MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
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CHOICE BASED CREDIT SYSTEM

(CBCS)

(with effect from 2025-26 Batches)

Curriculum for

M.Sc. Clinical Embryology

Amended as per AC-51/2025, Dated 29/04/2025

Amended History

1. Amended as per AC-51/2025, [Resolution No. 3.1(Annexur-3.3)];[Resolution No.3.5 (Annexur-7)]; Dated 29/04/2025.

Resolution No. 3.1 of Academic Council (AC-51/2025): Resolved to approve the CBCS syllabus, including Program Outcomes (POs), Course Outcomes (COs), and PO-CO Mapping for 15 two-year postgraduate programs under MGMSBS for Semesters I and II. These include: M.Sc. Medical Biotechnology , M.Sc. Medical Genetics, **M.Sc. Clinical Embryology**, M.Sc. Clinical Nutrition, M.Sc. Medical Dialysis Technology, M.Sc. Molecular Biology, M.Sc. Medical Radiology & Imaging Technology, M.Sc. Cardiac Care Technology , M.Sc. Operation Theatre and Anaesthesia Technology , M.Sc. Emergency and Trauma Care , M. Optometry , Master in Hospital Administration , Master of Public Health, M.Sc. Health Informatics & M.Sc. Clinical Research to be effective from batch admitted in Academic Year 2025-26 onwards [ANNEXURE-3.1 to 3.30].

Annexure-3.3 of AC-51/2025

MGM SCHOOL OF BIOMEDICAL SCIENCES, NAVI MUMBAI
(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)
(Deemed to be University u/s 3 of UGC Act 1956)
Grade "A^{++}" Accredited by NAAC
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CHOICE BASED CREDIT SYSTEM (CBCS)

(Academic Year 2025 - 26)

Curriculum for

M.Sc. Allied Health Sciences

M. Sc. Clinical Embryology

Semester I & II

DIRECTOR'S MESSAGE

Welcome Message from the Director

Dear Postgraduate Students,

Welcome to **MGM School of Biomedical Sciences (MGMSBS), MGMIHS**, a premier institution dedicated to advancing allied and health sciences education. As you embark on this transformative academic journey, you are joining a community that fosters excellence in research, clinical expertise, and innovation**.**

MGMIHS, accredited with **NAAC 'A^{++}' Grade (CGPA 3.55, 2022)** and recognized as a **Category I Institution by UGC**, offers an ecosystem that nurtures both academic and professional growth. With **NIRF (151-200 rank band) recognition, NABH-accredited hospitals, NABL-accredited diagnostic labs, and JCI accreditation for MGM New Bombay Hospital**, we uphold global benchmarks in education and healthcare.

At MGMSBS, our **15 postgraduate programs** are meticulously designed to align with the National Commission for Allied and Healthcare Professionals (NCAHP) standards**,** National Education Policy (NEP) 2020**,** and the National Credit Framework (NCrF**)**. We have implemented the **Choice-Based Credit System (CBCS)** to provide academic flexibility while ensuring rigorous training in clinical and technical skills**. Our** state-of-the-art research laboratories, digital classrooms, and the Central Research Laboratory (CRL) foster an environment that encourages innovation and evidence-based learning**.**

Postgraduate education at MGMSBS goes beyond theoretical learning—our curriculum integrates **hands-on clinical training, interdisciplinary collaboration, and exposure to real-world healthcare challenges**. We emphasize **research-driven education**, encouraging students to actively participate in **scientific discoveries, publications, and international collaborations**.
Beyond academics, we believe in **holistic development**, with initiatives such as the **AARAMBH Science and Wellness Club**, which promotes **mental well-being, leadership, and professional networking**.

As you step into this **next phase of academic and professional growth**, we encourage you to explore new ideas, engage in impactful research, and contribute meaningfully to the **healthcare ecosystem**. We are confident that your journey at MGMSBS will shape you into **skilled, compassionate, and visionary professionals**, ready to lead in the ever-evolving healthcare landscape.

We look forward to witnessing your achievements and contributions!

Dr. Mansee Thakur
Director, MGM School of Biomedical Sciences
MGM Institute of Health Sciences, Navi Mumbai

ABOUT MGM SCHOOL OF BIOMEDICAL SCIENCES

Mission

To improve the quality of life, both at individual and community levels by imparting quality medical education to tomorrow's doctors and medical scientists and by advancing knowledge in all fields of health sciences though meaningful and ethical research.

Vision

By the year 2020, MGM Institute of Health Sciences aims to be top-ranking Centre of Excellence in Medical Education and Research. Students graduating from the Institute will have the required skills to deliver quality health care to all sections of the society with compassion and benevolence, without prejudice or discrimination, at an affordable cost. As a research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing diseases. In doing so, it will maintain the highest ethical standards.

About – School of Biomedical Sciences

MGM School of Biomedical Sciences is formed under the aegis of MGM IHS with the vision of offering basic Allied Science and Medical courses for students who aspire to pursue their career in the Allied Health Sciences, teaching as well as research.

School of Biomedical Sciences is dedicated to the providing the highest quality education in basic medical sciences by offering a dynamic study environment with well-equipped labs. The school encompasses 23 courses each with its own distinct, specialized body of knowledge and skill. This includes 8 UG courses and 15 PG courses. The college at its growing years started with mere 100 students has recorded exponential growth and is now a full-fledged educational and research institution with the student strength reaching approximately **800** at present.

Our consistent theme throughout is to encourage students to become engaged, be active learners and to promote medical research so that ultimately they acquire knowledge, skills, and understanding so as to provide well qualified and trained professionals in Allied Health Sciences to improve the quality of life.

As there is increased need to deliver high quality, timely and easily accessible patient care system the collaborative efforts among physicians, nurses and allied health providers become ever more essential for an effective patient care. Thus the role of allied health professionals in ever-evolving medical system is very important in providing high-quality patient care.

Last but by no means least, School of Biomedical Sciences envisions to continuously grow and reform. Reformations are essential to any growing institution as it fulfills our bold aspirations of providing the best for the students, for us to serve long into the future and to get ourselves updated to changing and evolving trends in the health care systems.

Name of the Degree: M.Sc. Clinical Embryology

Objectives of the program -

1. To acquire and comprehend foundational and advanced scientific and clinical concepts in embryology to support industrial applications, healthcare practices, and entrepreneurial ventures.
2. To apply critical thinking skills to analyze and interpret complex problems in reproductive science and implement systematic, evidence-based solutions.
3. To develop decision-making capabilities to assess and manage challenges in clinical and research settings, ensuring precision and ethical integrity.
4. To demonstrate proficiency in planning, designing, executing, and utilizing research methodologies for advancements in reproductive healthcare and community well-being.
5. To cultivate the ability to function effectively as an individual and as part of a multidisciplinary team, ensuring collaborative success in clinical, industrial, and research domains.
6. To Exhibit strong written and oral communication skills to articulate scientific and clinical concepts effectively in healthcare, industry, academia, and research environments.
7. To uphold ethical principles and professional responsibilities in both clinical and research practices, ensuring adherence to regulatory and social frameworks.
8. To foster a continuous learning mindset and adaptability to technological advancements, enhancing professional growth and societal contributions.

