

(For the students admitted from the academic year 2024 - 2025 onwards)

S. No.	SUBJECT	Credits	Hours per Week			Marks for		Total Marks
			Lecture	Tutorial	Practical	CIA	ESE	
Course Duration – 1 year								
Semester 1								
Theory								
1	Basics of Embryology	6	4	1	-	25	75	100
2	Andrology	6	4	1	-	25	75	100
3	Research Methodology, ART Regulations and Ethical Practices.	4	3	1	-	25	75	100
Practical								
4	Semen Analysis and Processing Techniques	6	-	-	6	40	60	100
5	Fertility health metric analysis	6	-	-	6	40	60	100
Semester 2								
Theory								
6	Assisted Reproductive Technology	6	5	1	-	25	75	100
Practical & Project								
7	Assisted Reproductive Techniques	6	-	-	6	25	75	100
8	Project	6	-	-	8	60	90	150
Total		46	16	4	26			850
CIA		Continuous Internal Assessment						
ESE		End Semester Examination						
*		General Component: 22 Credits						
^		Skill Component: 24 Credits						

Course code	23CEPBA01	BASICS OF EMBRYOLOGY	L	T	P	C
Core/Elective/Supportive		Core paper - I	4	1	-	5
Pre-requisite		A basic knowledge in cell biology and embryology	Syllabus Version		2024 - 25	
Course Objectives:						
The main objectives of this course are to:						
1. To make students understand the basics of embryonic development,						
2. Acquire overall knowledge on male reproductive system and female reproductive system.						
3. Inculcate the knowledge in embryology and assisted reproductive techniques						
Expected Course Outcomes:						
On successful completion of the course, student will be able to:						
1	Define the process of embryonic development in general				K1	
2	Comprehend male and female reproductive system and their role in fertilization process.				K2	
3	Explain different assisted reproductive techniques.				K3	
4	Understand chromosomes and its significance				K2	
5	Gain knowledge of the structure and function of the major organ system.				K2	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Hours - 75						
<u>Unit – I</u>						
Introduction to Embryology, History of Embryology, Embryology terms, Sub divisions of Embryology, Recent advances and scope of embryology.						
<u>Unit – II</u>						
Introduction to Male Reproductive System: Internal and external genital organs. Gametogenesis; Spermatogenesis; Definition, spermatocytosis, spermiogenesis, maturation, Capacitation and hyper activation of spermatozoa. Hormonal regulation in Male Reproductive System.						

Unit – III

Introduction to Female Reproductive System: Oogenesis; Definition, Oogenesis at different phases of life. Ovarian cycle: pre-ovulatory and post ovulatory phase. Menstrual cycle: Definition, phase of the menstrual cycle, correlation of menstrual cycle with ovarian cycle and endometrial changes. Hormonal regulation in Female Reproductive System.

Unit – IV

Genetics and molecular biology in embryology. Chromosomes; Definition, Haploid and diploid chromosomes, autosomes and sex chromosomes. Chromosome structure and its significance. Karyotyping; Procedure for peripheral blood culture and karyotype. Lyon hypothesis and sex chromatin.

Unit – V

Fertilization; Definition, site, stages and results. Prenatal and Postnatal development.

Reference Books:

1. Devi, V. S. (2023). Inderbir Singh's Human Embryology. JP Medical Ltd.
2. Vishram, S. (2012). Textbook of Clinical Embryology/Vishram Singh.
3. Rao, K. A. (2018). Principles and Practice of Assisted Reproductive Technology: Three Volume Set (Vol. 2). JP Medical Ltd.

Course Designed By: Dr. VM. Thomas, Chairman and Institute Director, Dr. L. Krishnavignesh, Head, Academics and Research, Ms. Deepa.O, Senior Embryologist, Chennai Fertility Centre and Research Institute.

