REGULATIONS AND CURRICULUM GOVERNING

M.Sc. CLINICAL EMBRYOLOGY PROGRAM

Implemented in the Academic Year 2024-25

Name of the Constituent Unit: Yenepoya School of Allied Health Sciences

RABBI ZIDNI 'ILMA

YENEPOYA

(DEEMED TO BE UNIVERSITY)

Deralakatte, Mangalore, Karnataka.

NOTIFICATION FROM THE UNIVERSITY

Sl. No.	ACM with date	BOM/BOS with date	Decisions/Approvals
1.	51st ACM/ 16.05.2023	62nd BOM/ 14.06.2023	Proposal accepted to introduce M.Sc. Clinical Embryology program.
2.	58th ACM/ 13.08.2024	4th Executive council/ 10.09.2024	Starting of M.Sc. Clinical Embryology program under the Faculty of Allied and Healthcare Professions and approval of the Curriculum & Regulations.

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1. Preamble

Clinical embryology is a field of medicine that focuses on understanding how the human embryo develops and transforms into a fetus. It is an essential discipline that plays a key role in Assisted Reproductive Technology (ART) and in the diagnosis and treatment of numerous genetic illnesses and developmental anomalies.

It takes a thorough grasp of human anatomy, genetics, and cellular biology to research embryology. It involves the use of modern imaging technology and laboratory procedures to examine and assess the growth and development of embryos. As a preamble to clinical embryology, it is essential to recognize the importance of ethical considerations and patient autonomy in this field. It is crucial to ensure that all procedures and practices adhere to strict ethical guidelines and respect the rights and dignity of patients.

In addition, a thorough understanding of the principles of embryology, including the stages of embryonic development and the mechanisms of cellular differentiation, is necessary to provide safe and effective treatments and interventions.

Overall, clinical embryology plays a crucial role in advancing our understanding of human development and in helping couples overcome infertility and genetic disorders. As such, it isa field that requires ongoing research and collaboration to continue to improve outcomes for patients.

2. Definitions

2.1. Academic Year:

Two consecutive (one odd + one even) semesters constitute one academic year.

2.2. Choice Based Credit System:

The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

2.3. Course:

Usually referred to, as ‘papers‟ is a component of a programme. The courses shall

define learning objectives and learning outcomes. A course shall comprise

lectures/tutorials/laboratorywork/fieldwork/outreachactivities/projectwork/vocationaltraining/ viva/seminars/termpapers/assignments/presentations/self-studyetc.oracombination of some of these.

2.4. Credits:

Credit defines the quantum of contents/syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus, normally in each of the courses, credits will be assigned on the basis of the number of lectures/tutorial laboratory work and other forms of learning required, to complete the course contents minimum of 15-weekschedule: One credit=1hour of lecture per week/two hours of Laboratory or practical/three hours of clinical rotation, field work/posting. All courses need not carry the same credits.

2.5. Programs:

An educational program leading to award of a degree, diploma or certificate.

2.6 . Grade Point:

It is a numerical weight allotted to each letter grade on a10-pointscale.

2.7. Credit Point:

It is the product of grade point and number of credits for a course.

2.8. Cumulative Grade Point Average (CGPA):

It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

2.9.Letter Grade:

It is an index of the performance of students in a said course. Grades are denoted by letters: O+, O, A+, A, B+, P, F.

2.10.Semester Grade Point Average (SGPA):

It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

2.11.Transcript or Grade Card or Certificate:

Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester.

Type of Courses

2.12. Core course: a course that should compulsorily be studied by a candidate as a core requirement is termed as a core course. This is the core requirement to complete the M.Sc. Clinical embryology Program.

2.13. Skill Enhancement Course: These courses are aimed at improving practical, professional & procedural knowledge requirement for carrying the highly skilled task related to the field of study.

2.14. Multidisciplinary Elective: Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline or subject or domain or nurtures the candidate's proficiency skill.

A candidate shall have the freedom to choose Multidisciplinary Elective courses during the academic duration of the particular PG Program offered by Yenepoya (deemed to be) University through the PG departments or SWAYAM/MOOC external online platforms or a mix of courses offered by Yenepoya(deemed to be) University and SWAYAM/MOOC as appropriate.

i. A candidate opting for SWAYAM/MOOC courses shall have the freedom to choose the courses of once own choice and complete such courses before appearing fourth Semester End Examination.

ii. A candidate shall compulsorily submit the pass certificate of each course successfully completed to the controller of examination of Yenepoya (deemed to be) University through the proper channel before appearing the fourth semester end examination.

iii. A candidate opting multidisciplinary elective courses offered by the Yenepoya (deemed to be) University through the PG departments need to take up these courses generally during second and third semesters of the program.

iv. A candidate shall not take the courses offered by the department in which she/he is enrolled.

v. Registration for the multidisciplinary elective courses offered by the Yenepoya (deemed to be) University shall be at least one week prior to the commencement of the course with the CBCS coordinator. The CBCS unit shall notify the list of courses after being approved by the respective BOS. For SWAYAM/MOOC courses shall be as per the enrollment notification by the respective implementation authorities.

Yenepoya (deemed to be) University shall adapt the regulations of UGC governing SWAYAM/MOOC courses as amended from time to time.

3. Eligibility for Admission

The students who have passed with minimum of 50% marks in MBBS / Veterinary graduate(BVSc) / B.Sc. with Reproduction / Zoology / Microbiology / Biochemistry / Biotechnology /Bioscience / Biomedical Science / Physiology / Life Sciences as one of the core specialityfrom institutions where mode of study is a full-time program in universities considered equivalent by Yenepoya (Deemed to be) University are eligible for M.Sc. Clinical Embryology program.
In case of ST/SC/OBC candidates, the minimum mark shall be 45%

4. Duration of the Program

The duration of the program shall extend over 4 semesters (2 academic years) of 15 weeks or more each with a minimum of 90 actual working days of instructions in each semester and 2 – 3 weeks of examinations. The successful completion will lead to Masters' degree in Clinical Embryology

Semester

An academic year shall consist of two semesters;

OddSemester1st&3rd	September/October to February/March
Evensemester2nd&4th	March/April to August/September

5. Maximum period for completion of the Program

A Candidate shall complete the four semesters (two years) program within four years from the date of admission.

6. Aim of the Program

The aim of the M.Sc. Clinical embryology program is to impart advanced knowledge and practical training in embryology , focusing on developmental processes, congenital abnormalities, and clinical applications, to prepare students for research, clinical, and, academic careers.

7. Outcomes of the Program

A clinical embryology course aims to educate students on the fundamental principles and techniques used in the study of embryonic development and reproductive medicine. The primary goal of the course is to equip students with the knowledge and skills required to work
in assisted reproductive technology (ART) and reproductive medicine.
After successful completion of M.Sc. Clinical Embryology Program, students will be able to:
PO 1: Possess and apply scientific and clinical knowledge of embryology in professional practices
PO2: Possess and apply clinical skills to provide quality healthcare services

PO3: Demonstrate ethical values and professionalism in professional practice
PO4: Demonstrate evidence-based approach in clinical practices
PO5: Communicate effectively with patients, colleagues, and other healthcare professionals

Overall, the goals of a clinical embryology course are to provide students with the knowledge and skills necessary to work in a clinical embryology setting and to contribute to the advancement of the field of reproductive medicine through research and collaboration

Program Outcomes:

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and skills necessary to work in a clinical embryology setting and to contribute to the advancement of the field of reproductive medicine through research and collaboration.
Expected skill to be acquired by the end of the programme:
PO 6: Demonstrate knowledge of basic and systemic embryology including human genetics, genetic inheritance and gene regulation.
PO 7: Comprehend normal anatomy and physiology of the male and female reproductive system.
PO 8: Develop a basic understanding of endocrinology.
PO 9: Independently handle semen and its processing for both techniques – Intrauterine Insemination (IUI) and in – vitro fertilization (IVF)
PO 10: Competently handle human gametes in the scenario of IVF and ICSI.
PO 11: Assess viability of embryos and their developmental competence with fair accuracy.
PO 12: Cryopreserve human gametes and embryos, thaw them and subsequently develop them to transfer into the uterus

8.Program Structure

	Broad category of course	Hours/Credits	Course (Title + Course Code)
1.	**Discipline-Specific Courses**		
a)	Theory	**I Semester**	
		45 Hours / 3 Credits	Infertility and Reproductive disorders
		45 Hours / 3 Credits	Cell Biology & Genetics
		45 Hours / 3 Credits	Human Reproductive Anatomy
		45 Hours/ 3 Credits	Reproductive Endocrinology
		45 Hours/ 3 Credits	Biostatistics & Research Methodology
		45 Hours/ 3 Credits	Bioethics
		II Semester	
		45 Hours / 3 Credits	Clinical Embryology
		45 Hours / 3 Credits	Andrology Laboratory Practices
		45 Hours / 3 Credits	Health Care Management
		III Semester	
		45 Hours / 3 Credits	Cryobiology
		45 Hours / 3 Credits	Ethics and Regulations in ART
		45 Hours / 3 Credits	Preimplantation Genetic Testing (PGT)
		45 Hours/ 3 Credits	Assisted Reproductive Technology
		IV Semester	
		-	-