Teaching Strategies and Learning Activities:

Different teaching strategies and learning activities practiced in the institute assist the teacher in choosing the appropriate educational method for conveying knowledge and influencing attitudes and behavior.

Duration of Study: The duration of the study for M.Sc. Clinical Embryology will be of four semesters spread over two years.

Eligibility Criteria: As a minimum criterion of eligibility, aspiring candidates are needed to have attained a B.Sc. in any discipline of Life Sciences, Biosciences, Bachelor's degree in any of Biological Sciences, M.B.B.S, BDS, BAMS, BHMS, B.Pharm, B.Tech (Biotechnology), Bachelor’s Degree in Veterinary Sciences, or equivalent examination with a minimum aggregate score of 50%.

For any query visit the website: www.mgmsbsnm.edu.in

M.Sc. Clinical Embryology

Program Outcomes (POs)

Program Code	Program Objective
PO1	**Knowledge**– Acquire and comprehend foundational and advanced scientific and clinical concepts in embryology to support industrial applications, healthcare practices, and entrepreneurial ventures.
PO2	**Comprehension & Application**– Apply critical thinking skills to analyze and interpret complex problems in reproductive science and implement systematic, evidence-based solutions.
PO3	**Analysis & Evaluation**– Develop decision-making capabilities to assess and manage challenges in clinical and research settings, ensuring precision and ethical integrity.
PO4	**Research Skills**– Demonstrate proficiency in planning, designing, executing, and utilizing research methodologies for advancements in reproductive healthcare and community well-being.
PO5	**Collaboration & Leadership**– Cultivate the ability to function effectively as an individual and as part of a multidisciplinary team, ensuring collaborative success in clinical, industrial, and research domains.
PO6	**Communication Skills** – Exhibit strong written and oral communication skills to articulate scientific and clinical concepts effectively in healthcare, industry, academia, and research environments.
PO7	**Ethical & Professional Integrity**– Uphold ethical principles and professional responsibilities in both clinical and research practices, ensuring adherence to regulatory and social frameworks.
PO8	**Lifelong Learning & Adaptability**– Foster a continuous learning mindset and adaptability to technological advancements, enhancing professional growth and societal contributions.

Semester I

MCE 101 T	Relevant Gross Anatomy	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	To demonstrate and understand the relevant gross anatomy of male and female reproductive system	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO2	To understand the relevant gross anatomy of urinary bladder	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO3	To understand the relevant gross anatomy of endocrine system	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
MCE 102 T	**Histology**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	To describe the histology of male and female reproductive system	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO2	To identify and study the histology of urinary system	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO3	To understand the histology of endocrine system	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
MCE 103 T	**Genetics in Assisted Reproduction**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	To have detail knowledge about chromosomes, Molecular Genetics, Developmental genetics, Prenatal diagnosis and genetic counselling,	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO2	To study the importance and basics of Genetics in infertility	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ

CO3	To understand Epigenetis and The Human Genome Project.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
MCE 104 T	**General & Systemic Embryology**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	To able to understand in detail general embryology as week wise development from 1st week to 4th week and trophoblast development with twinning	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO2	To understand trophoblast development with twinning	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO3	To able to understand in detail systemic embryology under urinary system, MRS, FRS	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CC 001 T	**Research Methodology & Biostatistics (Core Course)**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Student will be able to understand develop statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis interpretation & reporting of Results and use of statistical software.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Group Discussion, Workshops	Theory Exam, Practical Exam, Viva-voce, Internal assessment, University exam, Station exercise, seminar presentation, MCQ
MCE 105 P	**Practical Lab I (MCE 101 & MCE 102)**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Recall and describe the structural organization of general tissues (epithelial, connective, muscle, and nervous) and their functional significance in human anatomy	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO2	Identify and analyze the histological and gross anatomical features of the male reproductive system, including the testis, epididymis, spermatic cord, vas deferens, seminal vesicle,	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book

	and prostate, correlating their functions with reproductive physiology.			
CO3	Illustrate and evaluate the histological and anatomical organization of the female reproductive system, including the mammary gland, ovary, fallopian tube, uterus, and vagina, and relate them to menstrual and reproductive physiology.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO4	Examine and interpret the structural and functional characteristics of the urinary system, particularly the urinary bladder, to understand its role in excretion and homeostasis.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO5	Analyze and integrate the histological and anatomical aspects of the endocrine glands (pituitary, thyroid, suprarenal) with their hormonal functions, emphasizing their clinical significance in reproductive and metabolic health.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
MCE 106 P	**Practical Lab II (MCE 103 & MCE 104)**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Demonstrate foundational knowledge of embryonic development by recalling key stages such as gametogenesis, fertilization, implantation, neural tube formation, and placental development using models and charts.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO2	Apply systemic embryology concepts by illustrating the development of the urinary and reproductive systems, including nephron formation, gonadal differentiation, and testicular descent, while analyzing congenital anomalies.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book

CO3	Perform and interpret genetic analysis techniques such as karyotyping, PCR, and FISH to detect chromosomal abnormalities and assess their relevance in assisted reproduction	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO4	Evaluate and integrate embryology and genetics in clinical applications by analyzing ART procedures, embryo biopsy techniques, and preimplantation genetic diagnosis (PGD) for reproductive medicine.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO5	Correlate developmental processes with clinical implications by identifying congenital anomalies, genetic disorders, and their inheritance patterns, justifying their impact on reproductive health.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
MCE 107 CP	**MCE Directed Clinical Education- I**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Demonstrate comprehensive understanding of assisted reproductive technologies (ART), laboratory workflows, quality control measures, and ethical guidelines governing clinical embryology.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos, Case-Study, Problem based learning, Seminar, Workshops, Industrial Visit, Guest lecture	University exam, Practical Exam, Station Exercise, Viva-voce, Log book, Seminar Presentation, Case- study presentation
CO2	Develop proficiency in key embryology laboratory techniques, including gamete handling, embryo culture, micromanipulation, and cryopreservation, while adhering to quality assurance protocols.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos, Case-Study, Problem based learning, Seminar, Workshops, Industrial Visit, Guest lecture	University exam, Practical Exam, Station Exercise, Viva-voce, Log book, Seminar Presentation, Case- study presentation
CO3	Exhibit ethical decision-making, patient-centered communication, and professional responsibility in clinical embryology practice, ensuring adherence to regulatory and ethical standards.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos, Case-Study, Problem based learning, Seminar, Workshops, Industrial Visit, Guest lecture	University exam, Practical Exam, Station Exercise, Viva-voce, Log book, Seminar Presentation, Case- study presentation

Semester II				
MCE 108 T	**Reproductive Hormones & Infertility**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Students should be able to understand hormonal regulation of reproduction	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO2	To explain infertility types and causes, interpret diagnostic tests for infertility.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO3	Students should recognize appropriate management strategies for infertility.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
MCE 109 T	**Ovulation Induction Methods**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Students should be able to understand patient selection and hormone use in ART.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO2	To explain ovulation induction, stimulation protocols, and monitoring, identify complications of ovarian stimulation.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO3	To describe ovum pick-up, equipment, and quality control in ART.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
MCE 110 T	**Quality Assessment, Quality Control & Handling Data in ART**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Understand QA & QC in ART labs.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO2	Explain lab practices, equipment maintenance, and safety.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7,**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz,	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ

		PO8	case study, Flip classroom	
CO3	Identify quality control measures and regulatory standards.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO4	Apply risk management strategies in ART procedures.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
MCE 111 T	**IVF Procedures**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Students should be able to understand IVF, in-vitro maturation, and related ART procedures,	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO2	To explain sperm and embryo preparation, grading, and selection methods, describe embryo transfer techniques, patient preparation, and post-transfer care	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom, posters/ videos	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
CO3	To identify IVF complications and the role of patient counseling.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Practical, Demonstration, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Internal assessment, University exam, seminar presentation, MCQ
MCE 112 P	**Practical Lab III (MCE 108 & MCE 109)**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Explain the role of reproductive hormones**,** including testicular, ovarian, and placental hormones, in regulating fertility and reproductive physiology.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO2	Identify and analyze the causes, investigations, and management of male and female infertility**,** incorporating techniques such as semen analysis, sperm function tests, tubal patency tests, and ovulation assessment methods.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO3	Demonstrate knowledge of ovulation induction methods**,** including the pharmacological basis, stimulation protocols, ovulation triggers, and patient	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book

	monitoring techniques.			
CO4	Evaluate the risks and complications of ovarian stimulation**,** including ovarian hyperstimulation syndrome (OHSS), and formulate strategies for its prevention and management.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO5	Integrate ovum retrieval techniques with clinical protocols, assessing their role in assisted reproductive technologies (ART) and optimizing patient outcomes.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
MCE 113 P	**Practical Lab IV (MCE 110 & MCE 111)**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Explain and apply quality assurance protocols in the IVF laboratory, including good lab practices, biomedical waste management, and risk assessment to ensure compliance with safety and ethical guidelines.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO2	Analyze the legal and ethical aspects of ART, including PC-PNDT Act, MTP Act, and surrogacy-related cases, ensuring adherence to national and international reproductive regulations.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO3	Demonstrate proficiency in advanced ART techniques, including in-vitro maturation, pre-implantation genetic screening (PGS), assisted hatching, and embryo reduction, for optimizing clinical outcomes.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO4	Evaluate sperm preparation, gamete grading, and embryo selection techniques**,** assessing their impact on embryo development, metabolism, and implantation success.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
CO5	Integrate and apply embryo culture and transfer techniques**,** including ZIFT, GIFT, and embryo transfer methodologies, while identifying and managing	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book

	potential complications in ART procedures.			
CO6	Develop patient-centered counseling strategies**,** addressing potential IVF complications and psychological aspects to enhance patient care in assisted reproduction.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos,	Internal Assessment, University exam, Practical Exam, Station Exercise, Viva-voce, Log book
MCE 114 CP	**MCE Directed Clinical Education- II**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Demonstrate comprehensive understanding of assisted reproductive technologies (ART), laboratory workflows, quality control measures, and ethical guidelines governing clinical embryology.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos, Case-Study, Problem based learning, Seminar, Workshops, Industrial Visit, Guest lecture	University exam, Practical Exam, Station Exercise, Viva-voce, Log book, Seminar Presentation, Case- study presentation
CO2	Develop proficiency in key embryology laboratory techniques, including gamete handling, embryo culture, micromanipulation, and cryopreservation, while adhering to quality assurance protocols.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos, Case-Study, Problem based learning, Seminar, Workshops, Industrial Visit, Guest lecture	University exam, Practical Exam, Station Exercise, Viva-voce, Log book, Seminar Presentation, Case- study presentation
CO3	Exhibit ethical decision-making, patient-centered communication, and professional responsibility in clinical embryology practice, ensuring adherence to regulatory and ethical standards.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Practical, Demonstration, Group Discussion, Quiz, Posters/ Videos, Case-Study, Problem based learning, Seminar, Workshops, Industrial Visit, Guest lecture	University exam, Practical Exam, Station Exercise, Viva-voce, Log book, Seminar Presentation, Case- study presentation
SEC 001 T	**Nutrition and Reproductive Health**	**Mapped POs**	**Teaching-Learning Methodologies**	**Assessment Tools**
CO1	Understand the relationship between nutrition and reproductive health.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Viva-voce, University exam, MCQ
CO2	Analyze the role of macro- and micronutrients in fertility and pregnancy also assess the impact of dietary patterns on reproductive disorders.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Viva-voce, University exam, MCQ
CO3	Evaluate the influence of nutrition on Assisted Reproductive Outcomes (ART) outcomes.	**PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8**	Lecture, Assignment, Seminar, Group discussion, Quiz, case study, Flip classroom	Theory Exam, Viva-voce, University exam, MCQ

SEC 002 T	Data analysis for Biologists (NPTEL)	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the basic principles of probability and statistical analysis in biological research.	**PO1, PO2, PO3, PO4, PO5, PO7, PO8**	Lecture, Assignment	Online NPTEL MCQ test
CO2	Use R programming for data manipulation, visualization, and statistical computations.	**PO1, PO2, PO3, PO4, PO5, PO7, PO8**	Lecture, Assignment	Online NPTEL MCQ test
CO3	Perform correlation and regression analysis for biological datasets.	**PO1, PO2, PO3, PO4, PO5, PO7, PO8**	Lecture, Assignment	Online NPTEL MCQ test
CO4	Apply clustering and classification techniques to categorize biological data.	**PO1, PO2, PO3, PO4, PO5, PO7, PO8**	Lecture, Assignment	Online NPTEL MCQ test
CO5	Analyze high-dimensional biological data using advanced statistical approaches.	**PO1, PO2, PO3, PO4, PO5, PO7, PO8**	Lecture, Assignment	Online NPTEL MCQ test

OUTLINE OF COURSE CURRICULUM
M.Sc. CLINICAL EMBRYOLOGY
Semester I

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MCE 101 T	Relevant Gross Anatomy	3	-	-	-	3	45	-	-	-	45	20	80	100
MCE 102 T	Histology	3	-	-	-	3	45	-	-	-	45	20	80	100
MCE 103 T	Genetics in Assisted Reproduction	3	-	-	-	3	45	-	-	-	45	20	80	100
MCE 104 T	General & Systemic Embryology	3	-	-	-	3	45	-	-	-	45	20	80	100
CC 001 T	Research Methodology & Biostatistics (Core Course)	3	-	-	-	3	45	-	-	-	45	-	50	50
Discipline Specific Core Practical														
MCE 105 P	Practical Lab I (MCE 101 & MCE 102)	-	-	4	-	2	-	-	60	-	60	10	40	50
MCE 106 P	Practical Lab II (MCE 103 & MCE 104)	-	-	2	-	1	-	-	30	-	30	10	40	50
MCE 107 CP	MCE Directed Clinical Education-I	-	-	-	9	3	-	-	-	135	135	-	50	50
CC 001 P	Research Methodology & Biostatistics (Core Course)	-	-	4	-	2	-	-	60	-	60	-	50	50
Total		15	0	10	9	23	225	0	150	135	510	100	550	650

