REPRODUCTIVE SCIENCE AND MEDICINE (REPR_SCI)

REPR_SCI 405-0 Reproductive Physiology and Endocrinology Foundations (1 Unit)
This is a lecture-based course that provides a comprehensive survey of the structure and function of the female reproductive system. Students will discuss the fundamentals of female reproductive anatomy and reproductive axis function (hypothalamus-pituitary-gonadal). Specific topics covered include: female sex determination and differentiation, reproductive hormone signaling and action, the ovarian and menstrual cycles, oogenesis and folliculogenesis, pregnancy and parturition, and female reproductive technologies. Topics will be presented from molecular, cellular, and tissue perspectives and will span development, puberty, adulthood, and reproductive senescence. Perturbations to the female reproductive system that can lead to infertility, disease, or disorders will be considered. Lectures are interactive and consist of didactic fundamentals, deep dives into the historical literature, and examination of current and emerging topics in the field.

REPR_SCI 406-0 Emerging Research in Reproductive Science and Medicine (1 Unit)
This is a primary literature and critical thinking-based course designed to challenge students with historical, contemporary, and emerging concepts in reproductive science and medicine, particularly around the concepts of human reproductive development and ways to regulate and restore function. Topics covered include model systems for reproductive science and medicine research, epigenetics, hormone receptor signaling and endocrine disruption, environmental toxins, cancer stem cells, and reproductive bioengineering. A basic understanding of cell and molecular biology is a prerequisite for this course in addition to prior completion of REPR_SCI 405-0 and REPR_SCI 407-0. Students who have not completed REPR_SCI 405-0 and REPR_SCI 407-0 should contact the Center for Reproductive Science, crs@northwestern.edu, for permission to enroll.

REPR_SCI 407-0 Reproductive Physiology and Endocrinology in Society (1 Unit)
This is a lecture-based course that provides a comprehensive survey of the structure and function of the male reproductive system. Students will discuss the fundamentals of male reproductive anatomy and reproductive axis function (hypothalamus-pituitary-gonadal). Specific topics that will be covered include: male sex determination and differentiation, reproductive hormone signaling and action, spermatogenesis, sperm capacitation and fertilization, male reproductive behavioral changes, and male reproductive technologies. Topics will be presented from molecular, cellular, and tissue perspectives and will span development, puberty, adulthood, and reproductive senescence. Perturbations to the male reproductive system that can lead to infertility, disease, or disorders will be considered. Lectures are interactive and consist of didactic fundamentals, deep dives into the historical literature, and examination of current and emerging topics in the field.

REPR_SCI 415-0 Medical Management of Fertility (1 Unit)
This course exposes students to key topics in assisted reproductive technologies (ART), embryology, and andrology. The course, which is team-taught by faculty with translational and clinical expertise, covers gamete and embryo biology, assisted reproductive techniques and associated technologies, ethics, and an introduction to fertility clinic operation. Students will also have the opportunity to experience some commonly used clinical laboratory techniques in reproductive endocrinology and infertility, such as sperm processing and analysis for ART, intracytoplasmic sperm injection (ICSI), time-lapse morphokinetics, embryo biopsy and genetic screening, and gamete cryopreservation and thawing. A basic understanding of cell and molecular biology is a prerequisite for this course in addition to prior completion of REPR_SCI 405-0 and REPR_SCI 407-0. Students who have not completed REPR_SCI 405-0 and REPR_SCI 407-0 should contact the Center for Reproductive Science, CRS@northwestern.edu, for permission to enroll.