Course code	23CEPBA02	ANDROLOGY	L	T	P	C
Core/Elective/Supportive		Core paper - II	4	1	-	5
Pre-requisite		A basic knowledge in male infertility	Syllabus Version		2024 - 25	
Course Objectives:						
The main objectives of this course are to: 1. Provide basic knowledge on male infertility. 2. Understand the importance of semen analysis in male infertility. 3. Enrich the student’s skills in performing semen analysis, processing and cryopreservation.						
Expected Course Outcomes:						
On successful completion of the course, student will be able to:						
1	Gain fundamental knowledge in male infertility				K2	
2	Learn and interpret WHO laboratory manual				K3	
3	Evaluate semen sample				K5	
4	Perform various semen processing methods.				K3	
5	Perform semen freezing				K3	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Hours - 75						
<u>Unit – I</u>						
Male Infertility: Introduction and Definition. Diagnosis of Infertility; Goal of evaluation, history, physical examination, routine tests, special tests and endocrine evaluation. Genetic in male infertility: chromosomal abnormalities, autosomal gene mutation, gene polymorphism, and X-linked genes. Azoospermia: diagnosis and management. Unexplained infertility.						
<u>Unit – II</u>						
WHO laboratory manual for the examination and processing of human semen; an introduction, reference values. Setting up of andrology lab. Collection of specimens, Evaluation of semen; Macroscopic analysis (liquefaction, appearance, volume, viscosity and pH) and Microscopic analysis (concentration, total sperm count, motility, morphology and vitality). Additional cell types. Sperm grading. Different counting chambers.						

Unit- III

Specialized sperm function test: Biochemical assay, abnormal morphology calculation, ROS, leucocyte detection, sperm vitality test, sperm mucus interaction test, mitochondrial activity index assay, tests for capacitation and acrosome reaction, zona binding assay, sperm penetration assay, nuclear chromatin de-condensation test and sperm DNA fragmentation index.

Unit – IV

Semen processing: Sperm preparation techniques; Simple wash, swim up, density gradient; continuous and discontinuous methods. Infected sample management. Processing of retrograde ejaculation. Processing of Surgically retrieved sperms and frozen samples. Advanced sperm selection methods: PICSI, MACS, and Microfluidics.

Unit – V

Cryopreservation: Principles and procedures, Theory of cryopreservation, Cryoprotectants. Techniques of cryopreservation; Neat and processed sample. Safety issues involved with cryopreservation.

Reference Books:

1. Rao, K. A. (2018). Principles and Practice of Assisted Reproductive Technology: Three Volume Set (Vol. 2). JP Medical Ltd.
2. Gardner, D. K., Weissman, A., Howles, C. M., & Shoham, Z. (Eds.). (2012). Textbook of assisted reproductive techniques fourth edition: volume 2: Clinical perspectives (Vol. 2). CRC press.
3. Saadeldin, I. M. (Ed.). (2022). Advances in Assisted Reproduction Technologies (Vol. 5). Bentham Science Publishers.
4. Coward, K., & Wells, D. (Eds.). (2013). Textbook of clinical embryology. Cambridge University Press.
5. World Health Organization. WHO Laboratory Manual for the Examination and Processing of Human Semen. 6th ed. Geneva: World Health Organization; 2021.

Course Designed By: Dr. L. Krishnavignesh, Head, Academics and Research, Ms. Deepa.O, Senior Embryologist, Ms. R. Abinaya, Embryologist, Chennai Fertility Centre and Research Institute.

Course code	23CEPBA03	Research Methodology, ART Regulations and Ethical Practices.	L	T	P	C
Core/Elective/Supportive		Core paper - III	3	1	-	4
Pre-requisite		A basic knowledge in male infertility	Syllabus Version		2024 - 25	

Course Objectives:

The main objectives of this course are to:

1. Inculcate knowledge about the research.
2. Understand the concept of sampling designs.
3. Gain knowledge on data analysis and sampling techniques.

Expected Course Outcomes:

On successful completion of the course, student will be able to:

1	Learn a basic knowledge of biostatistics and its application in medicine.	K1
2	To know various types of data presentation and data summarization in medical field	K2
3	Explore techniques involved in thesis writing.	K4
4	Interpret and adhere the state, national and international guidelines in ART.	K5
5	Document the day to day proceedings in the embryology lab.	K3

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Hours - 60

Unit – I

Research Methodology: An introduction – Research Design – Measurement and scaling – Fundamentals of Sampling – Data Collection – Scientific reading and writing.