OUTLINE OF COURSE CURRICULUM
M.Sc. CLINICAL EMBRYOLOGY
Semester II

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MCE 108 T	Reproductive Hormones & Infertility	3	-	-	-	3	45	-	-	-	45	20	80	100
MCE 109 T	Ovulation Induction Methods	3	-	-	-	3	45	-	-	-	45	20	80	100
MCE 110 T	Quality Assessment, Quality Control & Handing data in ART	3	-	-	-	3	45	-	-	-	45	20	80	100
MCE 111 T	IVF Procedures	3	-	-	-	3	45	-	-	-	45	20	80	100
Discipline Specific Core Practical														
MCE 112 P	Practical Lab III (MCE 108 & MCE 109)	-	-	1	-	2	-	-	60	-	60	10	40	50
MCE 113 P	Practical Lab IV (MCE 110 & MCE 111)	-	-	1	-	2	-	-	60	-	60	10	40	50
MCE 114 CP	MCE Directed Clinical Education-II	-	-	-	12	4	-	-	-	180	180	-	50	50
Skill Ehancement Course														
SEC 001 T	Nutrition and Reproductive Health	2	-	-	-	2	30	-	-	-	30	-	100	100
SEC 002 T	Data analysis for Biologists (NPTEL)													
Total		14	0	2	12	22	210	0	120	180	510	100	550	650

FIRST YEAR

M.Sc. Clinical Embryology

SEMESTER-I

CODE NO	CORE SUBJECT
Discipline Specific Core Theory	
MCE 101 T	Relevant Gross Anatomy
MCE 102 T	Histology
MCE 103 T	Genetics in Assisted Reproduction
MCE 104 T	General & Systemic Embryology
CC 001 T	Research Methodology & Biostatistics (Core Course)
Discipline Specific Core Practical	
MCE 105 P	Practical Lab I (MCE 101 & MCE 102)
MCE 106 P	Practical Lab II (MCE 103 & MCE 104)
MCE 107 CP	MCE Directed Clinical Education-I
CC 001 P	Research Methodology & Biostatistics (Core Course)

Name of the Program	M. Sc. Clinical Embryology
Semester	Semester I
Name of the Course	Relevant Gross Anatomy
Subject Code	MCE 101 T

Teaching Objectives	• To understand the anatomy, blood supply, nerve supply, lymphatic drainage, and clinical relevance
Course Outcomes	• To demonstrate and understand the relevant gross anatomy of male and female reproductive system • To understand the relevant gross anatomy of urinary bladder • To understand the relevant gross anatomy of endocrine system

Sr. No.	Topic		No. of Hrs.
1	Introduction	Introduction to anatomy and terminology	3
		Introduction to reproductive system	
2	Male reproductive system -	Testis – structure, coverings, blood supply, nerve supply, lymphatic drainage, applied anatomy	15
		Epididymis - structure, blood supply, applied anatomy	
		Spermatic cord – coverings, contents, applied anatomy	
		Vas deferens - structure, course & relations, blood supply, nerve supply, applied anatomy	
		Seminal vesicle - structure, blood supply, applied anatomy	
		Prostate - structure, capsule, blood supply, nerve supply, lymphatic drainage, applied anatomy	
		Penis- structure, coverings, blood supply, nerve supply, lymphatic drainage, applied anatomy	
		Scrotum- structure, coverings, blood supply, nerve supply, lymphatic drainage, applied anatomy	
3	Female reproductive system -	Ovary - structure, blood supply, nerve supply, lymphatic drainage, applied anatomy	15
		Fallopian tube - structure, blood supply, nerve supply, lymphatic drainage, applied anatomy	
		Uterus - structure, supports, blood supply, nerve supply, lymphatic drainage, applied anatomy	
		Vagina - structure, blood supply, nerve supply, lymphatic drainage, applied anatomy	
		External genitalia (Vulva)- structure, applied anatomy	
		Mammary gland - structure, blood supply, nerve supply, lymphatic drainage, applied anatomy	

4	Urinary system -	Urinary bladder - structure, blood supply, nerve supply, lymphatic drainage, applied anatomy	**3**
5	Endocrine system -	Hypothalamus - structure, nuclei, blood supply, applied anatomy	**9**
		Pituitary - structure, relations, blood supply, nerve supply, applied anatomy	
		Thyroid - structure, capsule, relations, blood supply, nerve supply, lymphatic drainage, applied anatomy	
		Suprarenal - structure, relations, blood supply, nerve supply, lymphatic drainage, applied anatomy	
Total			**45 hrs**

Name of the Program	**M. Sc. Clinical Embryology**
Semester	**Semester I**
Name of the Course	**Histology**
Course Code	**MCE 102 T**

Teaching Objectives	• To understand the microscopic structure and cellular composition, including their functional significance.
Course Outcomes	• To describe the histology of male and female reproductive system • To identify and study the histology of urinary system • To understand the histology of endocrine system

Sr. No.	Topic		No. of Hrs.
1	General	Introduction to histology	7
		Cell - basic unit of life: Prokaryotic & Eukaryotic cell Structure of Eukaryotic cell, cell organelles	
		Epithelial tissue – introduction, classification, details of each type	
		Connective tissue - introduction, classification, details of each type, Connective tissue cells and extracellular matrix	
		Muscle histology - introduction, classification, details of each type, structure of sarcomere, myofibrils	
		Nervous tissue – introduction, structure and classification of neurons, introduction, structure and classification of neuroglia	
2	Male reproductive system	Histology of Testes + anatomy of sperm	15
		Histology of Epidydimis	
		Histology of Vas deferens, seminal vesicle	
		Histology of Prostate	
		Histology of Scrotum	
3	Female reproductive system	Histology of ovary	15
		Histology of Fallopian tube	
		Histology of uterus	
		Histology of mammary gland	
		Histology of placenta, Umbilical Cord	
4	Urinary system	Histology of urinary bladder	2
5	Endocrines	Histology of pituitary	6
		Histology of thyroid	
		Histology of suprarenal	
Total			**45 hrs**

Name of the Program	M. Sc. Clinical Embryology
Semester	Semester I
Name of the Course	Genetics in Assisted Reproduction
Course Code	MCE 103 T

Teaching Objectives	• To understand the advance trauma and critical care.
Course Outcomes	• To have detail knowledge about chromosomes, Molecular Genetics, Developmental genetics, Prenatal diagnosis and genetic counselling, • To study the importance and basics of Genetics in infertility • To understand Epigenetis and The Human Genome Project.

