

# IDS 2935: Exploring Our Genome

## Quest 2

### I. General Information

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#### **Class Meetings**

- Fall 2023
- 100% Asynchronous, Enrollment cap = 152 students

#### **Instructors**

*Open student hours will be announced first week of class.*

Jennifer Drew, PhD, [jdrew@ufl.edu](mailto:jdrew@ufl.edu)  
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#### **Teaching Assistant(s)**

Korrie James, [korriejames@ufl.edu](mailto:korriejames@ufl.edu)  
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#### **Course Description**

Genomics has exploded with exciting discoveries and spawned innovative technological developments. Personal genomics and personalized health care have ushered in a new era of Precision Medicine. This course investigates the same fundamental questions that drive scientists studying genetics, behavior, and disease. These pressing questions address crucial aspects: What insights can genetics provide us about ourselves? How do we navigate the study and analysis of our personal genome data? How can common genetic variations inform decisions related to disease risk, lifestyles, and behaviors?

Throughout this course, we will immerse ourselves in the field of genomics, exploring the process of obtaining and interpreting genome sequence data. We'll gain an understanding of the limitations of this data and examine the ethical, legal, and societal implications that come with it. However, the centerpiece of our journey will be a semester-long, guided collaborative Capstone project. This course is designed to bolster scientific literacy while exploring your own interests in the human genome. By the end of this course, students will not only possess a foundational understanding of how to interpret genomic data found in scientific manuscripts but will have acquired a versatile set of skills that can be applied across various fields. This course welcomes students from all majors and backgrounds. No prior scientific or statistical/analytical background is assumed.

## Quest and General Education Credit

- Quest 2
- Biological Sciences

This course accomplishes the [Quest](#) and [General Education](#) objectives of the subject areas listed above. A minimum grade of C is required for Quest and General Education credit. Courses intended to satisfy Quest and General Education requirements cannot be taken S-U.

## Required Readings and Works

Lewis, R. (2021). [Human Genetics: Concepts and Applications, \(13th ed.\)](#) Boston: McGraw-Hill Publishers. Available via UF All Access.

All other required readings and works are available in Canvas.

Materials and Supplies Fees: n/a

## II. Graded Work

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### Description of Graded Work

Assignment	Requirements	Percentage
<b>Quizzes</b> <i>Series of 12 lecture-based modules, each worth 4% of total course grade. Students may drop 2 lowest scoring assignments.</i>	Weekly homework quiz that assesses understanding of concepts and critical thinking. Homework will assess specific learning objectives through mix of auto-graded multiple-choice questions, brief case studies with open text responses, short essays/discussion board posts to apply concepts and tools.	48%
<b>Capstone Assignments</b> <i>Series of Capstone assignments, leading up the final presentation and Capstone synthesis.</i>	Active learning modules that include a combination of independent and collaborative work and discussions. The final date of completion of each toolbox is listed in the Annotated Weekly Schedule and is tentative to change. The Capstone culminates in a collaborative poster summary that serves as a final project. Students share their presentations as the last two modules of the course.	50%
<b>Self-reflection</b>	Students upload a self-reflection and participate in a dialogue about their gains in professional growth/skills and gains in understanding and appreciation of their own genetic information.	2%
		<b>TOTAL = 100%</b>

## Grading Scale

For information on how UF assigns grade points, visit: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

A	94 – 100%		C	74 – 76%
A-	90 – 93%		C-	70 – 73%
B+	87 – 89%		D+	67 – 69%
B	84 – 86%		D	64 – 66%
B-	80 – 83%		D-	60 – 63%
C+	77 – 79%		E	<60