Unit – II

Introduction to Biostatistics- Descriptive Statistics – Data preparation and presentation – Chi square test.

Unit – III

ART regulation 2021 – Surrogacy Act – ASRM – ESHRE – ISAR - Documentation in ART: Consent forms, and Double witnessing and KPI.

Unit – IV

Role of Ethics in health care – Social and ethical responsibilities with regards to patient care – patient Consent

Unit – V

Moral and Ethical objectives in IVF – Gamete Donation – Embryo Donation – 3rd Party Reproduction

Reference Books:

1. Kothari, C. R. (2004). Research methodology: Methods and techniques. New Age International.
2. Gardner, D. K., Weissman, A., Howles, C. M., & Shoham, Z. (Eds.). (2012). Textbook of assisted reproductive techniques fourth edition: volume 2: Clinical perspectives (Vol. 2). CRC press.
3. Rao, K. A. (2018). Principles and Practice of Assisted Reproductive Technology: Three Volume Set (Vol. 2). JP Medical Ltd.
4. Coward, K., & Wells, D. (Eds.). (2013). Textbook of clinical embryology. Cambridge University Press.
5. Cengage Learning Boston, MA, US.
6. Purohit, S.G., Gore, S.D., and Deshmukh, S.R. (2008). Statistics using R, Narosa Publishing House, New Delhi, India

Course Designed By: Dr. VM. Thomas, Chairman and Institute Director, Dr. L. Krishnavignesh, Head, Academics and Research, Chennai Fertility Centre and Research Institute.

Course code	23CEPBAP1	SEMEN ANALYSIS AND PROCESSING TECHNIQUES	L	T	P	C
Practical's		Practical - I	6	-	√	6
Pre-requisite		Skills in andrology	Syllabus Version		2024 - 25	
Course Objectives:						
The main objectives of this course are to:						
1. Train the students on basic tools and techniques required to understand andrology.						
2. To make students independently handle and perform semen analysis, preparation for assisted reproductive procedures.						
3. Ascertain them that subsequent practical would be understandable based on these experiments.						
Expected Course Outcomes:						
On successful completion of the course, student will be able to:						
1	Learn to perform semen analysis.				K4	
2	Prepare semen sample for various IVF techniques.				K3	
3	Perform semen freezing.				K3	
4	Process surgically retrieved sperms.				K4	
5	Differentiate live and dead sperms.				K5	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Hours - 90						
<ul style="list-style-type: none">• Introduction to the lab• Instruments and media used• Health and safety procedures in laboratory• Semen analysis<ul style="list-style-type: none">✓ Macroscopic examination of semen (Volume, color, liquefaction, viscosity, and pH)✓ Microscopic examination of semen (Concentration, motility, morphology and vitality)• Semen preparation methods<ul style="list-style-type: none">○ Simple wash,○ Pelleting method,						

- Swim-up method,
- Density gradient methods
- Sperm survival test
- Semen freezing
- Processing of surgically retrieved sperms (PESA, TESA, TESE samples)
- CASA (Demo)
- DNA Fragmentation (Demo)
- Microfluidics
- QA & QC

Reference Books:

1. World Health Organization. WHO Laboratory Manual for the Examination and Processing of Human Semen. 6th ed. Geneva: World Health Organization; 2021.
2. Saadeldin, I. M. (Ed.). (2022). Advances in Assisted Reproduction Technologies (Vol. 5). Bentham Science Publishers.
3. Rao, K. A. (2018). Principles and Practice of Assisted Reproductive Technology: Three Volume Set (Vol. 2). JP Medical Ltd.
4. Gardner, D. K., Weissman, A., Howles, C. M., & Shoham, Z. (Eds.). (2012). Textbook of assisted reproductive techniques fourth edition: volume 2: Clinical perspectives (Vol. 2). CRC press.
5. Coward, K., & Wells, D. (Eds.). (2013). Textbook of clinical embryology. Cambridge University Press.