Sr. No.	Topic		No. of Hrs.
1.	Introduction and Chromosomes	Introduction and branches of genetics	6
		Mendel's law of inheritance	
		Chromosomes	
		Chromosomal disorders	
2.	Molecular genetics	Molecular genetics	3
		Modes of inheritance and gene disorders	
3.	Developmental Genetics	Developmental Genetics	3
4.	Preimplantation genetic diagnosis and prenatal diagnosis	Preimplantation genetic diagnosis	6
		Preimplantation genetic testing (PGT)- PGT-A, PGT-M, PGT-SR	
		Prenatal diagnosis and treatment of genetic disease	
5.	Genetic counseling	Genetic counseling	2
6.	Genetic techniques	Recombinant DNA Technology	7
		PCR, qPCR, RT PCR	
		FISH	
		NGS	
		Karyotyping	
		CGH	
7.	Genetics in infertility	Role of genetics in infertility	6
		Genes and recurrent pregnancy losses	
		Chromosomal and genetic analysis in IVF	
		Embryo biopsies	
8.	Innovative techniques in gamete & embryo viability assessment	Transcryptomics, Proteomics, Metabolomics	6
9.	Epigenetics	Epigenetics	4
10.	The Human genome project	The Human genome project.	2
Total			45 hrs

Name of the Program	M. Sc. Clinical Embryology
Semester	Semester I
Name of the Course	General & Systemic Embryology
Course Code	MCE 104 T

Teaching Objectives	• To provide an understanding of embryological development, including cell division, fertilization, and organ formation. • To explain the development of the urinary and reproductive systems, including male and female differentiation. • To introduce assisted reproductive technologies (ART) and discuss clinical implications of embryology.
Course Outcomes	• To able to understand in detail general embryology as week wise development from 1st week to 4th week and trophoblast development with twinning • To understand trophoblast development with twinning • To able to understand in detail systemic embryology under urinary system, MRS, FRS

Sr. No.	Topic		No. of Hrs.
1	Introduction	Introduction to embryology	5
		Cell division – cell cycle, mitosis, meiosis, apoptosis	
		Gametogenesis – spermatogenesis, oogenesis	
		Menstrual cycle, Ovarian cycle	
2	1st week	Fertilization	5
		1st week of development with implantation	
		Introduction to Assisted reproduction technology	
3	2nd week	2nd week of development – amniotic cavity, yolk sac, bilaminar germ disc	5
4	3rd week	Gastrulation , Primitive streak and three germ layers	5
		Notochord	
		Neural tube development	
5	4th week	Fate of germ layers and derivatives of germ layers	6
		Folding of embryo	
6	Trophoblast and twinning	Development of trophoblast and its derivatives	5
		Development of placenta	
		Twinning	
8	Urinary system	Development of Urinary system	4
9	MRS	Development of Male reproductive system	5
10	FRS	Development of Female reproductive system	5
Total			**45 hrs**

Name of the Program	M. Sc. Clinical Embryology
Semester	Semester I
Name of the Subject	Research Methodology & Biostatistics (Core Course)
Subject Code	CC 001 T

Teaching Objective	• The course is intended to give an overview of research and statistical models commonly used in medical and bio-medical sciences. The goal is to impart an intuitive, understanding and working knowledge of research designs and statistical analysis. The strategy would be to simplify, analyze the treatment of statistical inference and to focus primarily on how to specify and interpret the outcome of research.
Learning Outcomes	• Student will be able to understand develop statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis, interpretation & reporting of results and use of statistical software.

Sr. No	Topic	No. of Hrs.
A	**Research Methodology:**	**23**
1	**Scientific Methods of Research**: Definition of Research, Assumptions, Operations and Aims of Scientific Research. Research Process, Significance and Criteria of Good Research, Research Methods versus Methodology	4
2	**Research Designs**: Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case – Control Studies, Cross-sectional studies, Intervention studies.	5
3	**Sampling Designs**: Census and Sample Survey, Need and importance for Sampling, Implications of a Sample Design, Different Types of Sample Designs (Probability sampling and non-probability sampling), Systematic sampling, Stratified sampling, Cluster sampling, Multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.	5
4	**Measurement in research**: Measurement Scales, Sources of Error in Measurement,	3
5	**Methods of Data Collection**: Types of data, Collection of Primary Data, Observation Method, Interview Method	4
6	Research Ethics and plagiarism	2
B	**Biostatistics**	**22**
7	**Data Presentation**: Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, scatter plots, line graphs	3
8	**Measures of Central Tendency and Dispersion**: Mean, Median, Mode, Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	3
9	**Testing of Hypotheses**: Definition, Basic Concepts, Procedure for Hypothesis Testing, power of test, Normal distribution, Parametric Tests including Z-test, t-test, and ANOVA	4

10	**Chi-square Test**: Chi-square as a Non-parametric Test, Applications.	2
11	**Measures of Relationship**: Correlation and Simple Regression Analysis	3
12	**Non-parametric test**: Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test, Kruskal Walli's test, Friedman's test, and Spearman Rank correlation test.	3
13	**Vital Health Statistics**: rate, crude rate, age specific rate, Measurement of fertility, Rate, Measures of mortality.	4
Total		**45 hrs**

CC 001 P–Research Methodology & Biostatistics

Sr. No.	Topics	No. of Hrs.
A	**Research Methodology**	
1	Research Article Presentation (Seminar)	**5**
B	**Biostatistics**	
2	Data Presentation	**4**
3	Measures of Central Tendency and Dispersion	**6**
4	Testing of Hypotheses	**16**
5	Chi-square Test	**4**
6	Measures of Relationship	**6**
7	Analysis of Variance	**5**
8	Non parametric or Distribution-free Tests	**8**
9	Computer Application Using Statistical Software including SPSS	**6**
Total		**60 hrs**

Reference Books:

1. Daniel WW. Biostatistics: A foundation for analysis in the health sciences. 10th ed. Wiley; 2013.
2. Gupta SC, Kapoor VK. Fundamentals of mathematical statistics. Sultan Chand & Sons; 2020 Sep.
3. Kothari CR, Garg G. Research methodology: Methods and techniques.2019.
4. Mahajan BK. Methods in biostatistics for medical students and research workers. 7th ed. Jaypee Brothers Medical Publishers; 2010.
5. Murthy MN. Sampling theory and methods. Statistical Publishing Society; 1967.
6. Singh YK. Fundamental of research methodology and statistics. New Age International; 2006.

Resolution No. 3.5 of Academic Council (AC-51/2025):

Resolved to approve the submitted list of recommended books for M.Sc. Clinical Nutrition and the course on **Biostatistics and Research Methodology** [ANNEXURE-7].

Annexure-7 of AC-51/2025

Biostatistics & Research Methodology Books List

Subject	Book Name	Author
Biostatistics & Research Methodology	Biostatistics: A Foundation for Analysis in the Health Sciences (10th ed.)	Daniel WW.
	Biostatistical Analysis (5th ed.)	Zar JH.
	Research Methodology: Methods and Techniques	Kothari CR, Garg G.
	Methods in Biostatistics for Medical Students and Research Workers (7th ed.)	Mahajan BK.
	Sampling Theory and Methods	Murthy MN.
	Fundamentals of Research Methodology and Statistics	Singh YK.
	Fundamentals of Biostatistics (8th ed.)	Rosner B.
	An Introduction to Medical Statistics (4th ed.)	Bland M.