	Broad category of course	Hours/Credits	Course (Title + Course Code)
1.	**Discipline-Specific Courses**		
a)	Practical (SEC)*	**II Semester**	
		200 Hours/8 Credits	Andrology Practical
		100 Hours/5 Credits	Clinical Embryology Practical
		III Semester	
		180 Hours /6 Credits	Assisted Reproductive Technology Practical
		180 Hours/ 6 Credits	Cryopreservation - Practical
2.	**Curriculum Enrichment Courses**		
a)	Research Project	12 credits	Dissertation
3.	**Electives**		
a)	Interdisciplinary Courses	90 Hours/6 Credits	Coursera/Swayam
	Total	**82 Credits**	

SEC: Skill Enhancement Course

9.Attendance

9.1. Each course (theory, practical, clinical etc.) shall be treated as an independent unit for the purpose of attendance. Candidates having minimum 80% attendance in each of the Courses can only qualify to appear for the Semester End Examination. The Candidates with less than 80% of attendance shall be required to repeat that Course by attending the semester.

9.2. There shall be no provision for condonation of shortage of attendance.

9.3. For SWAYAM/MOOC/NPTEL it shall be as per the regulations governing the courses of implementing authority. There shall be no provision for condonation of shortage of attendance.

9.4. The HOD/Course Coordinator through the Dean of Faculties shall announce the names of the candidates who will not be eligible to take the Semester End-Examinations (SEE) in the various courses and send a copy of the same to the Controller of Examinations (COE) Office. Registrations of such candidates for those courses shall be treated as cancelled.

10.Syllabus/Course Contents

I Semester

Course Title: INFERTILITY AND REPRODUCTIVE DISORDERS

Course: Core

Credits: 3 **No. of Hours: 45**

Course Outcomes:

After completing this course the students will be able to:

1. Learn more about the infertility couple screening process.
2. Become familiar with the numerous methodologies and evaluations for infertility, as well as treatment plans.
3. Learn more about various reproductive anomalies.
4. To understand the disorders leading to male and female infertility.

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	7	**Introduction and Histroy**				10%	LE
		1.1. History of embryology	✓				
		1.2.Early Embryonic Development and disorders	✓				
		1.3.History of IVF		✓			
		1.4. Assessment of Infertility	✓				
		1.5.Definition and Types of infertility	✓				
		1.6.Recent trends in ART	✓				
	17	**Infertility Profiling** 2.1 .Psychological evaluation of the infertility couple	✓			20%	LE
		2.2 .Psychotherapy in Infertility	✓				

		2.3 .Counselling of Infertile Couple	✓				
		2.4 Fertile window	✓				
		2.5 Psychological Evaluation for Primary or Secondary infertility.	✓				
		2.6 Recipientcounseling for egg donation,	✓				
		2.7 Embryo donation.	✓				
3	7	**Infertility guidelines** 3.1.Oocyte and sperm donation,	✓			25%	LE, SE
		3.2 eligibility criteria for recipients of sperm,	✓				
		3.3 oocyte or embryo donations,	✓				
		3.4 guidelines for sperm donation	✓				
		3.5 guidelines for oocyte donation	✓				
		3.6 Surrogacy	✓				
		3.7 Adoption	✓				
		3.8 Ethical aspects of Infertility Treatment	✓				
4	8	**Male Infertility**				25%	LE, SE
		4.1.Causes of Male Infertility,	✓				
		4.2 Investigation of Male infertility,	✓				
		4.3 Management of Male infertility:	✓				
		4.3.1 Introduction to Semen Analysis,	✓				
		4.3.2 DFI,	✓				
		4.4Sperm Parameter Defects:	✓				
		4.4.1Azoospermia,	✓				
		4.4.2 Asthenozoospermia,	✓				
		4.4.3 Oligozoospermia	✓				
		4.4.4 Necrozoospermia,	✓				
		4.4.5Teratozoospermia,	✓				

		4.4.6 Globozoospermia	✓				
		4.4.7Cryptozoospermia,	✓				
		4.4.8 Cryptozoospermia,	✓				
		4.4.9Aspermia Pyospermia,	✓				
		4.5TESA/MESA/PESA/TESE procedure,	✓				
5	8	**Female Infertility** 5.1.Causes of Female infertility**,**	✓			20%	SE
		5.2 Investigation of female infertility:	✓				
		5.2.1Hormonal Investigations for FemaleInfertility,	✓				
		5.3 Anatomical assessment:	✓				
		5.3.1.HSG**,**	✓				
		5.3.2. Laparoscopy And USG,	✓				
		5.3.3Management of female infertility,	✓				
		5.3.4Endometriosis,	✓				
		5.3.5 Poor Ovarian Reserve,	✓				
		5.3.6 Premature Ovarian Failure,	✓				
		5.3.7 Drugs used to treat female infertility Anomalies and Infertility	✓				
		6.1 Ovarian anomalies,	✓				
		6.2 Uterine Anomalies and their classification,	✓				
		6.3 Congenital anomalies,	✓				
		6.4Testiculardescent anomalies,	✓				
		6.5 .Congenital anomalies of penis :	✓				
		6.6. Hypospadias,	✓				

		6.7 Epispadias,	✓				
		6.8 Varicocele.	✓				

LE – Long Essay, SE – Short Essay

Reference Books:

1.Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2002). Molecular Biology of the Cell. Garland Science.

2. Cooke, H. J., & Saunders, P. T. (2002). The anatomy of the human testis and scrotum.

3. Advances in Anatomy, Embryology, and Cell Biology, 167, III-IX, 1-120.

4. De Felici, M., & McLaren, A. (2019). Germ cells. Cold Spring Harbor Perspectives in Biology, 11(11), a034693. 6. Johnson, M. H., & Everitt, B. J. (2018). Essential Reproduction. John Wiley & Sons.

5.Gardner, R. L. (2020). The early blastocyst is bilaterally symmetrical and its axis of symmetry is aligned with the animal-vegetal axis of the zygote in the mouse. Development, 147(9), dev184689.

6. Gurdon, J. B., & Bourillot, P. Y. (2001). Morphogen gradient interpretation. Nature, 31413(6858), 797-803.

7. Gellersen, B., & Brosens, J. J. (2014). Cyclic decidualization of the human endometrium in reproductive health and failure. Endocrine Reviews, 35(6), 851-905.

8. Pijnenborg, R., Vercruysse, L., Hanssens, M., & Brosens, I. (2006). Human placental bed research: a review. Placenta, 27, S49-S58. 13. Scott, R. T., Upham, K. M., Forman, E. J., & Zhao, T. (2013). Treating infertility with assisted reproductive technologies: an overview of cochrane reviews. Chinese Journal of EvidenceBased Medicine,

9.(2), 172-176. 14. Waddington, C. H. (2012). The epigenotype. International Journal of Epidemiology, 41(1), 10-13

Course Title: CELL BIOLOGY AND GENETICS

Course: Core

Credits: 3 No. of Hours: 45

Course Outcomes:

After completing this course the students will be able to:

•To understand the fundamental concepts and principles of cell biology, including the structure and function of cells, organelles, and biomolecules.

•To learn the processes involved in cell division, growth, and differentiation.

•To understand the mechanisms of gene expression and regulation.

•To learn the fundamental principles of genetics, including inheritance patterns and genetic disorders.

•To develop an understanding of the role of genetics in human health and disease.

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	5	**Introduction to Cell Biology**				10%	LE, SE
		1.1Overview of cell biology and its significance in biological sciences	✓				
		1.2 History of cell biology,	✓				
		1.3 Cell structure and function,	✓				
		1.4 Prokaryotic and eukaryotic cells	✓				
		1.5 Membrane structure and transport mechanisms	✓				
2	10	**Biomolecules** 2.1. Structure and function of carbohydrates,	✓			20%	LE, SE

		2.2. Structure and function of lipids,		✓			
		2.3. Structure and functionof proteins,		✓			
		2.4Structure and function of nucleic acids**,**					
		2.5 Enzymes and catalysis	✓				
3	5	**3: DNA Replication** 3.1. DNA structure and organization**,**	✓			25%	LE, SE
		3.2 DNA replication mechanisms	✓				
4	5	**DNA as the genetic material** 4.1Structure,	✓			20%	LE,SE
		4.2. replication,	✓				
		4.3. gene expression	✓				
		4.3.1.transcription,	✓				
		4.3.2. Translation,	✓				
		4.3.3. recombination.	✓				
5	10	**Genetics and Inheritance**				15%	LE,SE
		5.1 Mendelian genetics					
		5.2Chromosomal theory of inheritance,	✓				
		5.3Non-Mendelian inheritance	✓				
6	10	**An over view of different types of Microscopy**				10%	SE
		6.1 Phase contrast**,**	✓				
		6.2Fluorescence**,**	✓				
		6.3Electron and Confocal microscopy	✓				

LE – Long Essay, SE – Short Essay

Reference Books:

1.Alberts, B., A. Jhonson, J. Lewis, M. Raff, K. Roberts & P. Walter 2008. Molecular Biology of the cell. V Ed. Garland Science, New York.

