



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-1 (M.Sc.)

Subject: Instrumentation in assisted reproductive technology (ART)-MSCEM-11503

Type of course: Major

Prerequisite: Basic understanding of instrumentation in embryology and assisted reproductive technology (ART).

Rationale: This course provides an overview of the various instrumentation and techniques utilized in the field of embryology and assisted reproductive technology (ART). Students will learn about the principles, applications, and practical aspects of these methodologies in studying embryonic development in assisted reproductive technology (ART).

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Microscopic application in embryology Faculty will provide prepared slides of cells. Students have to analyze and identify the type of cell and observed result have to submit on GMIU web Portal.	10
2	Molecular Techniques Lab Simulation: Faculty will provide gel electrophoresis photo and Group of Students have to interpret the results and identify the presence or absence of specific genetic markers associated with embryonic development and submit result on GMIU web portal.	10



3	Case Studies Present students with real-life case studies or research scenarios involving challenges or technical issues in embryological research and submit survey report on GMIU web Portal.	10
4	Problem-Solving Activities: Divide students into groups and ask them to brainstorm solutions or troubleshooting strategies for the given problems and report have to upload it to GMIU web Portal.	10
5	Coastal area cleaning Students have to clean nearby coastal area and photo will be upload on GMIU web Portal.	10
Total		50

Course Content:

Unit No	Course content	Hrs	% Weightage
1	Fundamentals of ART and Laboratory Setup <ol style="list-style-type: none"> <u>Introduction to ART</u> <ul style="list-style-type: none"> Overview of ART techniques: IVF, ICSI, PGD, etc. Ethical and legal considerations in ART. History and development of ART technologies. <u>ART Laboratory Design</u> <ul style="list-style-type: none"> Layout and Infrastructure requirements Clean room standards and environmental control (Temperature, humidity, air quality) Lab safety protocols and quality control measures. Essential laboratory equipment and their layout. 	10	25%
2	Microscopy and Imaging Technologies <ol style="list-style-type: none"> <u>Basic Microscopy Techniques</u> <ul style="list-style-type: none"> Light microscopy principles and applications. Phase contrast and differential interference contrast (DIC) microscopy. Use of microscopes in oocyte and embryo assessment. <u>Advanced Imaging Techniques</u> <ul style="list-style-type: none"> Fluorescence microscopy and confocal microscopy. Time-lapse imaging systems for embryo monitoring. Image analysis software and quantitative assessment tools. 	10	25%



3	<p>Micromanipulation and Gamete Handling</p> <p>1. <u>Micromanipulation Equipment</u></p> <ul style="list-style-type: none"> • Micromanipulators and micro injectors. • Piezoelectric devices and their applications. • Laser-assisted hatching and biopsy tools. 	15	25%
4	<p>Incubation and Culture Systems</p> <p>1. <u>Incubators and Culture Conditions</u></p> <ul style="list-style-type: none"> • CO₂ and tri-gas incubators. • Monitoring and maintaining optimal culture conditions. • Time-lapse incubators and their benefits. <p>2. <u>Culture Media and Conditions</u></p> <ul style="list-style-type: none"> • Types and preparation of culture media. • Monitoring pH and osmolality in culture media. • Quality control in media preparation. 	15	25%

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	30%	30%	20%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Provide in-depth knowledge of the instrumentation and technologies used in ART.
CO2	Gain practical skills in handling and operating ART equipment.
CO3	Apply the principles and applications of various ART techniques.
CO4	Become proficient in quality control and laboratory management in ART settings.



Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] Textbook of Assisted Reproductive Techniques by David K. Gardner, Ariel Weissman, Colin M. Howles, and Zeev Shoham.
- [2] Human Embryology and Developmental Biology by Bruce M. Carlson.
- [3] Clinical Laboratory Manual for ART by Steven R. Bayer, Michael M. Alper, and Alan H. De Cherney.
- [4] In Vitro Fertilization: A Textbook of Current and Emerging Methods and Devices by Zoltan Peter Nagy, Alex C. Varghese, and Ashok Agarwal.
- [5] "Principles and Techniques of Embryo Transfer" by Bhattacharyya & Chakravarty.
- [6] "Human Embryology and Developmental Biology" by Bruce M. Carlson.
- [7] "Color Atlas of Human Anatomy, Vol. 1: Locomotor System" by Werner Platzer.
- [8] "Principles of Developmental Genetics" by Sally A. Moody.