## III. Weekly Schedule – Concepts and Reading

<b>Weekly Topic and Key Specific Learning Objectives</b>	<b>Corresponding Textbook Chapters</b> <b>All other readings posted in class</b>
<ul style="list-style-type: none"> <li>Lecture titles listed below each topic</li> <li>Average lecture duration = 15 min</li> </ul>	
<b>1. Overview of Human Genome</b>	<b>1</b>
<ul style="list-style-type: none"> <li>What is a genome</li> <li>Structure and Function of Genome</li> <li>Precision Medicine</li> </ul>	
<b>2. History and Fundamentals of Genomics</b>	<b>4</b>
<ul style="list-style-type: none"> <li>Major Milestones of genetics and genomics</li> <li>Fundamentals of Inheritance (Mendelian Genetics)</li> <li>Modes of inheritance</li> </ul>	
<b>3. From Gene to Protein</b>	<b>10 and 11</b>
<ul style="list-style-type: none"> <li>Central Dogma: From Gene to Protein</li> <li>Transcription</li> <li>Genetic code</li> <li>Translation</li> <li>Gene Regulation</li> </ul>	
<b>4. Mutations and Single Gene Disorders</b>	<b>12</b>
<ul style="list-style-type: none"> <li>Mutations</li> <li>Causes of Mutations</li> <li>Nature of Mutations and Genetic Diseases</li> </ul>	
<b>5. Genetic Diversity and Ancestry</b>	<b>15 - 18</b>
<ul style="list-style-type: none"> <li>Genetic Variation in Populations</li> <li>Changing Frequencies</li> <li>Molecular Evolution</li> <li>Genetics of Identity</li> </ul>	
<b>6. Genetics of Complex Disorders</b>	<b>7</b>
<ul style="list-style-type: none"> <li>Complex Traits</li> <li>Genome-wide Association Studies</li> </ul>	

- Polygenic Risk Scores and Precision Medicine

<b>7. Nutrigenetics and Metabolism</b>	
<ul style="list-style-type: none"> <li>• Introduction to Nutrigenetics</li> <li>• Five mechanisms of nutrigenetics</li> <li>• Statistical Applications: A Case Study of the “Great Florida Spitting Contest”</li> <li>• Advanced Topics in Nutrigenetics</li> </ul>	
<b>8. Genetic Technology – Classic Biotechniques</b>	<b>21 and 22</b>
<ul style="list-style-type: none"> <li>• Extraction and Modification</li> <li>• Amplification</li> <li>• Genotyping and Sequencing</li> </ul>	
<b>9. Genetics Technology: Applications and Advances</b>	<b>21 and 22</b>
<ul style="list-style-type: none"> <li>• Genetic Testing</li> <li>• Pharmacogenomics</li> <li>• Genome editing, gene silencing and gene drive</li> <li>• Genetic-based therapies</li> </ul>	
<b>10. Cancer: Disease of the Genome</b>	<b>20</b>
<b>Overview of Cancer</b>	
<ul style="list-style-type: none"> <li>• Hallmarks of Cancer 1 – 4</li> <li>• Hallmarks of Cancer 5 – 10</li> <li>• Hallmarks of Cancer 11 - 14</li> </ul>	
<b>11. Genetics of Immunity and Human Response</b>	<b>19 and 11</b>
<ul style="list-style-type: none"> <li>• Response to Self</li> <li>• Response to Environment - Epigenetics</li> <li>• Response to Commensal Microbial communities</li> <li>• Response to Infection</li> </ul>	
<b>12. Genetics of Behavior</b>	<b>8</b>
<ul style="list-style-type: none"> <li>• Guest Lecture</li> <li>• Student-driven Q and A</li> </ul>	
<b>13. Our Genome – Capstone and Colloquium</b>	
<ul style="list-style-type: none"> <li>• Student generated project presentations</li> </ul>	
<b>14. Our Genome – Capstone and Colloquium and Reflection</b>	
<ul style="list-style-type: none"> <li>• Student generated project presentations</li> </ul>	

## IV. Student Learning Outcomes (SLOs)

At the end of this course, students will be expected to have achieved the [Quest](#) and [General Education](#) learning outcomes as follows:

**Content:** *Students demonstrate competence in the terminology, concepts, theories, and methodologies used within the discipline(s).*

- Identify, describe, and explain the structure, function, components, and influence of the human genome and understand how genomics and biotechnological advancements have changed biology and the questions that can be addressed (**B**). **Assessments:** Quizzes.