2. Brachet, J. 1985. Molecular Cytology, Academic Press, N. Y.

3. Furukawa, R., & M. Fechheimer. 1997. The structure, function & assembly of actin filament bundles. Int.Rev. Cytol. 175: 29-90.

4. Strickberger M. W. 1996. Genetics. Mac Millan Publishing Co. NewYork

5. Brooker, R. J. 1999. Genetics: Analysis and Principles. Benjamin Cummings, Longman, INC.

6. Griffiths,AJF, Wessler SR, Lewontin RC, Gelbart WM and JH Miller 2005, Introduction to genetic analysis W.H. Freeman and Company, New York.

7. Simmons S 2006, Principles of genetics, 4th Edition, John Wiley & Sons (Asia) Pte Ltd. New Jersey

Course Title: HUMAN REPRODUCTIVE ANATOMY

Course: Core

Credits: 3 No. of Hours: 45

Course Outcomes:

At the end of the Course, the students will;

- Demonstrate comprehensive knowledge and understanding of gross and microscopic structure of the human cell and its organelles.
- Comprehend normal anatomy and physiology of the male and female reproductive system

Course Content

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
1	7hours	**I: Basic Human Embryology**				10%	SE
		1.1 Formation of Germ Layers,	✓				
		1.2 Differentiation of Two Sexes – Male and Female,	✓				
2	7hours	2.Gametogenesis,	✓			15%	SE
		2.1 Meiosis**,**	✓				
		2.2 Implantation and placentation	✓				
3	8 hours	3.1 Preimplantationembryo development**,**	✓			15%	LE,SE

		3.2 Development of various organs					
4	**7 hours**	4.1 **Anatomy of Male Reproductive System**	✓			15%	**LE,SE**
		4.2 Anatomy of Female Reproductive System	✓				
5	**8hours**	**Physiology of Ovulation,**	✓			25%	**LE,SE**
		5.1 Folliculogenesis,	✓				
		5.2 Physiology of Menses,	✓				
		5.3 Hormonal control of human reproduction	✓				
		5.4 Ovarian Hyper stimulation syndrome (OHSS)	✓				
		5.5 Complication of stimulation	✓				
6	**8hours**	**Physiology of Sperm**				20%	**LE,SE**
		6.1 Andrology,	✓				
		6.2 Ultra Structure of sperm Spermatogenesis,	✓				
		6.3 Hormonal Control of Spermatogenesis,	✓				
		6.4 Spermiagenesis	✓				
		6.5 Male Factor.	✓				

REFERENCE BOOK

1,Jones RE, Lopez KH. Human reproductive biology. Academic Press; 2013 Sep 28.
2. Segal SJ. The physiology of human reproduction. Scientific American. 1974 Sep 1;231(3):52-63.
3. Wood JW. Dynamics of human reproduction: biology, biometry, demography. Routledge; 2017 Sep 29.

Course Title: Reproductive Endocrinology

Course: Core

Credits: 3 **No. of Hours: 45**

Course Outcomes:

At the end of the Course, the students will;

- Develop competency in reproductive endocrinology, including an understanding of thehormonal regulation of the reproductive system, the diagnosis and management of reproductivedisorders, and the application of reproductive technologies in treating infertility.
- Knowledge of various reproductive disorders, including infertility, PCOS, endometriosis, and
- disorders of sexual development.

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
1	7hours	**1.**Normal and Abnormal Sexual Development	✓			10%	SE
		1.1. Normal and abnormal sexual differentiation and the differential diagnosis of ambiguous genitalia	✓				
2	7hours	2. Normal and Abnormal Growth and Pubertal Development	✓			10%	SE
		2.1The Physiology of puberty, retarded sexual maturation and growth problems in adolescents	✓				

3	7 **hours**	3. Hormones and their Functions	✓			10%	**LE,SE**
		3.1 Hypothalamic pituitary function and thyroid hormone function	✓				
4	**8 hours**	**4.** Male and Female Reproductive Endocrinology	✓			15%	**LE,SE**
5	**8hours**	5.Reproduction and Adrenal	✓			20%	**LE,SE**
		5.1 Normal adrenal function, clinical and endocrine features of adrenal disorders	✓				
6	**8hours**	**Physiology of Sperm**	✓			15%	**LE,SE**
		6. Hirsutism and Amenorrhea	✓				
		6.1 Evaluation and management of hirsutism, diagnosis and management of amenorrhea.	✓				
7		7. Hormonal Disorders	✓			10%	**LE,SE**
		7.1Chronic Anovulation and Polycystic Ovary Syndrome					

Reference Books:

1. Speroffs Clinical Gynecologic Endocrinology and Infertility 9th Edition 2020.

BIOSTATISTICS AND RESEARCH METHODOLOGY

Course Outcome:

At the end of the Course, the students will be able to

- To Understand the Statistical Terms.
- To Possess Knowledge and Skill in the use of Basic Statistical and Research Methodology

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
1	**6 hours**	**1. Introduction** 1.1 Introduction to biostatistics &research methodology, types of variables & scales of measurements, measure of central tendency & dispersion, rate, ratio, proportion, incidence & prevalence	✓			5%	**LE,SE**
2	**3 hours**	2. **Sampling** 2.1 Population & Sample, Sampling and non-sampling errors and methods of minimizing these errors, Random and non-random sampling, different sampling techniques – simple random, stratified,	✓			10%	**LE,SE**

		systematic, cluster& multistage.					
3	**3 hours**	3. **Sampling distributions** 3.1 Parameter and Statistic. Standard error. Basic probability distributions - Normal, poisson, binomial distributions with their applications in biological sciences.	✓			5%	**SE**
4	**6 hours**	**4. Tests of significance** 4.1 Basics if testing of hypothesis – Null & Alternative hypothesis, type 1 and type II errors, level of significance (parametric) & power of the tests, p value, Confidence interval. Tests of significance – T test (paired &UN paired), Chi square test & Test of proportion, One way analysis of variance. Repeated measures analysis of variance. Tests of significance (non-parametric) – Mann – Whitney U Test, Wilcoxon Test, Kruskal – Wallis Analysis of	✓			15%	**LE,SE**

		variance, Friedmann's Analysis of variance					
5	**3 hours**	**5. Correlation and regression** 5.1 Linear correlation by Karl Pearson and rank order correlation due to Spearman, Testing the significance of correlation co efficient, simple linear regression – estimation & testing, residual plots, multiple linear regression.	✓			15%	**LE**
6	**2 hours**	**6. Samplesize determination** 6.1.General concept. Sample size for estimating means and proportion, testing of difference in means and proportions of two groups.	✓			5%	**SE**
7	**2 hours**	**7. Study designs**	✓			10%	**SE**

		7.1.Epidemiological methods – case series analysis and prevalence studies. Analytical epidemiological methods – case control and cohort studies. Clinical trials / intervention studies, odds ratio and relative risk, stratified analysis					
8	**2 hours**	**8.Multivariate analysis** 8.1Concept of multivariate analysis, introduction to logistic regression and survival analysis	✓			15%	**LE,SE**
9	**1 hours**	**9.Reliability and validity of diagnostic tests** 9.1Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV), ROC curve.	✓			10%	**LE,SE**
10	**1 hours**	**10.Format of scientific documentations** 10.1 Structure of research protocols, structure of thesis/research report, formats of reporting in scientific journals. Systematic review and meta-analysis.	✓			10%	**LE,SE**

Reference Books:

1. Rao NSN: Applied statistics in health sciences, JP publishers
2. Mahajan B.K: Methods of biostatistics, Kothari book depot, A.D Marg, Bombay
3. Potti L.R: A text book of statistics, Yamuna publications, Sreekanteshwaram,
4. Trivandrum.
5. Lancaster H.O: Introduction to medical statistics, Johnwiley& sons, New York.
6. Leius A.E: Biostatistics, Reinhold publishing Co, New York.
7. Cotton T: Statistics in medicine, Little Brown & Co, Boston.
8. Hill A.B: Principles of medical statistics, Oxford University press, New York

Course Title: BIOETHICS

Course: Core

Credits: 3 **No. of Hours: 45**

Course Outcomes:

At the end of the Course, the students will be able to

Course Objectives:

• Locate the importance of bioethics in health care and research

• Understand the ethical principles and theories
• Identify ethical issues in healthcare setting and their possible solutions
• Analyze the ethical issues in specific clinical settings
• Apply ethical principles in clinical research
• Locate the importance of healthcare provider- patient relationship.

