopsy, Blastocyst biopsy, Cumulus cell analysis Genetic analysis techniques and diagnosis; FISH,,PCR-comparative genomic hybridization, Next generation sequencing, Preimplantation genetic haplotyping Implications of PGD, PGD and religion, Legal aspects in India and rest of the world PGS (pre-implantation genetic screening) and aneuploidy screening</p>	<p>Overview of research process and Research hypothesis Observational study designs, analysis of data and interpretation Process of conducting clinical trials Ethics and scientific conduct in human and animal research Literature search, systematic review and meta-analysis Publication process-Manuscript writing, selection of journal and uploading manuscript impact factor Statistics-variables in statistics, measures of central tendency and dispersions, data distributions, parametric and non-parametric tests, correlation and regression analysis, estimation of sample size, Chi-square test, t Test, P value</p> <p>Preimplantation genetics (PGD), overview, Indications; Sex linked disorders, Single gene defects, chromosomal disorders Technical of Biopsy procedures; Polar body biopsy; Cleavage-stage biopsy, Blastocyst biopsy, Cumulus cell analysis Genetic analysis techniques and diagnosis; FISH,,PCR-comparative genomic hybridization, Next generation sequencing, Preimplantation genetic haplotyping Implications of PGD, PGD and religion, Legal aspects in India and rest of the world PGS (pre-implantation genetic screening) and aneuploidy screening</p>

Theory Paper 2: Principles of Cryopreservation**2 credits**Lecture (2 Credits 2 hours / week)

Existing	Proposed
<p>History of cryopreservation, Principles of cryobiology; cryoprotectants, cryofreezers, Factors affecting freezing, cryopreservation protocols,</p> <p>Embryo cryopreservation; slow freezing method, penetrating and non-penetrating cryoprotectants, Slow freezing method for embryos, vitrification and warming of embryos, Cryoprotectants used in vitrification</p> <p>Oocyte cryopreservation: history, indications, method of cryopreservation of mature and immature oocytes, current status of oocyte vitrification</p> <p>Ovarian tissue cryopreservation; history, current status, future prospects, Ovarian tissue transplantation</p> <p>Cryopreservation of semen and testicular tissue</p> <p>Storage of cryopreserved samples and its safety</p>	<p>History of cryopreservation, Principles of cryobiology; cryoprotectants, cryofreezers, Factors affecting freezing, cryopreservation protocols,</p> <p>Embryo cryopreservation; slow freezing and thawing method, penetrating and non-penetrating cryoprotectants, Slow freezing method for embryos,</p> <p>vitrification and warming of embryos, Cryoprotectants used in vitrification, Vitrification devices, Freeze all strategy, Importance of embryo cryopreservation</p> <p>Oocyte cryopreservation: history, indications, method of cryopreservation of mature and immature oocytes, current status of oocyte vitrification</p> <p>Fertility preservation; Ovarian tissue cryopreservation; history, current status, prospects, In vitro culture of ovarian tissue, Ovarian tissue transplantation and outcome</p> <p>Cryopreservation of semen and testicular tissue</p> <p>Storage of cryopreserved samples and its safety</p>

Practical Paper 1: Intracytoplasmic sperm Injection (ICSI)**8 credits**Practical (8 Credits 16 hours / week)

existing	Proposed changes (No changes)
<p>History of micromanipulation, Operation and maintenance of micromanipulation,</p> <p>Familiarization of different micromanipulators,</p> <p>Advantages and disadvantages of different micromanipulators, microtools: preparation and choice of microtools,</p>	<p>History of micromanipulation, Operation and maintenance of micromanipulation,</p> <p>Familiarization of different micromanipulators,</p> <p>Advantages and disadvantages of different micromanipulators, microtools: preparation and choice of microtools,</p>

<p>Alignment of microtools and troubleshooting, preparation of dishes for micromanipulation, method of stopping sperm motility, method of aspiration of spermatozoa, method of holding oocyte, focusing oocyte and injection pipette, Method of intracytoplasmic sperm injection</p> <p>Assisted hatching; zona drilling, zona thinning, chemical and laser assisted hatching</p> <p>Biopsy procedures: Instrumentation, preparation of laboratory for biopsy procedure, method of biopsy, Acid Tyrode zona drilling, laser zona drilling,</p> <p>Biopsy of polar body, biopsy of blastomeres, trophoctoderm</p>	<p>Alignment of microtools and troubleshooting, preparation of dishes for micromanipulation, method of stopping sperm motility, method of aspiration of spermatozoa, method of holding oocyte, focusing oocyte and injection pipette, Method of intracytoplasmic sperm injection</p>
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Practical Paper 1: Micromanipulation and Embryo biopsy

8 credits

Practical (8 Credits 16 hours / week)