- Identify, describe, and explain the process of DNA replication and how DNA structure was determined. Predict DNA sequences. Recognize what can be revealed in a whole genome sequence and limits of the interpretation. **Assessments:** Quizzes.
- Describe and explain personal genomics, distinguish between clinical, research, and consumer-based genetic testing and describe the role of a genetic counselor, and critically evaluate the impact and value of consumer genetic testing. Identify and discuss ethical (ELSI) issues and concerns stemming from personal genomics, genetic testing, and incidental findings, reporting and quality. Identify the goals, advantages, clinical applications, and resources for precision medicine and pharmacogenetics. **Assessments:** Quizzes, discussions.
- Identify, describe, and explain the role of mutations and characterize mutations to predict the role of a mutation in a disease. Predict the underlying genetic mechanism of a disease phenotype based on clinical information and recognize characteristics of unique or atypical types of mutations. Understand and describe how genetic variation enhances and explains the human condition. Describe and explain how epigenetics aids in an understanding of the environmental influences on genetic expression, and how evolutionary and cultural factors have helped shape the influence of genetics on disease and health **(B)**. **Assessments:** Quizzes.

**Critical Thinking:** *Students carefully and logically analyze information from multiple perspectives and develop reasoned solutions to problems within the discipline(s).*

- Critically analyze and evaluate quantitative data derived from an ongoing genome-wide association study (GWAS) to draw conclusions and test hypotheses about genetics and the human condition **(Quest 2, B)**. **Assessments:** Capstone exercises, discussions, self-reflection, presentation.
- Critically evaluate and assess the contribution of the analysis and its biological implications, with respect to what is known (not known, and unknowable) in the history of genomics **(Quest 2, B)**. **Assessments:** Quizzes, discussion, presentation.

**Communication:** *Students communicate knowledge, ideas, and reasoning clearly and effectively in written and oral forms appropriate to the discipline(s).*

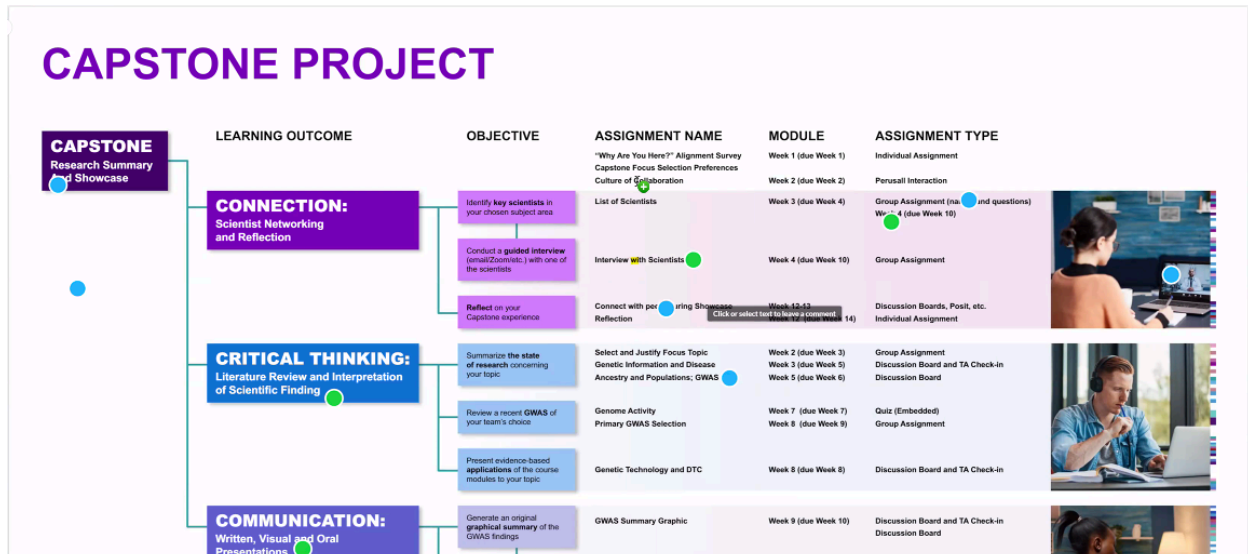
- Develop and present in writing the analysis of quantitative data, and logic to draw reasonable conclusions based on their analysis on a specific problem **(Quest 2, B)**. **Assessments:** Homework assignments, Capstone, and presentation.
- Prepare a presentation and research summary with peer collaboration to communicate findings and implications to the broader field **(Quest 2, B)**. **Assessments:** Capstone final presentation.