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	40	**Introduction to bioethics** **1.1 Definition and scope of bioethics**	✓			50%	LE,SE
		1.2. History of bioethics	✓				
		1.3.Codes of ethics	✓				
2		2.1.Ethical principles	✓				
		2.2.Ethical theories and their	✓				
		2.7 Application of ethical theories and principles in			✓		

		healthcare					
3		**Ethics in healthcare**	✓				
		3.1. Consent	✓			25%	LE,SE
		3.2.Risk: benefit analysis	✓				
		3.3 Distributive justice	✓				
		3.4Privacyand confidentiality	✓				
		3.5 Stigma and discrimination	✓				
		3.6 Health technology assessment	✓				
		3.7 Public health ethics	✓				
4		Specific ethical issues in healthcare				15%	LE,SE
		4.1 End of life care and euthanasia					
		4.2 Artificial reproductive techniques					
		4.3 Medical termination of pregnancy					
		4.4Pre-natal sex determination					
		4.5 Organ donation					
		4.6 Medical errors and truth telling					
		4.7 Medical negligence and malpractice					
5		Research ethics				10%	LE,SE
		5.1 Research ethics principles					
		5.2 Informed consent					
		5.3 Vulnerability in research					
		5.4 Responsible conduct of research					
		5.5 Publication ethics					

REFERNCE

1.English DC. Bioethics a Clinical Guide for Medical Students.

2. Tayaoe M.C. Textbook of Medical Bioethics, Attitude and Communication for Medical Students; 2016 Feb 28

3. Princy Louis Palatty. A Textbook of Bioethics for Healthcare Professionals 1st Edition; 2018

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(DEEMED TO BE UNIVERSITY)

II Semester

Course Title: CLINICAL EMBRYOLOGY

Course: Core

Credits: 3 No. of Hours: 45

Course Outcomes:

After completing this course the student will be able to:

To provide an overview of the fundamental concepts and principles of embryology, including the development of the human embryo from fertilization to birth.

• To understand the mechanisms of cell differentiation, tissue formation, and organogenesis during embryonic development.

• To learn the various stages of human embryonic development and their associated morphological changes.

• To gain an understanding of the genetic and environmental factors that affect embryonic

Development

Course Content:

Unit	Hrs.	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	6	1.Introduction to Assisted Conception:	✓			10%	SE
		1.1Timed Intercourse	✓				
		1.2Intra Uterine Inseminiation	✓				
		1.3Ovulation Induction	✓				
		1.4IVF	✓				
		1.5ICSI	✓				
		1.6Physiology	✓				

		1.7The importance of embryology in medicine	✓				
2	6	2.Gametogenesis .		✓		5%	LE,SE
		2.1.Meiosis and gametogenesis in males and females,		✓			
		2.2.Spermatogenesis and oogenesis, genetic basis of gametogenesis,	✓				
		2.3.Environmental factors affecting gametogenesis	✓				
3	8	**3.Fertilization**				20%	SE
		3.1.Process of fertilization	✓				
		3.2.Sperm Capacitation and Hyper activation,	✓				
		3.3.mechanisms of sperm-egg interaction Acrosome reaction and cortical reaction	✓				
		3.4.oocyte activation,	✓				
		3.5.Formation of Pronuclei	✓				
		3.6.Factors affecting fertilization**.**	✓				
4	7	4.1. Cleavage and Blastocyst Formation	✓			20%	LE,SE
		4.2.Stages of cleavage and blastocyst formation	✓				
		4.3.cellular and molecular mechanisms of cleavage	✓				
		4.4.Zygote, OCC, Oocyte, cleavage and Blastocyst grading.	✓				
5	6	5.Implantation and Placenta Formation	✓			15%	LE,SE
		5.1.The process of implantation	✓				
		5.2.Role of trophoblast and endometrium in implantation	✓				
		5.3.Molecular Basis Of Implantation	✓				
		5.4.The structure and function of the placenta,	✓				

		5.5.Placental hormonesynthesis and function.	✓				
6		6.Embryo culture system	✓			20%	LE,SE
		6.1.Culture Media and Components	✓				
		6.2.Single Step and Sequential Culture System for Embryos	✓				
		6.3.Factorsaffecting the growth of embryos	✓				
		6.4. Oxygen, carbon-di-oxide, pH, temperature, Toxins, light, Embryo density,	✓				
		6.5.Quality Control	✓				
7		7.Implantation Failure	✓			10%	LE,SE
		7.1.Reasons for Implantation Failure: Luteal Phase defects, Polyps, Asherman's Syndrome	✓				
		7.2.Thrombophilia and immunological factors Methods for improving implantation failure	✓				
		7.2.1Endometrial Scratching, Endometrial receptivity assay, PRP treatment	✓				

LE – Long Essay, SE – Short Essay

Reference Books:

1. Text book of Assisted Reproductive Technologies (ART) 2rd Edition, by Gardner 2009.

2. Invitro Fertilization, a Practical Approach, by Gardner 2007.

Course Title: Andrology Laboratory Practices

Course: Core

Credits: 3 No. of Hours: 45

Course Outcomes:

After completing this coursethe students will be able to:

To understand the clinical diagnosis and management of male infertility, including the interpretation of laboratory tests and imaging studies, and the design of treatment plans.

• To understand the semen collection and preparation techniques.

• To understand the semen analysis and sperm function tests.

• To gain knowledge on advanced sperm analysis techniques

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	8	1.Introduction to Andrology Laboratory	✓			10%	SE
		1.1.Set up of Andrology Lab	✓				
		1.2.Lab Maintenance and SOP	✓				
		1.3.Instrumentation and Consumables,	✓				
		1.4.Labcleaning protocols and Sterility	✓				
		1.5.Performance checklists	✓				
2	9	2.Semen Examination	✓			20%	LE,SE
		2.1.Semen collection and delivery					
		2.2.sperm motility assessment,					
		2.3.sperm counting chambers					
		2.4.sperm vitality and morphology					
		2.4.1.advanced semen analysis					

		2.4.2Computer- Aided Sperm Analysis (CASA), SQA					
3	7	3.Sperm Function Tests	✓			20%	LE,SE
		3.1.Sperm DNA Damage and Function Tests :	✓				
		3.1.1.SCD, TUNEL, SCSA,MAR, Immunobead test Fructose test, HOS, Eosin and Nigrosine test ROS, Peroxidase test	✓				
4	8	4.Sperm Preparation Techniques	✓			20%	LE,SE
		4.1. Introduction, choice of methods depending on the sample:	✓				
		4.1.1Density Gradient, Simple Wash, Swim Up, Microfluidics, MACS,	✓				
		4.1.2preparation of HIV/HBV infected Semen sample,	✓				
		4.2.disposal of samples	✓				
5	6	Preparation of Surgically Retrieved Spermatozoa and its Preservation	✓	✓		20%	LE,SE
6	7	6.Andrology Laboratory Safety	✓	✓		10%	LE,SE
		6.1.Potential Biohazards in Andrology lab,					
		6.2.Safety procedures of laboratory equipment's					
		6.3.Licensing of Level 1 ART clinics,					
		6.4.Licensing authorities: NABH, ICMR, ESHRE, ASRM					

LE – Long Essay, SE – Short Essay

Reference Books:

1. World Health Organization. WHO laboratory manual for the examination and processing of humansemen, 5th ed. Geneva: World Health Organization, 2010.

2. Agarwal A, Cho C-L, Esteves SC. Standardization and quality control of sperm concentration,sperm motility, and sperm morphology assays in a multicenter research network. Fertile Steril.2013;100(1):78-87.

3. Evenson DP, Darzynkiewicz Z, Melamed MR. Simultaneous measurement by flow cytometry ofsperm cell viability and mitochondrial membrane potential related to cell motility. J HistochemCytochem. 1982;30(3):279-280.

4. De Vantéry Arrighi C, Belloc S, Hammou JC, et al. Computer-aided sperm analysis (CASA) in the assessment of human male fertility: accuracy and reliability of different systems. Hum Reprod.2001;16(4):759-768.

5. A Practical Guide to Basic Laboratory Andrology, Second Edition, Mortimer D et.al, 2022.

Course Title: Health Care Management

Course: Core

Credits: 3 **No. of Hours: 45**

Course Outcomes:

After completing this coursethe student will be able to:

• Concepts of Hospitals – The student will gain knowledge about hospital administration & planning.

• Workflow in hospitals - Enumerate and identify various Clinical Services like OPD, IPD, ward Management, OT, Emergency, disaster Management and ICU.

• Organizational Structures - To learn to meet special challenges posed by human behavior in workplace of 21st century

• Quality management - To create an awareness about the process of applying for and implementing various accreditation process in healthcare facilities.

