



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

**Subject:** Fundamentals of Human Gametes - MSCEM11504

**Type of course:** Major

**Prerequisite:** To provide students the knowledge and skills to understand the more complex concepts related to human gametes, gametogenesis, fertilization, and the genetic implications of gamete formation.

**Rationale:** By understanding the fundamentals of human gametes, students and professionals can appreciate the complexity of human reproduction, address reproductive health issues, contribute to scientific research, and navigate the ethical considerations of modern reproductive technologies.

**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.*

**Course Content:**

Unit No	Course content	Hrs	% Weightage
1	<p><b>Chapter-1 Introduction to Gametogenesis</b></p> <ol style="list-style-type: none"> <li><u>Gametogenesis Overview</u> <ul style="list-style-type: none"> <li>Definition and stages of gametogenesis: Spermatogenesis and oogenesis.</li> <li>Hormonal regulation of gametogenesis: FSH, LH, and gonadal steroids.</li> </ul> </li> <li>Differences between male and female gametogenesis.</li> </ol> <p><u>Molecular Basis of Gametogenesis</u></p> <ul style="list-style-type: none"> <li>Genetic and epigenetic regulation during gametogenesis.</li> <li>Meiosis: Processes and checkpoints in gamete formation.</li> <li>Gamete maturation and factors influencing gamete quality.</li> </ul>	15	25





2	<p><b>Chapter-2 Anatomy and Physiology of Human Gametes</b></p> <ol style="list-style-type: none"> <li><u>Spermatozoa: Structure and Function</u> <ul style="list-style-type: none"> <li>Anatomy of spermatozoa: Head, midpiece, and tail.</li> <li>Sperm motility and capacitation processes.</li> <li>Factors affecting sperm quality and fertility potential.</li> </ul> </li> <li><u>Oocytes: Structure and Development</u> <ul style="list-style-type: none"> <li>Structure of the human oocyte: Cytoplasmic organelles and zona pellucida.</li> <li>Oocyte maturation processes: Nuclear and cytoplasmic changes.</li> <li>Oocyte competence and developmental potential</li> </ul> </li> </ol>	15	25
3	<p><b>Chapter-3 Fertilization and Early Embryonic Development</b></p> <ol style="list-style-type: none"> <li><u>Fertilization Process</u> <ul style="list-style-type: none"> <li>Events of fertilization: Sperm-egg interaction and penetration.</li> <li>Activation of oocyte and sperm nuclei.</li> <li>Formation of the zygote and initiation of embryonic development.</li> </ul> </li> <li><u>Early Embryonic Development</u> <ul style="list-style-type: none"> <li>Cleavage stages: From zygote to blastocyst formation.</li> <li>Implantation process and early embryo-endometrium interaction.</li> <li>Role of gamete quality in embryo development and implantation success.</li> </ul> </li> </ol>	15	25
4	<p><b>Chapter-4 Gamete Biology in Assisted Reproductive Technologies (ART)</b></p> <ol style="list-style-type: none"> <li><u>Clinical Applications of Gamete Biology</u> <ul style="list-style-type: none"> <li>Role of sperm and oocyte quality in IVF and ICSI outcomes.</li> <li>Techniques for assessing and enhancing gamete quality.</li> <li>Advances in gamete cryopreservation and fertility preservation strategies.</li> </ul> </li> </ol>	15	25

**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<p><b>Class room chart</b> Students need to prepare the chart on the topics assign by faculty and upload them to the GMIU web Portal.</p>	10
2	<p><b>Exploring Sperm cell</b> Students need to provide models or diagrams of sperm cells with detail description of each part and function and student need to upload photo on GMIU web Portal.</p>	10





3	<b>Advance learning</b> Student have to choose by itself, an advance laboratory technique or any instrument of IVF centers or lab and have to write short summary on it and report need to upload on GMIU web portal.	10
4	<b>Identification of Cells</b> Students need to identify gametes/somatic cells and give differentiation of gametes and somatic cells, photo of that particular cell need to upload on GMIU web portal.	10
5	<b>Learning circles</b> Faculty will give appropriate topic or problem and students have to solve it and discuss it in group with teacher, and have to write short summary on the topic after discussion and report need to upload on GMIU web portal.	10
<b>Total</b>		<b>50</b>

**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	30%	40%	20%	10%	-	-

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 a comprehensive understanding of the biology, development, and function of human gametes.
CO2	Explore the molecular mechanisms underlying gametogenesis, fertilization, and early embryonic development.
CO3	Examine the clinical relevance of gamete biology in assisted reproductive technologies (ART) and fertility preservation.
CO4	Apply gamete biology in the Assisted Reproductive Technologies (ART) and modern ART techniques.



**Instructional Method:**

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any 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 the laboratory.

**Reference Books:**

- [1] Molecular Biology of the Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter.
- [2] Essential Reproduction by Martin H. Johnson.
- [3] Textbook of Assisted Reproductive Techniques by David K. Gardner, Ariel Weissman, Colin M. Howles, and Zeev Shoham.