Course Designed By: Dr. L. Krishnavignesh, Head, Academics and Research, Ms. Deepa.O, Senior Embryologist, Ms. Abinaya, Embryologist, Chennai Fertility Centre and Research Institute.

Course code	23CEPBAP2	FERTILITY HEALTH METRIC ANALYSIS	L	T	P	C
Practical's		Practical – II	6	-	√	6
Pre-requisite			Syllabus Version		2024 - 25	
Course Objectives:						
<p>The main objectives of this course are to:</p> <ol style="list-style-type: none"> 1. Learn different estimation procedures. 2. Understand the instrumentation used in the lab and to handle it. 3. Gain knowledge on waste management. 						
Expected Course Outcomes:						
On successful completion of the course, student will be able to:						
1	Learn to perform semen analysis.				K4	
2	Prepare semen sample for various IVF techniques.				K3	
3	Perform semen freezing.				K3	
4	Process surgically retrieved sperms.				K4	
5	Differentiate live and dead sperms.				K5	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Hours - 90						
<ol style="list-style-type: none"> 1. Introduction to the lab 2. Instruments and media used 3. Estimation of Fructose 4. Estimation of Zinc 5. Estimation of Copper 6. Estimation of α- glucosidase 7. AMH assay 8. Antisperm- Antibody Assay 9. Testosterone, TSH, LH, E2, P4, FSH (Any 2) 10. Sample / waste management disposal 11. QA & QC 						
Reference Books:						
<ol style="list-style-type: none"> 1. Rao, K. A. (2018). Principles and Practice of Assisted Reproductive Technology: Three Volume Set (Vol. 2). JP Medical Ltd. 						

Course Designed By: Dr.D. Devakumar, Head, laboratory Medicine Chennai Fertility Centre and Research Institute, Dr. L. Krishnavignesh, Head, Academics and Research.

Course code	23CEPBA04	ASSISTED REPRODUCTIVE TECHNOLOGY	L	T	P	C
Core/Elective/Supportive		Core paper – IV	5	1	-	6
Pre-requisite		A basic knowledge in male infertility	Syllabus Version		2024 -25	
Course Objectives:						
The main objectives of this course are to: <div><div>1.</div><div>To impart knowledge on diagnosis and the management of infertility.</div></div> <div><div>2.</div><div>To develop comprehensive knowledge on different grades of embryos.</div></div> <div><div>3.</div><div>To familiarize various cryopreservation techniques.</div></div>						
Expected Course Outcomes:						
On successful completion of the course, student will be able to:						
1	Understand the concepts of infertility and its management.				K2	
2	Grade the embryos.				K3	
3	Gain knowledge of different stimulation protocols and the drugs used in ART.				K2	
4	Understand chromosomes and its significance				K2	
5	Discuss recent developments in ART procedures				K4	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Hours - 90						
Unit – I						
Female factor infertility: ovulatory factor, tubal factors, endometrial factors and uterine factors. Primary ovarian failure. Polygenic complex female infertility. Endocrine causes. Genetic causes in female infertility: chromosomal aberration, single gene disorder and turner’s syndrome. Unexplained infertility.						
Unit – II						
Introduction of IVF. Indication for IVF, Treatment, evaluation and counselling in infertility. Different ART procedures. Patient selection for different ART procedure. Controlled ovarian stimulation-overview.						

Unit – III

Embryonic culture system: Culture media and system, metabolism of embryo, culture condition, Air purification and incubator. Grading of Day2/Day 3 and Day 5 embryo.

Unit – IV

Cryopreservation of oocytes and embryo: slow and rapid freezing. Open and closed system. Oocyte freezing and thawing. Embryo freezing and thawing. Embryo loading and transfer technique.

Unit – V

Pre-implantation genetic screening and diagnosis: History and indication, sources of genetic material, Diagnostic methods, Mosaicism – overview. Genetic counselling in infertility.