REPR_SCI 420-0 Human Reproductive Health and Disease (1 Unit)
This course covers human reproductive health and disease from a clinical angle – from physiology to pathology to therapeutic interventions. Aspects of both male and female reproduction are covered. The course is team-taught primarily by clinicians and physician-scientists who are experts in reproductive science and medicine and who are active in research and patient care. Topics include sexual function and dysfunction, infertility, reproductive aging, reproductive cancers, endometriosis, uterine leiomyoma, and pregnancy complications. Class sessions are interactive, and discussions focus on pathology, risk factors, diagnosis, standard of care, and the current status of research. A basic understanding of cell and molecular biology is a prerequisite for this course in addition to prior completion of REPR_SCI 405-0 and REPR_SCI 407-0. Students who have not completed REPR_SCI 405-0 and REPR_SCI 407-0 should contact the Center for Reproductive Science, crs@northwestern.edu, for permission to enroll.

REPR_SCI 425-0 Responsible Conduct of Research in Reproductive Science (1 Unit)
The goal of this course is to provide instruction and guidance on the responsible conduct of research as it pertains to all scientific disciplines but also through the specific lens of reproductive science and medicine. The National Institutes of Health defines the responsible conduct of research as the practice of scientific investigation with integrity. The responsible conduct of research involves the awareness and application of established professional norms and ethical principles in the performance of all activities related to research. Students will learn about and discuss a variety of topics required to perform high quality research, including rigor and reproducibility, mentoring relationships, authorship and peer review, misconduct and integrity, conflicts of interest, animals and humans in research, collaborations/team science, and social impact. Students will complete laboratory safety training and biomedical human subjects research training as part of this course. Students will demonstrate understanding of course concepts through case studies, faculty interviews, and classroom engagement. The quarter culminates in a student-driven case study discussion. Contemporary social impact issues from reproductive science are integrated throughout the class.

REPR_SCI 430-0 Translational Topics in Fertility Preservation and Oncofertility (1 Unit)
This lecture and case studies-based course bridges basic science and clinical knowledge to expose students to the translational advances in the field of oncofertility and fertility preservation. Course topics include fertility preservation in different populations (adult women and men, pediatrics, transgender and disorders of sex development (DSD) populations, tissue/cell processing methods (gamete and gonad harvesting, processing, cryopreservation, and storage), clinical care (patient navigation conversations, consults, cancer agent risk factors, psychological factors), fundamental biology techniques (bioengineering gonadal bioprostheses, spheroids, microphysiologic platforms, follicle culture), and ethical issues in the field. Students will also learn to evaluate complex case studies with complimentary lectures. A basic understanding of cell and molecular biology is a prerequisite for this course in addition to prior completion of REPR_SCI 405-0 and REPR_SCI 407-0. Completion of REPR_SCI 440-0 is also required so that

students are familiar with the lab techniques that will be discussed in this course.

REPR_SCI 440-0 Reproductive Technologies Laboratory (1 Unit)
This is an intensive laboratory-based course designed to provide students with exposure to a range of topics and associated technologies used in reproductive science and medicine. Experiments in this course will use multiple model systems commonly used in this field. Modules will cover topics including gonad architecture, gametogenesis, meiosis, fertilization, preimplantation embryo development, and reproductive signaling. Techniques that will be addressed include, but are not limited to, collection and micromanipulation of reproductive tissues and cells, immunohistochemistry and immunocytochemistry, biomaterial-based culture methods, microinjection, in vitro fertilization, live cell imaging, advanced microscopy, and bioengineering and organoid models. In addition, students will learn firsthand how to conduct and analyze experiments using the principles of the scientific method and how to communicate their results via visual, oral, and written approaches. Enrolled students should take REPR_SCI 405-0, REPR_SCI 407-0, and REPR_SCI 425-0 concurrently with REPR_SCI 440-0 or should have previously completed these courses as pre-requisites.