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	3	1. Hospital Structure	✓			10%	LE, SE
		1.1.Introduction to Hospitals, Healthcare & Medical Care,	✓				
		1.2.Rationale of Hospital Administration	✓				
		1.3.History of Hospitals, Public Health Delivery system in India,	✓				
		1.4.Types of Hospitals,	✓				
		1.5. Voluntary Health Organizations	✓				
2	2	2.Management of Healthcare Organizations	✓			15%	LE, SE

		2.1Introduction to Management,	✓				
		2.1.1. Evolution& Theories of Management	✓				
		2.1.2Management Functions:	✓				
		2.1.3Planning Organizing Controlling Decision Making Staffing Techniques in Management	✓				
3	2	3.Social Identity Theory Organizational Culture Communications in an Organization	✓			10%	LE, SE
		3.1The Importance of Interpersonal skills,	✓				
		3.1.1Organizational Behavior Scope & Process of OB Structure & theories Motivation - Abraham Maslow's hierarchy of needs theory,	✓				
		3.1.1.Theory X & Y. Contemporary theories of motivation.	✓				
		3.2.Foundations of Group Behavior – Formal Vs Informal	✓				
4	3	4.Management and Health Economics	✓			10%	SE
		4.1. Demand& Supply	✓				
		4.2.Nature of Costs	✓				
		4.3. Marginal cost and breakeven analysis	✓				
		4.4.Marketstructure:Business&Government	✓				
		4.4.1Role of Government	✓				
5	5	5.Accounting for Hospital Management	✓			15%	LE, SE
		5.1. Budgeting& Budgetary control - Classification of budget, P & L,	✓				

		Balance Sheets Types of Accounts, Debit & Credit					
		5.1.Financial Statement Analysis	✓				
6	5	5.Concept of Hospital	✓			20%	LE, SE
		5.1Departmentation in Hospital Outpatient	✓				
		5.2.Inpatient Services	✓				
		5.3.Intensive Care Unit	✓				
		5.4. Emergency Services Laboratory Radiology	✓				
		5.5.Organizing of support services	✓				
		5.6.Utility Services Evaluation of Hospital services	✓				
		5.7. Hospital Statistics Hospital Information Systems	✓				
		5.8.Issues related to 5.9.Healthcare technology, Planning, Infrastructure	✓				
7	5	6.1. Evolution of Quality management	✓			20%	SE
		6.2. Quality Management Tools & methods	✓				
		6.3.Quality certification & Accreditation – NABH, NABL	✓				

LE – Long Essay, SE – Short Essay

Reference Books:

1.Prasad LM. Principles and practice of management. Sultan Chand & Sons; 2020 Oct 1.

2. Robbins SP, Judge TA, Vohra N. Organizational behaviour by pearson 18e. Pearson Education India; 2019.

3. Sakharkar B. M. Hospital planning & administration. Jaypee Brothers Medical Publishers Pvt.Limited, 2008 Dec 1.

4. Francis CM, De Souza MC. Hospital administration. Jaypee Brothers Medical Publishers; 2000.

5. Kulkarni GR, Satyashanker P, Anil Gomes L. Financial management for hospital administration. Jaypee Brothers Medical Publishers Pvt. Limited, 2009

Course Title: Andrology Practical

Course: Core

Credits: 8 No. of Hours: 200 hrs

Course Outcomes:

After completing this course the student will be able to:

. To understand the principles of semen analysis
• To learn about the various diagnostic tests used in andrology
• To develop skills in performing clinical procedures

Course Content:

Unit	Hrs 200	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1		1. Abnormalities in sperm	✓			25%	-
2		2.Semen Examination with Kruger's Criteria	✓			75%	-
		2.1.Test for sperm morphology and vitality	✓				
		2.1.1Sperm Functional Tests: Hypo osmotic swelling test (HOST), DNA fragmentation test	✓				
		2.1.2.Semen Fructose test	✓				
		2.1.3.Semen preparation techniques for IUI, IVF, ICSI	✓				
		2.1.4.Sperm processing of surgically retrieved samples	✓				
		2.1.5.Preparation of retrograde ejaculated samples	✓				
		2.1.6.Preparation of Infected (HIV/HBV) samples	✓				

Course Title : Clinical Embryology Practical

Course: Core

Credits: 5 **No. of Hours: 100 hrs**

Course Learning Objectives:

1. 1.Develop knowledge about the fundamental role in folliculogenesis, IUI preparation and types of sperm surgical retrieval techniques.
2. Acquire knowledge about the molecular basis of capacitation and fertilization
3. 3.Acquire basic knowledge controlled ovarian stimulation, skills in Ovum pickup and embryotransfer.
4. To introduce the fundamentals of all ART procedures.

Course Content:

In the Practicals the student will get experience in various aspects in andrology and embryology under the supervision of experienced professionals and is expected to work and contribute in the IVF lab .

Unit	Hrs 100	Content	Must Know	Good to Know	Desirable to Know	Weightage
1		Preparation for IVF procedure	✓			10%
2		Culture Medium in ART and culture system	✓			10%
3		Dish Preparation for IVF/ ICSI	✓			10%
4		Sperm concentration calculation and insemination in IVF	✓			10%
5		Follicular Fluid screening and oocyte identification	✓			15%
6		Oocyte Quality and fertilization Check	✓			10%
7		Pronuclear grading	✓			10%
8		Cleavage stage grading	✓			10%
9		Blastocyst grading and blastocyst culture pros and cons	✓			10%

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III Semester

Course Title: Cryobiology

Course: Core

Credits: 3 **No. of Hours: 45**

Course Outcomes:

After completing this course the student will be able to:

1.Provide an updated scenario of the functional molecular interactions that can be impaired during cryopreservation (also altering epigenetics). The course will focus also on the protein/protein and protein/lipid interactions that can give a functional modulation of gametes.

2. Describe the gametes biology at physiological and low temperatures.

3. Describe the applications of gametes cryoconservation techniques.

4. To introduce the fundamentals of computational modeling in cryobiology.

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	5	Fertility preservation				10%	SE
		1.1.Introduction,	✓				
		1.2.Indications and Contraindications for Fertility Preservation,	✓				
		1.3.Tests to determine Reproductive functions and Fertility,	✓				
		1.4.Fertility Preservation counselling	✓				
2	6	Ovarian And Testicular Tissue Cryopreservation	✓			15%	LE,SE
		2.1.Preparation of Ovarian Tissue,	✓				
		2.2.Sectioning of Ovarian Cortex,	✓				
		2.3.Cryoprotectants and Protocol.	✓				

		2.4.Storageand Maintenance.	✓				
		2.5. Pre Pubertal Testicular Tissue Cryopresevation	✓				
3	8	Sperm Cryopreservation:				20%	LE,SE
		3.1.Sample Collection		✓			
		3.2.Cryoprotectants,	✓				
		3.3.Procedure for Cryopreservation and Storage	✓				
		3.4.Different types of sperm freezing techniques,	✓				
		3.5.Equipments required for sperm freezing,	✓				
		3.6.Cryopreservation of surgicallyretrieved spermatozoa,		✓			
		3.7.composition of semen Freezing media,	✓				
		3.8.Sperm Thawing.	✓				
4	10	Embryo Freezing				25%	LE,SE
		4.1.Slow freezing,	✓				
		4.2. Rapid freezing and ultra rapid freezing,	✓				
		4.3.Embryo Cryopreservation and Thawing:	✓				
		4.4.Vitrification and thawing media and composition,	✓				
		4.5.Vitrification devices,	✓				
		4.6.oocyte and embryo Vitrification,	✓				
		4.7.settings and equilibration of thawing media.	✓				
5	8	Consent forms for freezing				15%	LE,SE
		5.1. Thawing,	✓				
		5.2. Egg Donation,	✓				
		5.3.Embryo donor,	✓				
		5.4.Shipping of Embryos,	✓				
		5.5.Discard of embryos,	✓				

		5.6.screening of donors,	✓				
		5.7.screening of oocyte donors,	✓				
		5.8.safety and regulations to protect oocyte donors,	✓				
		5.9.Long term provisions made for oocyte donors,	✓				
		5.10.donors, Anonymity of sperm and oocyte donors.	✓				
6	8	Cryobank				15%	LE,SE
		6.1.Set up of Cryobank,	✓				
		6.2. Equipments required,	✓				
		6.3.Cleaning and Maintenance,	✓				
		6.4.Ethics and ART rules surrounding cryobank,	✓				
		6.5.Liquid Nitrogen and Cryotank	✓				
		6.6.Liquid nitrogen and Handling.	✓				

Reference Books:

1. Gardner, D. K., & Weissman, A. (2017). How to prepare sperm and eggs for fertilization invitro. Reproductive Endocrinology and Infertility: Integrating Modern Clinical and Laboratory Practice, 217-223.

2. Palermo, G., & Neri, Q. V. (2017). ICSI: intracytoplasmic sperm injection. In Reproductive Endocrinology and Infertility: Integrating Modern Clinical and Laboratory Practice, 225-233.