MCE 105 P: Practical Lab I (MCE 101 & MCE 102)

Sr. No.	Topic		No. of Hrs.
Relevant gross anatomy & Histology (Study of organ systems though prosection and charts)			
1	General	Cell, Epithelial tissue, Connective tissue, Muscle, Nervous tissue	**60**
2	Male reproductive system	Testis, Epididymis, Spermatic cord, Vas deferens, Seminal vesicle, Prostate	
3	Female reproductive system	Mammary gland, Ovary, Fallopian tube, Uterus, Vagina	
4	Urinary system	Urinary bladder	
5	Endocrine system	Pituitary, Thyroid, Suprarenal	
Total			**60 hrs**

MCE 106 P: Practical Lab II (MCE 103 & MCE 104)

Sr. No.	Topic		No. of Hrs.
General embryology (models and charts)			**30**
1	Introduction	Cell division, Gametogenesis, ovarian cycle, Sperm, ovum, Menstrual cycle	
2	1st week	Fertilization, implantation, Assisted reproduction technology	
3	2nd week	amniotic cavity, yolk sac, Bilaminar germ disc	
4	3rd week	Primitive streak and three germ layers, Notochord, Neural tube	
5	4th week	Folding of embryo	
6	Trophoblast and twinning	Placenta, Twinning	
Systemic embryology (models and charts)			
7	Urinary system	Metanephricblastema, ureteric bud, ascent of kidneys	
8	MRS	Gonad, mesonephric duct, descent of testis	
9	FRS	Gonad, paramesonephric duct, descent of ovary	
Genetics in Assisted Reproduction (cytogenetic lab and charts , photographs and videos)			
10	Disorders	Chromosomal disorders	
		Modes of inheritance and gene disorders	
11	Techniques	Karyotyping with reference to chromosome 21	
		Karyotyping with reference to chromosome 13	
		Karyotyping with reference to chromosome 18	
		Recombinant DNA Technology	
		PCR with relation to Genetic Diseases	
		FISH	
		Embryo biopsy	
Total			**30 hrs**

Course code- MCE 107 CP: MCE Directed Clinical Education – I

Course Outcomes	• Demonstrate comprehensive understanding of assisted reproductive technologies (ART), laboratory workflows, quality control measures, and ethical guidelines governing clinical embryology. • Develop proficiency in key embryology laboratory techniques, including gamete handling, embryo culture, micromanipulation, and cryopreservation, while adhering to quality assurance protocols. • Exhibit ethical decision-making, patient-centered communication, and professional responsibility in clinical embryology practice, ensuring adherence to regulatory and ethical standards.

This module introduces students to key embryology laboratory techniques within clinical or research settings. It covers assisted reproductive technologies (ART), laboratory workflows, quality control, ethics, and patient-centered practices, bridging theoretical knowledge with clinical application. **(Total - 135 hrs.)**

FIRST YEAR

M.Sc. CLINICAL EMBRYOLOGY

SEMESTER-II

Code No.	Core Subjects
Discipline Specific Core Theory	
MCE 108 T	Reproductive Hormones & Infertility
MCE 109 T	Ovulation Induction Methods
MCE 110 T	Quality Assessment, Quality Control & Handling Data in ART
MCE 111 T	IVF Procedures
Discipline Specific Core Practical	
MCE 112 P	Practical Lab III (MCE 108 & MCE 109)
MCE 113 P	Practical Lab IV (MCE 110 & MCE 111)
MCE 114 CP	MCE Directed Clinical Education-II
Skill Enhancement Course	
SEC 001 T	Nutrition and Reproductive Health
SEC 002 T	Data Analysis for Biologists (NPTEL)

Name of the Program	**M. Sc. Clinical Embryology**
Semester	**Semester II**
Name of the Course	**Reproductive Hormones & Infertility**
Course Code	**MCE 108 T**

Teaching Objectives	• To understand the causes, diagnosis, and management of infertility. • To explain normal reproductive physiology and the role of key hormones. • To outline the investigations for male and female infertility. • To discuss treatment options, including medical, surgical, and ART.
Course Outcome	• Students should be able to understand hormonal regulation of reproduction • To explain infertility types and causes, interpret diagnostic tests for infertility. • Students should recognize appropriate management strategies for infertility.

Sr. No.	**Topic**		**No. of Hrs.**
1	Infertility	Introduction, physiological infertility, unexplained infertility, criteria for investigation	**4**
		Normal follicular genesis, ovulation, menstrual cycle, spermatogenesis	
2	Physiology of reproductive hormones	Pituitary hormones- FSH, LH, Prolactin, Oxytocin	**11**
		Thyroid hormones	
		Testicular hormones	
		Ovarian hormones with placental hormone	
		Immunophysiology	
3	Male infertility	Causes	**15**
		Investigations – i. History ii. Semen analysis (WHO criteria)- effective sperm count, Sperm morphology assessment by Strict (Kruger) criteria, sperm vitality, fructose test, Semen biochemistry iii. Endocrine evaluation iv. USG- Scrotal (Testicular Volume), transrectal- TRUS(prostate), Transabdominal (CBAVD) v. Sperm function assessment- Sperm mucus test, Acrosome reaction, sperm penetration and survival test vi. Advanced sperm testing- Antisperm antibody test, Sperm DNA damage, Microfluidics, Testicular biopsy, Chromosomal study, Immunological and FISH level studies vii. General Examination- Scrotal & abdomen examination	
		Management – Medical, Surgical and ART	

4	Female infertility	Causes	**15**
		Investigations – i. History ii. General examination- Tubal patency; Study normalcy of ovulation (basal body temperature, cytology, USG, Fern test, Spinn Barkeit test, endometrial biopsy, hormonal study)	
		Management – medical, surgical, ART	
Total			**45 hrs**

Name of the Program	M. Sc. Clinical Embryology
Semester	Semester II
Name of the Course	Ovulation Induction Methods
Course Code	MCE 109 T

Teaching Objectives	• To explain patient selection, hormonal regulation, and drug use in ART. • To discuss ovarian stimulation, ovulation triggers, and patient monitoring. • To highlight complications, ovum pick-up procedures, and quality assurance in ART.
Course Outcome	• Students should be able to understand patient selection and hormone use in ART. • To explain ovulation induction, stimulation protocols, and monitoring, identify complications of ovarian stimulation. • To describe ovum pick-up, equipment, and quality control in ART.

Sr. No.	Topic		No. of Hrs.
1.	Introduction	Selection of patient	**3**
2.	Drugs of infertility	Hormones	**10**
		Ovulation induction drugs	
		Drugs acting on uterus	
		Drugs during pregnancy	
		Drugs during lactation	
3.	Stimulation protocols	Drugs and method	**14**
		Natural cycle/ modified natural cycle, minimal stimulation cycle, Conventional IVF cycle	
		Ovarian stimulation protocols	
		Ovulation trigger	
4.	Monitoring	Follicular study, Patient monitoring	**4**
5.	Complications and OHSS	Diminished ovarian reserve	**6**
		Hyper stimulation and OHSS (ovarian hyper stimulation syndrome)	
		Complications of stimulation – Miscarriage, Ectopic pregnancy, Multiple gestation, Heterotrophic pregnancy	
6.	Ovum pick up	Equipments & Consumables	**8**
		Anaesthesia	
		Ovum pick up procedure	
		Quality assurance, Associated pathologies and complications	
Total			**45 hrs**

Name of the Program	M. Sc. Clinical Embryology
Semester	Semester II
Name of the Course	Quality Assessment, Quality Control & Handling Data in ART
Course Code	MCE 110 T

Teaching Objectives	• To explain QA & QC principles, lab safety, and equipment management in ART labs. • To discuss contamination control, traceability, and regulatory standards. • To highlight risk management and error prevention strategies in ART procedures.
Course Outcome	Students should be able to : • Understand QA & QC in ART labs. • Explain lab practices, equipment maintenance, and safety. • Identify quality control measures and regulatory standards. • Apply risk management strategies in ART procedures.