Existing	Proposed changes
<p>History of micromanipulation, Operation and maintenance of micromanipulation,</p> <p>Familiarization of different micromanipulators,</p> <p>Advantages and disadvantages of different micromanipulators, microtools: preparation and choice of microtools,</p> <p>Alignment of microtools and troubleshooting, preparation of dishes for micromanipulation, method of stopping sperm motility, method of aspiration of spermatozoa, method of holding oocyte, focusing oocyte and injection pipette, Method of intracytoplasmic sperm injection</p> <p>Assisted hatching; zona drilling, zona thinning,</p>	<p>Assisted hatching; zona drilling, zona thinning, chemical and laser assisted hatching</p> <p>Biopsy procedures: Instrumentation, preparation of laboratory for biopsy procedure, method of biopsy, Acid Tyrode zona drilling, laser zona drilling,</p> <p>Biopsy of polar body, biopsy of blastomeres, trophoctoderm</p>

<p>chemical and laser assisted hatching</p> <p>Biopsy procedures: Instrumentation, preparation of laboratory for biopsy procedure, method of biopsy, Acid Tyrode zona drilling, laser zona drilling,</p> <p>Biopsy of polar body, biopsy of blastomeres, trophoctoderm</p>	
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4 Semester

Theory Paper 1: New Developments in ART and embryonic stem cells

2 credits

Existing	Proposed changes -No changes
<p>Stem cells and regenerative medicine; adult hemopoietic stem cells, testicular stem cells, embryonic stem cells, induced pluripotent Isolation of ICM (inner cell mass) and derivation of embryonic stem cells, preparation of mouse and human monolayer cells, Placental fibroblast cells, embryonic stem cell culture systems, identification of stem cell colonies, markers of stem cells, stem cell banking.</p> <p>Differentiation of stem cells, potential of stem cells in regenerative medicine, disease conditions stem cells investigated, disadvantages, current problems and future prospects</p> <p>Mitochondrial DNA mutations and diseases; Introduction</p> <p>Prevention of mitochondrial diseases and oocyte reconstruction; Pronuclear transfer technique, Spindle transfer technique, Ethics of oocyte reconstruction, current research</p> <p>Proteomics and metabolomics</p> <p>New embryo culture techniques</p> <p>Embryo editing</p> <p>Current and future developments</p>	<p>Stem cells and regenerative medicine; adult hemopoietic stem cells, testicular stem cells, embryonic stem cells, induced pluripotent Isolation of ICM (inner cell mass) and derivation of embryonic stem cells, preparation of mouse and human monolayer cells, Placental fibroblast cells, embryonic stem cell culture systems, identification of stem cell colonies, markers of stem cells, stem cell banking.</p> <p>Differentiation of stem cells, potential of stem cells in regenerative medicine, disease conditions stem cells investigated, disadvantages, current problems and future prospects</p> <p>Mitochondrial DNA mutations and diseases; Introduction</p> <p>Prevention of mitochondrial diseases and oocyte reconstruction; Pronuclear transfer technique, Spindle transfer technique, Ethics of oocyte reconstruction, current research</p> <p>Proteomics and metabolomics</p> <p>New embryo culture techniques</p> <p>Embryo editing</p> <p>Current and future developments</p>

Theory Paper 2: Regulation and Ethics in assisted reproduction.**2 credits**

Existing	Proposed-No changes
<p>Moral philosophy</p> <p>Regulation in assisted reproduction- ICMR (Indian Council of Medical Research) guidelines and proposed ART bill, PCPNDT act, Surrogacy laws</p> <p>Regulation and ethics in clinical IVF practice; gamete and embryo donation, Research on embryos, sex selection, surrogacy, cloning; reproductive and therapeutic</p> <p>Regulation of gamete banks and gamete donors, Accreditation of ART centres and personnel, Counselling in ART</p>	<p>Moral philosophy</p> <p>Regulation in assisted reproduction- ICMR (Indian Council of Medical Research) guidelines and proposed ART bill, PCPNDT act, Surrogacy laws, Regulations of ART in other countries</p> <p>Regulation and ethics in clinical IVF practice; gamete and embryo donation, Research on embryos, sex selection, surrogacy, cloning; reproductive and therapeutic</p> <p>Regulation of gamete banks and gamete donors, Accreditation of ART centres and personnel, Counselling in ART, Ethics and regulations of embryo editing, Ethics of 3 parent baby, Ethics and regulations of PGD & PGT-A</p>

Research Seminar**4 credits**

Existing	Proposed-No changes
<p>Collection of information, Search engines (PubMed, gene data bank), Preparation of PPT. The student shall present a recently published research paper related to infertility and embryology through power point presentation</p>	<p>Collection of information, Search engines (PubMed, gene data bank), Preparation of PPT. The student shall present a recently published research paper related to infertility and embryology through power point presentation</p>

Project work**10 Credits**

Existing	Proposed-No changes
<p>Project work is designed to provide research experience to the students. The student has to work independently on a research problem related to infertility. The student shall carry out this project in consultation with faculty.</p>	<p>Project work is designed to provide research experience to the students. The student has to work independently on a research problem related to infertility. The student shall carry out this project in consultation with faculty.</p>