3. Alpha Scientists in Reproductive Medicine and ESHRE Special Interest Group of Embryology.(2011). The Istanbul consensus workshop on embryo assessment: proceedings of an expert meeting.Human reproduction, 26(6), 1270-1283.

4. Tournaye, H., Verheyen, G., Albano, C., Camus, M., Van Landuyt, L., Devroey, P., & Van

Steirteghem, A. (1995). Intracytoplasmic sperm injection versus in vitro fertilization: a randomized controlled trial and a meta-analysis of the literature. Fertility and sterility, 64(2), 357-361.

5. Herraiz, S., Buendía, P., Rodríguez, A., Romero, A., Rodríguez, M., Gallardo, E., ... &Pellicer, A. (2018). Improving ICSI: a review from the spermatozoon perspective. Reproductive biomedicine online, 37(4), 430-446.

6. Kaser, D. J., Racowsky, C., & Witkin, S. S. (2017). Time-lapse imaging of development invitro: current status, future directions. Fertility and sterility, 108(4), 567-575.

Course Title: Ethics and Regulation in ART

Course: Core

Credits: 3 **No. of Hours: 45**

Course Outcomes:

After completing this course the student will be able to:

1.To be able to appreciate the value of quality control in ART laboratories.
2. To be knowledgeable about risk management, regulation, licensing, and accreditation.
3. Become familiar with the rules and ethics of Assisted Reproduction Technology (ART).
4. Be familiar with the setup of ART laboratories in clinics and banks..

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	6	Management of embryology lab				10%	SE
		1.1. Standard Operating Procedure	✓				
		1.2. Preparing Scope	✓				
		1.3. Quality Manual & quality objectives of ART Laboratory	✓				
		1.4. Defining Standard Operating Procedure-Purpose-Format-Developing & Implementing, Effective Writing	✓				
2	8	Ethics and ART rules					
		2.1.Introduction to ART Ethics	✓			10%	LE,SE
		2.2. Laws, Rules and Regulations	✓				
		2.3. The Structure of ART Law & Regulations to Prevent Laboratory Procedural Errors	✓				

		& Contamination					
		2.4. Hygienic Practice	✓				
		2.5. Chemical, Environmental & Biological Contaminations and biological waste disposal,	✓				
		2.6. Laws & Regulations for Labelling of Chemicals & Machines	✓				
		2.7. Layout of Laboratory & Protocols.	✓				
3	8	National and International standards				20%	LE,SE
		3.1.The assisted reproductive technology (regulation) act, 2021, The surrogacy (regulation) act,	✓				
		3.2. National Guidelines for Accreditation, Supervision & Regulation of ART Clinics in India	✓				
		3.3. ART Bank, ISAR ethics committee guidelines. ASRM Guideline, ESHRE Guideline	✓				
4	8	Quality Management				20%	LE,SE
		4.1.ART-Quality Control & 4.2.Quality Assurance	✓				
		4.3.Risk Assessment	✓				
		4.4.Risk Characterization, Risk Evaluation,	✓				
		4.5.ISO Standards & Implementations	✓				
		4.6.Quality Management Certifications & Regulations,	✓				
		4.7.Process Control & Optimization. Unit	✓				
5	7	Introduction to good Laboratory Practices				20%	LE,SE
		5.1.History and development of GLP, FDA, GLP regulations	✓				
		5.2.Fundamental points of GLP,	✓				
		5.3.GLP and In vitro studies	✓				
		5.4.Definition of GLP in IVF,	✓				

		5.5.Elements of GLP in IVF	✓				
6	8	6.1.Laboratory Management in ART	✓			20%	LE,SE
		6.2.Laboratory design and organization	✓				
		6.3.Staff training and management	✓				
		6.4.Patient management and communication	✓				
		6.5.Quality assurance programs in ART	✓				

LE – Long Essay, SE – Short Essay

Recommended Books:

1.G.S.R. 419(E) Government of India Ministry of Health and Family Welfare (Department of HealthResearch) Notification New Delhi, March 2022

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. Björndahl, L., & Brown, J. K. (2022). The sixth edition of the WHO Laboratory Manual for the Examination and Processing of Human Semen: ensuring quality and standardization in basic examination of human ejaculates. Fertility and Sterility, 117(2), 246-251.

4. Rao, K. A. (2018). The infertility manual. JP Medical Ltd.

5. Zsolt Peter Nagy,Alex Verghese, Ashok Agarwal Practical manual of in vitro fertilization.

6. In vitro fertilization (3rd edition) Elder and Dale, Cambridge University Press, 2011

7. Textbook of Assisted Reproductive Techniques, Fifth Edition, 2018 David K.

Course Title: Pre-Implantation Genetic Testing (PGT)

Course: Core

Credits: 3 No. of Hours: 45

Course Learning Objectives:

•To develop an understanding of the fundamental principles of PGT, including its historical context,types of genetic abnormalities that can be detected, and ethical and social implications.

•To understand the principles of reproductive genetics, including inheritance patterns of genetic disorders, and be able to provide genetic counseling for individuals and couples considering PGT.

•To gain knowledge of the procedures and techniques involved in preparing for PGT, including ovarian stimulation and follicular monitoring, gamete collection and preparation, embryo biopsy techniques, and quality control and safety considerations.

•To gain a thorough understanding of Pre-implantation Genetic Diagnosis (PGD), including its applications, biopsy techniques, genetic analysis, diagnosis and management of chromosomal abnormalities and monogenic disorders, and clinical outcomes and success rates.

•To understand Pre-implantation Genetic Screening (PGS) and its applications for screening embryos for aneuploidy.

•To gain knowledge of emerging technologies in PGT, and understand the ethical considerations and implications for the future of PGT.

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type of Questions
1	7	Introduction to Pre-implantation Genetic Testing	✓			5%	SE
		1.1. Definition and overview of PGT					
		1.2. Historical context and development of PGT					
		1.3. Types of genetic abnormalities that can be detected with PGT					
		1.4. Ethical and social implications of PGT					

2	7	Reproductive Genetics and Counselling 2.1 Overview of reproductive genetics	✓			20%	LE, SE
		2.2 Inheritance patterns of genetic disorders		✓			
		2.3 Genetic counselling for individuals and couples considering PGT	✓				
		2.4 Testing options and considerations for at-risk couples	✓				
3	8	Preparing for Pre-implantation Genetic Testing 3.1 Ovarian stimulation and follicular monitoring	✓			15%	LE, SE
		3.2 Gamete collection and preparation	✓				
		3.3 Embryo biopsy techniques		✓			
		3.4 Quality control and safety considerations		✓			
4	7	Pre-implantation Genetic Diagnosis 4.1 Overview of PGD and its applications	✓			20%	LE, SE
		4.2 Biopsy techniques and genetic analysis	✓				
		4.3 Diagnosis and management of chromosomal abnormalities	✓				
		4.4 Diagnosis and management of monogenic disorders	✓				
		4.5 Clinical outcomes and success rates					
5	8	Pre-implantation Genetic Screening 5.1 Overview of PGS and its applications	✓			20%	LE, SE

		5.2 Techniques and considerations for screening embryos for aneuploidy	✓				
		5.3 Financial Statement Analysis	✓				
6	8	Emerging Technologies and Future Directions 6.1 Overview of emerging technologies in PGT	✓			10%	SE
		6.2 Ethical considerations and implications for the future of PGT	✓				

Text book/ Reference Books:

1.Handyside AH. Preimplantation genetic diagnosis after 20 years. Fertility and Sterility. 2010 Apr1;93(6):2017-25.

2. Forman EJ, Tao X, Ferry KM, Taylor D, Treff NR, Scott Jr RT. Single embryo transfer with comprehensive chromosome screening results in improved ongoing pregnancy rates and decreasedmiscarriage rates. Human Reproduction. 2012 Nov 1;27(11):1217-22.

3. Thornhill AR, deDie-Smulders CE, Geraedts JP, Harper JC, Harton GL, Lavery SA, Moutou C,Robinson MD, Schmutzler AG, Scriven PN, Sermon KD. ESHRE PGD Consortium 'bestpractice guidelines for clinical preimplantation genetic diagnosis (PGD) and preimplantation geneticscreening (PGS)'. Human Reproduction. 2005 Dec 1;20(1):35-48.

4. Colls P, Escudero T, Fischer J, Cekleniak N, Ben-Ozer S, Meyer B, Foco L, Bergh T, Harton G.Validation of array comparative genome hybridization for diagnosis of translocations inpreimplantation human embryos. Reproductive BioMedicine Online. 2012 Aug 1;25(2):210-8.

5. Munné S, Sandalinas M, Escudero T, Marquez C, Cohen J. Chromosome mosaicism in cleavagestage human embryos: evidence of a maternal age effect. Reproductive BioMedicine Online. 2002 Jan1;4(3):223-32.