REPR_SCI 442-0 Reproductive Research Laboratory I (1 Unit)
This course is specifically designed to lead students through a hypothesis-driven, discovery-based research project stemming from current research questions in reproductive science, including but not limited to: factors important to reproductive organ development, signaling pathways that inform reproductive organ structure and function, and molecular and cellular pathways implicated in reproductive disease and infertility. Students will be engaged in a laboratory research project conducted in collaborative teams. Teams will be guided through research project design, experimental methodology and techniques, proper data management and analysis, and presentation of their scientific work. Experimental techniques utilized in this class will initially be workshopped to train students in protocol application and troubleshooting. To gain a scope for the multi-faceted nature of reproductive science and emerging techniques in experimental execution, this class will explore and utilize specialized facilities that focus on live and fixed specimen imaging and state of the art biological analysis and screening. Techniques utilized may include: molecular and cell biology, cell culture, protein biochemistry, immunohistochemistry, and microscopy. REPR_SCI 405-0, REPR_SCI 407-0, and REPR_SCI 425-0 are pre-requisites for this course.

REPR_SCI 443-0 Reproductive Research Laboratory II (1 Unit)
This course is a continuation of REPR_SCI 442-0, which is designed to lead students through a hypothesis-driven, discovery-based research project stemming from current research questions in reproductive science, including but not limited to: factors important to reproductive organ development, signaling pathways that inform reproductive organ structure and function, and molecular and cellular pathways implicated in reproductive disease. Students will engage in a laboratory research project, in a collaborative team format, that will continue to reinforce skill sets in research project design, experimental methodology and techniques, proper data management and analysis, and presentation of cumulated work. However, while REPR_SCI 442-0 is focused primarily on developing foundations in experimental inquiry, design, and execution, emphasis in REPR_SCI 443-0 will shift to advancing data acquisition and analysis, expanding project design directions and enhancing oral and written scientific communication. REPR_SCI 405-0, REPR_SCI 407-0, REPR_SCI 425-0, and REPR_SCI 442-0 are pre-requisites for this course.

REPR_SCI 455-0 Science Communication in Reproductive Science and Medicine (1 Unit)
The goal of this course is to increase students' competence in oral, written and visual science communication. Students will learn how to communicate complex topics in reproductive science and medicine to their scientific community and their peers, as well as to broad audiences including funders, policymakers, and the media. Over the course of the quarter, students will learn to write a research abstract and research proposal. They will also prepare a visual representation of their scientific hypothesis and learn to deliver an oral presentation in the form of a 3-minute elevator pitch. Through these deliverables, students will practice writing, editing, and giving constructive criticism on written and oral assignments through peer-review and class interactions. This class is co-taught by a board-certified editor in the life sciences with experience in biomedical writing, editing, and consulting.

REPR_SCI 497-0 Assessment and Career Planning (1 Unit)
This course is designed to provide students with skills and resources to evaluate themselves in light of their career and professional goals so that they are prepared to be well-rounded scientists. Students receive instruction on self-assessment and professional development planning. Students will identify their strengths using assessment tools and use this information to set goals to utilize strengths more effectively. To practice and understand the power of professional networking, students will identify individuals actively engaged in professions of interest and conduct informational interviews. In-class activities include mock speed networking, informational interviews, and job interviews to increase comfort with these important professional interactions. This course also includes classes on resumes, CVs, and cover letters as well as the job search process and interviewing to provide a well-rounded approach to professional development. This course does not specifically prepare students for any one career. Rather, recognizing that professional development is a continuous process, this course provides students the skills and resources to uncover their unique strengths relevant to the professional world of reproductive science and medicine.

REPR_SCI 591-0 Thesis Research in Reproductive Science and Medicine (1-3 Units)
During this course, students will prepare a written thesis describing their research project (developed during REPR_SCI 595-0) including the research question/hypothesis, rationale and significance, a literature review, experimental approach, data and results, and future directions. At the culmination of this course, the thesis will be presented and defended to a faculty committee.
Prerequisite: REPR_SCI 595-0.

REPR_SCI 595-0 Research in Reproductive Science and Medicine (1-3 Units)
Students will join a research laboratory and develop and execute an independent research project in collaboration with their research mentor. Students will become integrated members of their laboratory or research group and commit a minimum of 20 hours per week to research during the academic year. Research mentors will evaluate student research commitment and progress and assign the grade for the course. The research done through REPR_SCI 595-0 will be included in a final thesis that will be prepared as part of REPR_SCI 591-0.