Sr. No.	Topic		No. of Hrs.
1	Introduction	Introduction to QA, QC in ART labs	4
		Good lab practice in IVF lab	
		Biomedical waste management	
2	Instruments in the IVF Lab	Equipment for andrology, embryology& cryopreservation lab	5
		Equipment logs	
		Maintenance & Calibration of instruments used in ART Lab	
3	Quality Management	Lab maintenance protocol	5
4	Quality Control	Internal & external quality control, Quality standards	15
		Quality indicators (key performance indicators)	
		Contaminations, ART media, Disposables, Embryo culture & Cryopreservation	
		Traceability in ART, Lab witnessing system	
		Useful Routine Quality Control Procedures	
		New technologies in QC	
5	Data Handling	Identity check, Confidentiality, Keeping records	6
6	Risk in the IVF Laboratory	Contaminated samples, Basic Housekeeping Procedures in the IVF Laboratory, Safety and Health in the IVF Lab	3
7	Staff Management	Managing an IVF team, Hygiene, Protective measurements (gloves, masks etc) for staff , Actions upon injury	3
8	Adverse events, back – up strategies	How to avoid, what to do?, E.g. Mix – up of gametes , loss or damages during handling, Transfer of wrong embryos, Breakdown of equipment, back – up strategies	4
Total			**45 hrs**

Name of the Program	M. Sc. Clinical Embryology
Semester	Semester II
Name of the Course	IVF Procedures
Course Code	MCE 111 T

Teaching Objectives	• To explain the principles and techniques of In-Vitro Fertilization (IVF) and related procedures. • To describe embryo development, metabolism, grading, selection, and transfer techniques. • To discuss sperm preparation methods, including advanced techniques like MACS. • To outline pre-implantation genetic screening, assisted hatching, and embryo reduction. • To highlight complications of IVF and the importance of patient counseling.
Course Outcome	• Students should be able to understand IVF, in-vitro maturation, and related ART procedures, • To explain sperm and embryo preparation, grading, and selection methods, describe embryo transfer techniques, patient preparation, and post-transfer care • To identify IVF complications and the role of patient counseling.

Sr. No.	Topic		No. of Hrs.
1	Introduction to IVF	Introduction to In-vitro fertilization	**2**
2	Non- routine methods	In-Vitro Maturation, Pre-implantation Genetic Screening, Assisted Hatching, Embryo reduction	**4**
3	Embryo development and metabolism	Normal and abnormal embryo development	**5**
		Metabolism of embryo	
4	Sperm preparation techniques	Simple wash, Swim-up method, Density Gradient method	**6**
		Sperm preparation for HIV- infected samples, Retrograde ejaculation samples, testicular & epididymal spermatozoa	
		Magnetic activating cell sorting (MACS)	
5	Grading of gamete and embryo	Grading of oocyte	**14**
		Grading of sperm	
		Assessment of fertilization	
		Grading of embryo	
		Selection of embryo	

6	Embryo transfer techniques	ZIFT, GIFT	**10**
		Embryo transfer Procedure	
		Factors associated with ET, Duration of ET	
		Patient Preparation for Embryo Transfer, Post Embryo transfer related issues	
7	Complications and counselling	Complications of IVF	**4**
		Patient counseling	
Total			**45 hrs**

MCE 112 P– Practical Lab III (MCE 108 & MCE 109)

Sr. No.	Topics			No. of Hrs.
Reproductive Hormones & Infertility				**60**
1	Reproductive hormones	Testicular hormones		
		Ovarian hormones with placental hormone		
2	Male infertility	Causes of Male infertility		
		Investigation of Male infertility- Semen analysis, Sperm function test, Semen Biochemistry		
		Management of Male infertility		
3	Female infertility	Causes of Female infertility		
		Investigation of Female infertility- Tubal patency; Study normalcy of ovulation (basal body temperature, cytology, USG, Fern test, Spinn Barkeit test, endometrial biopsy, hormonal study)		
		Management of Female infertility		
Ovulation Induction Methods				
4	Drugs of infertility	Drugs of infertility	Use of various drugs of infertility	
5	Stimulation protocol	Monitoring	Various stimulation protocols	
			Ovulation trigger	
			Follicular study	
			Patient monitoring and complications	
			Hyper stimulation and OHSS (ovarian hyper stimulation syndrome)	
			Complications of stimulation	
		Ovum pick up	Ovum pick up	
Total				**60 hrs**

MCE 113 P– Practical Lab IV (MCE 110 & MCE 111)

Sr. No.	Topic		No. of Hrs.
Quality Assessment, Quality Control & Handling data in ART			**60**
1	Good lab practice in IVF lab		
2	Biomedical waste management		
3	Risk in the IVF Laboratory		
4	PC PNDT Cases		
5	MTP Act related Rules		
6	Surrogacy related cases		
IVF Procedure			
7	Non- routine methods	In-Vitro Maturation, Pre-implantation Genetic Screening, Assisted Hatching, Embryo reduction	
8	Embryo development and metabolism	Normal and abnormal embryo development	
9	Sperm preparation	Various methods	
10	Grading of gamete and embryo	Grading of oocyte, sperm, embryo and selection of embryo	
11	Embryo culture and transfer techniques	Embryo transfer – consumables, loading techniques, embryo transfer techniques	
		ZIFT, GIFT	
		Embryo reduction	
12	Complications and counselling	Complications of IVF	
		Patient counseling	
Total			**60 hrs**

Course code- MCE 114 CP: MCE Directed Clinical Education – II

Course Outcomes	• Demonstrate comprehensive understanding of assisted reproductive technologies (ART), laboratory workflows, quality control measures, and ethical guidelines governing clinical embryology. • Develop proficiency in key embryology laboratory techniques, including gamete handling, embryo culture, micromanipulation, and cryopreservation, while adhering to quality assurance protocols. • Exhibit ethical decision-making, patient-centered communication, and professional responsibility in clinical embryology practice, ensuring adherence to regulatory and ethical standards.

This module introduces students to key embryology laboratory techniques within clinical or research settings. It covers assisted reproductive technologies (ART), laboratory workflows, quality control, ethics, and patient-centered practices, bridging theoretical knowledge with clinical application. **(Total - 180 hrs.)**

SKILL ENHANCEMENT COURSES

Name of the Program	**M.Sc. Clinical Embryology**
Semester	**Semester II**
Name of the Subject	**Nutrition and Reproductive Health**
Subject Code	**SEC 001 T**

Course Outcome	• Understand the relationship between nutrition and reproductive health. • Analyze the role of macro- and micronutrients in fertility and pregnancy also assess the impact of dietary patterns on reproductive disorders. • Evaluate the influence of nutrition on Assisted Reproductive Outcomes (ART) outcomes.