6. Sermon K, Seneca S, De Rycke M, Goossens V, Van Steirteghem A, Devroey P, Staessen C.Preimplantation diagnosis for Huntington's disease with exclusion testing. The Lancet. 1998 Oct17;352(9136):1191-2.

7. Handyside AH. 24-chromosome copy number analysis: a comparison of available technologies.Fertility and Sterility. 2013 Nov 1;100(5):1187-91.

Course Title: Assisted reproductive Technology

Course: Core

Credits: 3 **No. of Hours: 45**

Course Outcomes:

After completing this course the student will be able to:

a. To understanding of the principles and techniques of ART, including in vitro fertilization(IVF), intracytoplasmic sperm injection (ICSI), and cryopreservation.
b. • To develop skills in clinical diagnosis and management of infertility, including the interpretation of laboratory tests and imaging studies, and the design of treatment plans using ART..

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1	7	Patient Investigation and Use of Drug 1.1Indications for IVF treatment, initial investigations of patients (female and male),	✓			10%	LE,SE
		1.2 Drugs used for controlled ovarian stimulation	✓				
		1.3The role of Follicle stimulation hormone (FSH) and Luteinizing hormone (LH)	✓				
2	8	OvarianStimulation ProtocolsImportanceof monitoring 2.1.Prognostic testing for ovarian reserve	✓			20%	LE,SE
		2.2. Agonists/Antagonist Drugs,	✓				

		2.3. monitoring IVF cycles	✓				
		2.4. ultrasound in IVF,	✓				
		2.5. oocyte retrieval and selection	✓				
		2.6. luteal phase –luteal support protocols	✓				
3	8	Conventional Invitro Fertilization				20%	LE,SE
		3.1Collectionand preparation of Gametes	✓				
		3.2 follicular screening and Identification of oocytes		✓			
		3.3 preparation for IVF procedure	✓				
		3.4 IVF Witnessing, dish preparation for IVF	✓				
		3.5 insemination in IVF	✓				
		3.3. Denudation and Fertilization Check	✓				
4	7	Intra Cytoplasmic Sperm Injection (ICSI)				20%	LE,SE
		4.1 Indications and Contra-indications for ICSI	✓				
		4.2 Dish preparation	✓				
		4.3 micro tool alignment	✓				
		4.4 Enzymatic Denudation	✓				
		4.5 Immobilization	✓				
		4.6Aspiration and Cytoplasmic injection	✓				
		4.7 Trouble shooting scenarios	✓				
5	7	Advanced Techniques in ART				15%	LE,SE
		5.1Intracytoplasmic morphologically selected sperm injection (IMSI)	✓				
		5.2 Physiological selection of sperm and Intracytoplasmic sperm injection	✓				

		5.3 spindle view (polscope). LAH, PZT	✓				
6	8	Embryo Transfer	✓			15%	LE,SE
		6.1 Embryo Transfer-Fresh Embryo	✓				
		6.2 Frozen Embryo	✓				
		6.3 Different types of catheters used	✓				
		6.4 Endometrial Preparation in ART	✓				
		6.5 Luteal phase defects in ART Cycles	✓				
		6.6 Luteal phase support in IVF.	✓				

Course Title: Assisted Reproductive Technology Practical

Course: Core

Credits: 6 No. of Hours: 180

Course Objectives:

• Provides hands-on experience with laboratory equipment such as microscopes, incubators, and centrifuges.

• Handling and examination of gamete and embryos

• The use of embryological techniques such as tissue culture.

Course Content:

In the Practicals the student will get experience in various aspects in micromanipulation technique in ART under the supervision of experienced professionals and is expected to work and contribute in the IVFlab.

Unit	Hrs 180	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1		Setting up of Art laboratory	✓			10%	-
2		Micro tool preparation technique	✓			10%	
3		Micro tool alignment	✓			10%	
4		ICSI dish preparation	✓			10%	
5		Oocyte denudation and assessment	✓			10%	
6		TESA sample processing	✓			10%	
7		Sperm immobilisation	✓			10%	
8		Intra cytoplasmic Sperm Injection	✓			20%	
9		Troubleshooting in Micro manipulation unit	✓			10%	

Course Title: Cryopreservation Practical

Course: Core

Credits: 6 No. of Hours:180

Course Outcomes:

After completing this course the student will be able to:

1.Provide an updated scenario of the functional molecular interactions that can be impaired during cryopreservation (also altering epigenetics). The course will focus also on the protein/protein and protein/lipid interactions that can give a functional modulation of gametes.

2. Describe the gametes biology at physiological and low temperatures.

3. Describe the applications of gametes cryoconservation techniques.

Course Content:

Unit	Hrs 180	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Questions
1		Cryo devices used in gamete and embryo freezing	✓			10%	-
2		Liquid Nitrogen handling	✓			10%	
3		Sperm freezing techniques: slow and Vitrification methods	✓			15%	
4		Dish preparation for freezing and thawinging	✓			10%	
5		Oocyte vitrification	✓			10%	
6		Cleavage stage embryo vitrification	✓			10%	
7		Vitrification of Blastocyst				15%	
8		Oocyte and embryo thawing	✓			10%	
9		Vitrification of TESA and PESA samples	✓			10%	

LE – Long Essay, SE – Short Essay

SEMESTER IV

DISSERTATION

Course type: Research Project Credits: 12

Course Outcomes:

At the end of the course, students will be able to:

1. Demonstrate the ability to conduct independent research, critically evaluate literature, collect

and analyze data, and draw meaningful conclusions.

2. Apply critical thinking skills to assess existing knowledge, identify research gaps, and

contribute new insights to their area of specialization.

3. Deepen their understanding and expertise in their chosen area of specialization through the

dissertation, showcasing mastery of the subject matter.

Guidelines:

• Each candidate is required to carry out a dissertation on a selected topic under the guidance of an recognized post graduate guide.

• The topic for the dissertation should be chosen based on the area of specialization. The data

for the study will be collected in the area posted.

• Students shall use scientific methods of research, it could be - quantitative/qualitative/mixed

methods. A student selects the tentative research topic in the second semester, in consultation with the guide.

• The synopsis shall be presented to the scientific review board (SRB) for approval following

which ethics approval will have to be taken from the centre for ethics.

• No change in the dissertation topic or change of guide shall be made without prior approval of the University.

• The candidate should start collecting data only after getting Scientific Review Board (SRB)

and Institutional Ethics Committee (IEC) Approval.

The dissertation should be structured under the following suggested headings:

- Title
- Abstract
- Introduction
- Review of literature
- Rationale /Need of the study
- Research question/Hypothesis
- Aim/Objectives of the study
- Methodology
- Results/Findings
- Discussion
- Conclusion
- Limitations of the study
- Recommendations
- Summary
- References/Bibliography
- Annexure

The written text of the dissertation should be neatly typed in double line spacing on one side of paper

(A4 size) and should be bound, Spiral binding should be avoided.

A declaration by the candidate that the work was done by him/her shall be included. The co-guide (where ever applicable), guide, head of the department and head of the institution shall certify the bonafide of the dissertation.

Two copies of the dissertation shall be submitted to the university through proper channel along with a soft copy (CD)

Acceptance of the dissertation is a pre-requisite for a candidate to be eligible to appear in the final examination.

11.Teaching - Learning methods

Teaching - Learning method	Courses
Experiential learning	Clinical Embryology I – IV
Integrated/Inter-disciplinary learning	Bioethics, Healthcare Management
Participatory learning	Bioethics, Health Care Management, Recent Advances in ART, Supervision and regulation of ART clinics,Handling gametes and grading embryos
Problem-solving methodologies	Biostatistics & Research Methodology, Trouble shooting in micromanipulation unit, Clinical Embryology I–IV
Self-directed learning	Coursera / SWAYAM, Microtool alignment,Oocyte denudation and Assessment
Patient-centric and Evidence-based learning	Clinical Embryology I – IV, ART Quality control and Quality Assurance, Quality Management Certifications & Regulations
The Humanities	Bioethics, ART Bank, ISAR ethics committee guidelines. ASRM Guideline, ESHRE Guideline,
Project-based learning	Dissertation, Biostatistics & Research Methodology

Teaching - Learning method	Courses
Team-work	Clinical Embryology I–IV
Role-play	Bioethics,Counseling couples about infertility and ART options, Consent and documentation
Reflective writing	Clinical Embryology I–IV, Gamete handling, embryo culture ,cryopreservation

12.Scheme of Examination

12.1. Continuous Internal assessment format (distribution of marks)

Continuous Internal assessment components	Maximum marks
Average of two IA tests	20
Case Studies/Seminar/Assignments/Quizzes etc.	30
Total marks	50

12.2. Question Paper Pattern

Subjects having maximum marks = 50				Duration
Type of question	Number of questions	Marks for each question	Total	150 min
Long essay type	02	15	30	
Short essay Type	02	10	20	
Total			50	

12.3. Practical Examination

SI.NO	Components	Marks
1	Spotters	10
2	Case Scenario/OSCE/OSPE	20
3	Viva Voce	20
Total Marks		50

12.4.Particulars of practical, viva-voce & dissertation

12.4.1.Practical examination will be aimed at examination of clinical skills and competence of the candidates for undertaking independent work as a specialist.