Reference Books:

1. Rao, K. A. (2018). Principles and Practice of Assisted Reproductive Technology: Three Volume Set (Vol. 2). JP Medical Ltd. Nayana H patel - Advance Assisted Reproductive Technology - Edit: 01, 2020.
2. Lundin, K., & Ahlström, A. (Eds.). (2021). Manual of Embryo Culture in Human Assisted Reproduction. Cambridge University Press.
3. Agarwal, A., Henkel, R., & Majzoub, A. (Eds.). (2021). Manual of Sperm Function Testing in Human Assisted Reproduction. Cambridge University Press.
4. Coward, K., & Wells, D. (Eds.). (2013). Textbook of clinical embryology. Cambridge University Press. 2020.
5. Elder, K., and Dale, B. (2020). In Vitro Fertilization, Cambridge University. Press ISBN: 9781108611633.

Course Designed By: Dr. VM. Thomas, Chairman and Institute Director, Dr. Smisha Sridev Barathan, Senior consultant, Department of Reproductive Medicine, Dr. L. Krishnavignesh, Head, Academics and Research, Ms. Deepa.O, Senior Embryologist, Chennai Fertility Centre and Research Institute

Course code	23CEPBAP3	ASSISTED REPRODUCTIVE TECHNIQUES	L	T	P	C
Practical's		Practical - III	6	-	√	6
Pre-requisite		Skills in gamete handling	Syllabus Version		2024 -25	
Course Objectives:						
The main objectives of this course are to:						
1. Train students on advance techniques required to understand make students understand the assisted reproductive techniques.						
2. Provide them a base on diverse areas like IVF, ICSI, Cryopreservation and embryo biopsy.						
3. As certain them that subsequent practical would be understandable based on these experiments.						
Expected Course Outcomes:						
On successful completion of the course, student will be able to:						
1	Handle instruments used in ART lab				K2, K3	
2	Prepare media and dishes for ART procedures				K2, K3	
3	Identify and screen oocytes				K3, K4	
4	Perform IVF, ICSI, embryo biopsy and relevant ART procedures				K4, K5, K6	
5	Cryopreserve gametes and embryos, thaw them and subsequently load them for the transfer procedure				K2, K3	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Hours: 90						
● Introduction to the ART lab						
● Media preparation methods						
● Instruments used in ART						
● Dish preparation techniques						
● Oocytes identification and screening						
● Denudation						

- *In vitro* Fertilization (IVF)
- Intra Cytoplasmic Sperm Injection (ICSI)
- Embryo culture and grading
- Cryopreservation
- Oocytes
- Embryos
- Embryo loading
- Embryo biopsy and tubing for Pre-implantation Genetic testing
- QA & QC

Reference books:

1. Rao, K. A. (2018). Principles and Practice of Assisted Reproductive Technology: Three Volume Set (Vol. 2). JP Medical Ltd. Kevin Coward - Textbook of Clinical Embryology - Edit: 01, 2013.
2. Saadeldin, I. M. (Ed.). (2022). Advances in Assisted Reproduction Technologies (Vol. 5). Bentham Science Publishers.
3. Coward, K., & Wells, D. (Eds.). (2013). Textbook of clinical embryology. Cambridge University Press.

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Course code	23CEPBAPW	Project work	L	T	P	C
Project			8	-	√	8
Pre-requisite		Skills in embryology	Syllabus Version		2024 -25	

Students pursuing PG diploma in Clinical Embryology and Pre Implantation Genetics course is required to carry out work on a selected research project under the guidance of the faculty. This is to train post graduate diploma student in research methods and techniques. Project work includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing research study, collection of data, data analysis and comparison of results and finally drawing conclusions.

The project should be written under the following headings

- Introduction
- Aims of objective of the study
- Review of literature
- Material and Methods
- Results
- Discussion
- Conclusion
- Summary
- Tables
- Annexure

For copies of the project report have to be prepared and submitted to the department / university before the final examination date notified and it has to be evaluated by the examiners with project presentation and viva.