Sr. No.	Topics		No. of Hrs.
1	Introduction	Basics of nutrition: Macronutrients and micronutrients	30
		Nutritional requirements for reproductive health	
		Impact of malnutrition on fertility (undernutrition and overnutrition)	
		Impact of other lifestyle factors on fertility	
2	Nutrition and Fertility	Dietary factors affecting menstrual cycle and ovulation	
		Role of nutrients and phytochemicals in female infertility	
		Influence of diet on hormone balance and reproductive longevity	
		Nutritional management of PCOS and endometriosis	
3	Nutrition During Pregnancy and Fetal Development	Nutritional requirements during pregnancy	
		Impact of maternal diet on fetal programming and epigenetics	
4	Nutrition needs and factors related to high risk pregnancy	Obesity and pregnancy	
		Pregnancy and weight loss surgery	
		Nutrition in multifetal pregnancy	
		Adolescent Pregnancy: where do we start?	
		Anoxeria nervosa and bulimia nervosa during pregnancy	
		Diabetes and pregnancy	
		Preeclampsia	
		AIDS/HIV in pregnancy	
5	Nutrition and Assisted Reproductive Technologies	Preconception nutrition for IVF success	
		Influence of maternal and paternal nutrition on ART outcomes	
		Nutritional supplementation in ART (e.g., folic acid, vitamin D, CoQ10)	
Total			**30 hrs**

Name of the Program	**M.Sc. Clinical Embryology**
Semester	**Semester II**
Name of the Subject	**Data Analysis for Biologists (NPTEL)**
Subject Code	**SEC 002 T**

Course Objectives	• To introduce fundamental concepts of probability and statistics relevant to biological data. • To provide hands-on training in R programming for data analysis and visualization. • To familiarize students with correlation, regression, clustering, and classification techniques. • To develop skills for analyzing high-dimensional biological data
Course Outcomes	After completing this course, students will be able to: • Understand the basic principles of probability and statistical analysis in biological research. • Use R programming for data manipulation, visualization, and statistical computations. • Perform correlation and regression analysis for biological datasets. • Apply clustering and classification techniques to categorize biological data. • Analyze high-dimensional biological data using advanced statistical approaches.

Sr. No.	Topics	No. of Hrs.
1	Basic concepts of probability and statistics and Basic concepts of probability and statistics	**5**
2	Basics of R Programming and Data Visualization	**10**
3	Correlation and regression analysis, Clustering and classification, Correlation and regression	**10**
4	Clustering and classification, Analysis of higher-dimensional data	**5**
Total		**30 hrs**

Reference Books:

1. **Biostatistics: A Foundation for Analysis in the Health Sciences** – Wayne W. Daniel & Chad L. Cross.
2. **Statistics for Biologists** – Campbell & Swinscow.
3. **The Art of R Programming** – Norman Matloff.

***Note:** Attaint the NPTEL Course with title and course code as "**Data Analysis for Biologists (Course Code: noc25-bt16) (NPTEL)".**

Scheme of University Examination Theory for PG Program:

General structure / patterns for setting up question papers for Theory / Practical courses, their evaluation weightages for PG programs of MGMSBS are given in the following tables

Marks scheme for the University exam:

Final theory marks will be 100 marks (80 marks University Theory exam + 20 Marks Internal assessment).

Question		**Marks distribution**	**Marks allotted per section**	**Marks**
Sec: A	MCQ	10 x 1 M = 10	10	10
Sec: B	SAQ	3/4x 5 M = 15	15	35
Sec: B	LAQ	2/3 x 10 M = 10	20	
Sec: C	SAQ	3/4x 5 M = 15	15	35
Sec: C	LAQ	2/3x 10 M = 10	20	
Total				**80 Marks**

Marks Scheme for the University Examination (50 Marks)

Final theory marks will be 50 marks University Theory exam pattern Research Methodology & Biostatistics (Core course)

Question	**Question No.**	**Question Type**	**Marks Distribution**	**Marks**
Sec: A	1.	LAQ (2 out of 3)	2 X 10 Marks = 20	20
Sec: B	2.	SAQ (6 out of 8)	6 X 05 Marks = 30	30
Total				**50 Marks**

Marks Scheme for the University Examination (100 Marks)

Final theory marks will be 100 marks University Theory exam pattern Elective Course

Question	**Question No.**	**Question Type**	**Marks Distribution**	**Marks**
Sec: A	1.	LAQ (10 out of 12)	10 X 10 Marks = 100	100
Total				**100 Marks**

Practical exam pattern: Total 40 marks with following breakup:

Exercise	Description	Marks
Q No 1	Practical exercise - 1	1 x15=15 M
Q No 2	Station exercise	2x5M=10 M
Q No 3	VIVA	10 M
Q No 4	Journal	5M
Total		**40 Marks**

Practical exam pattern Research Methodology & Biostatistics (Core course)
Total 50-mark distribution:

Exercise	Description	Marks
Q No 1	**Practical/Problem-Solving:** These questions can assess statistical analysis, research design, hypothesis testing, or interpretation of data etc.	2 × 10 marks each) = **20 marks**
Q No 2	Identification of study designs, Critical appraisal of research papers, Application of biostatistical tools, Sampling techniques etc.	(4 × 5 marks each) = **20 marks**
Q No 3	**Viva Voce (Oral Examination)** Assessing conceptual clarity, application of research methodology, and statistical reasoning.	**10 marks**
Total		**50 Marks**

Practical to be conducted at respective departments and marks submitted jointly by the parent department to the university.

Breakup of theory IA calculation for 20 marks

Description	Marks
Internal exam (at department)	15 marks
Seminar	5 marks
Total	**20 Marks**

Breakup of practical IA calculation:

Description	Marks
Internal exam (at department)	10 marks
Viva	5 marks
Journal	5 marks
Total	**20 Marks**

Note –20 marks to be converted to 10 marks weightage for submission to the university.

Model Checklist for Evaluation of the Clinical Directed Posting (PG)

Name of the student: _____Date:_____
Program: _____
Semester: _____ Name of the Internal faculty/Observer: _____
Name of the External Faculty/Observer: _____

Core Competencies	Marks allotted	Marks obtained
Students will begin to develop critical thinking abilities utilizing the allied health personnel roles of communicator and caregiver. Students will learn principles of professional allied health personnel practice and provide direct care to individuals within a medical surgical setting while recognizing the diverse uniqueness of individuals with health alterations.		
Clinical Teaching		
a. Demonstrate beginning competency in technical skills.	10	
Independent Work by Student guided by faculty		
a. Develop effective communication skills (verbally and through charting) with patients, team members, and family	2.5	
b. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.	2.5	
Hands on practical work by students		
a. Protect confidentiality of electronic/manual health records data, information, and knowledge of technology in an ethical manner	05	
Independent work by student		
a. Demonstrate expected behaviors and complete tasks in a timely manner. Arrive to clinical experiences at assigned times. Maintain professional behavior and appearance.	05	
Log book	10	
Viva	10	
Attendance	05	
Total	**50 Marks**	

Sign of Internal Examiner:_____
Sign of External Examiner: _____

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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