12.4.2.Viva-Voce examination shall aim at assessing depth of knowledge, logical reasoning, confidence &oral communication skills.

12.4.3Special emphasis shall be given to dissertation work during the M.Sc .Clinical Embryology 2ndYear examination.

12.4.4.The marks of Viva-Voce examination shall be included in the clinical examination to calculate the percentage and declaration of results. OSCE/OSPE-shall have minimum of 5 stations.

12.5. Evaluation and Certification of online courses:

12.5.1.Evaluation will be based on predefined norms and parameters and announced in the overview of the Course at the time of offering the course. Formative continuous online assessments and end of course proctored exams shall be completed by the student.

12.5.2.The certificate obtained shall be submitted to the college office which will be communicated to the office of the Controller of Examinations of Yenepoya (Deemed to be University).

12.5.3.The Yenepoya (Deemed to be) University will give the equivalent credit weightage to the students for the credits earned through online learning courses through MOOCS/Coursera as per the credit plan of the program.

12.6. Credit Mobility of Online Courses:

12.6.1.The Yenepoya (Deemed to be University) will give the equivalent credit weightage to the students for the credits earned through online learning courses as per the credit plan of the program.

12.6.2.In case a student fails to complete the online course he/ she may be allowed to complete the course requirements by registering for another online course in

subsequent semester or opt for a course offered at Yenepoya (Deemed to be University), provided such a course is offered during that semester.

12.6.3.The elective course offered by the Yenepoya (Deemed to be University) shall be restricted to a maximum of 3 credits.

12.6.4.A candidate shall compulsorily complete total 6 Credits of Multidisciplinary courses.

12.6.5.These courses shall be selected either from the Generic Electives offered by the Yenepoya (Deemed to be) university or from the SWAYAM/Coursera courses. A Candidate shall have freedom to choose the courses of once own choice and learn at their own pace but, require to complete minimum 3 credits before second semester and 6 credits before third semester SEE.

12.6.6.A candidate who wishes to earn additional credits may be permitted to do so during the academic duration.

12.7. Continuous Internal Assessment Components of PG Dissertation

<table>
<tr><th>Sl. No</th><th>Parameters</th><th></th><th>Marks</th></tr>
<tr><td>1.</td><td colspan="2">Maintaining the timeline</td><td>10</td></tr>
<tr><td rowspan="4">2.</td><td colspan="2">Presentation a Conference /CME/Publication (student can choose any of the criteria to avail 40 marks)</td><td rowspan="4">40</td></tr>
<tr><td>Criteria</td><td>Marks Allocated</td></tr>
<tr><td>Online Oral/Online Poster/Offline Poster presentation/Conference proceeding publications in Scopus/WoS indexed
journals/Publication of Copyright</td><td>20</td></tr>
<tr><td>Offline oral presentation at National/International Conference/Patents/Publication of Review Paper/Pilot Study/Study
Protocol in Indexed Journal</td><td>40</td></tr>
<tr><td>3.</td><td colspan="2">Manuscript submission (Based on the dissertation) to the Indexed journals (SCOPUS/WoS) along with submission
of final dissertation</td><td>50</td></tr>
<tr><td></td><td colspan="2">Total</td><td>100</td></tr>
</table>

12.8.Assessment of Research project

A declaration by the candidate that the work was done by him/her shall be included. The guide, Head of the Department and Head of the Institution shall certify the bonafide of the project.

Total 200 marks shall be awarded for the research project and the marks distribution as follows:

- 100 marks – Dissertation evaluation by Internal and External examiners
- 100 marks – Continuous Internal Assessment

12.9.Evaluation of Dissertation

12.9.1.Dissertation shall be evaluated by two examiners, one external & one Internal for 100 marks from the panel of examiners approved by the Board of Studies and by the University.

12.9.2.The criteria for the evaluation shall be as prescribed by the Board of Studies.

12.9.3.Acceptance of the dissertation is a pre-requisite for a candidate to be eligible to appear in the final examination.

12.10.Guide:

12.10.1.The academic qualification and teaching experience required for recognition of guide shall be as given under:

12.10.2.MD in OBG with fellowship in reproductive medicine or MCH/DNB in urology with 5 year' sexperience in treating male infertility or Ph.D. in any Life Sciences with minimum 5 years of experience in Clinical Embryology or M.Sc. Clinical Embryology with three years of teaching experience.

12.10.3.Student guide ratio: A recognized guide shall supervise dissertation work of not more thanfive students per academic year. The age of the guide shall not exceed 65 years.

12.10.4.Co-Guide may be included provided the work requires substantial contribution from a sisterdepartment, another institution recognized for teaching in Yenepoya (Deemed to beUniversity), or any other State level University.

12.11.Change of Guide:

In the event of registered guide leaving the Institute/ college due to anyreason or in the event of death or any other valid reasons, guide can be changed with prior permission from the University only.

13.Eligibility to appear for University Examination

13.1. Each course (theory, practical, clinical etc.) shall be treated as an independent unit for the purpose of attendance. Candidates having minimum 80% attendance in each of the Courses can only qualify to appear for the Semester End Examination. The Candidates with less than 80% of attendance shall be required to repeat that Course by attending the semester. There shall be no provision for condonation of shortage of attendance.

13.2.Evaluation of a course shall be done based on continuous internal assessment (CIA) mode followed by semester end university examination (SEE) for each course.

13.3.The components of CIA (Continuous Internal Assessment) may includesessional tests, Seminar/ Journal Club/ Case Studies /Assignment and otheractivitiesas determined by the board of studies in the respective departments.

13.4.The CIA:SEE percentage is 50:50 and minimum marks for CIA shall be 50% and SEE shall be 50%.

13.5.The pass marks per course shall be 50%

13.6.There shall be examinations at the end of each semester ordinarily during February/March for odd semesters and August/September for even semesters

13.7.The SEE duration shall be two and half hours.

14.Criteria for passing

14.1.The CIA:SEE percentage is 50:50 and minimum marks for CIA shall be 50% and SEE shall be 50%.
14.2.The pass marks per course shall be 50%
14.3.A candidate shall be declared to have passed the PG program if he/she secures atleast CGPA of 5.0 (Course Alpha-Sign Grade P) in the aggregate of both internal assessment and semester end examination marks.
14.4.The candidates who pass all the semester examinations in the first attempts in Two years are eligible for ranks provided they secure at least a CGPA of 8.0 (atleast Alpha-Sign Grade A).
14.5.The results of the candidates who have passed the fourth semester examination but not passed the lower semester examinations shall be declared as NCL (Not Completed Lower semester examinations). Such candidates shall be eligible for the degree only after completion of all the lower semester examinations.
14.6.A candidate who passes the semester examinations in parts is eligible for only CGPA and Alpha-Sign Grade but not for ranking.
14.7.There shall be no minimum marks with respect to internal assessment and viva-voce marks.
14.8.A candidate who fails in any of the project work/project report/dissertation shall reappear for the same and pass the examination subsequently within the nearest semester and examination schedule.

15.Carry over provisions

Carry over shall be allowed to the candidates up to IV semesters.

16.Grading and Classification

The results of successful candidates at the end of each semester shall be declared in terms of Grade Point Average (GPA) and Alpha-Sign Grade. The results at the end of the sixth semester shall be classified on the basis of the Cumulative Grade Point Average (CGPA) obtained in all the four semesters and the corresponding overall alpha sign grade.

a. Letter Grades and Grade Points:

Letter Grade	Grade Point	Range of Marks
O+(Outstanding)	10	90–100
O(Excellent)	9	80–89.99
A+(Very Good)	8	70–79.99
A(Good)	7	60–69.99
B+(Average)	6	55–59.99
P(Pass)	5	50–54.99
F(Fail)	<5	<50

cumulative Grade Point Average(CGPA):

The results at the end of the fourth semester shall be classified on the basis of CGPA obtained in the four semesters and the corresponding overall letter grade. The letter grade as described below shall be adopted.

Letter Grade	CGPA Range
O+(Outstanding)	9.0–10.0
O(Excellent)	8.0–8.99
A+(Very Good)	7.0–7.99
A(Good)	6.0–6.99
B+(Average)	5.5–5.99
P(Pass)	5.0–5.49
F(Fail)	<5.0

17.Journals

List of recommended Journals

a. Clinical Embryology (ESHRE journal)
b. Human Reproduction
c. Fertility and Sterility
d. Journal of Assisted Reproduction and Genetics
e. Molecular Human Reproduction
f. Developmental Biology

Annexures:

Annexure I - Question Paper layout for theory examinations

Annexure II – Journal Club evaluation checklist

Annexure III – Assignment guideline

Annexure IV - Seminar Assessment Rubric Template