**Connection:** *Students connect course content with meaningful critical reflection on their intellectual, personal, and professional development at UF and beyond.*

- Analyze and compare the genomic data to address the effects that may occur on the genomic association due to lifestyle and cultural adaptations and impacts. **Assessments:** Quizzes, presentation, and final reflection.
- Self-reflect and evaluate personal development within the scientific and professional skills that are expanded on and assessed throughout the course. Communicate and explain the stages of scientific dissemination, including ethical authorship and peer review **(Quest 2)**. **Assessments:** Quizzes, discussions, and final reflection.

# V. Quest Learning Experiences

## 1. Details of Experiential Learning Component



In the semester-long **Capstone Project**, students will engage in a multifaceted exploration of human genomics, weaving together knowledge, skills, and collaboration. The project unfolds through distinct stages, enabling students to dive into the intricate world of genomics. Students will begin by immersing themselves in scientific literature found in genomics journals. They will critically analyze and synthesize existing knowledge, pinpointing key discoveries and trends within their chosen area of interest. To gain practical insights, students will connect with accomplished scientists. Through interviews, they will unveil real-world applications of genomics across various domains, enriching their understanding of the field's impact. Armed with newfound insights, students will translate their research into compelling visualizations. These visual representations will complement their oral presentations, allowing them to effectively convey intricate genomic concepts to peers. Throughout the project, students will apply concepts from course lectures, exploring how theoretical knowledge translates into practical scenarios. This exploration will contribute to the advancement of their chosen genomics topic.

Guided by instructors and teaching assistants, students will receive feedback and support at various checkpoints, ensuring their progress aligns with project objectives. The culmination of this project is a comprehensive learning experience spread across two modules. During this phase, students will share their projects with classmates, fostering interaction and knowledge exchange. This exchange will not only showcase their discoveries but also provide an opportunity for reflection on the skills and insights gained.

The capstone project is founded upon three essential pillars:

- **Connection:** Through networking and collaboration, students will establish valuable connections with professionals in the field, enriching their understanding of genomics' practical implications.
- **Critical Thinking:** The literature review and synthesis foster critical thinking, enabling students to distill complex information and identify gaps in knowledge.

- **Communication:** By presenting their findings to the class, students will hone their communication skills, ensuring that intricate genomic concepts are accessible and engaging.

Throughout this project, students will collaborate with peers pooling their knowledge and collective insights. They will synthesize work in their chosen area of human genomics, weaving together course concepts and real-world applications. Ultimately, the capstone project serves as a platform for holistic learning, where theoretical understanding, practical experience, collaboration, and communication converge.

## 2. Details of Self-Reflection Component

In this course, students are asked to reflect on the growth of their critical thinking abilities, research skills, and scientific literacy. Self-reflection will be an integral part of the experiential learning journey, providing students with opportunities to assess their progress at various stages. Students will be expected to apply critical thinking, particularly in their approach to reviewing the scientific literature, analyzing data, interpreting findings, and considering the broader implications of their projects in improving the human condition.

As part of the course-run capstone, students will be expected to submit a reflective piece. This reflection will encompass insights gained from exploring the human genome and its role in shaping the human condition. Additionally, students will evaluate the skills they gained working independently and collaboratively on the capstone objectives to consider how these newly acquired skill sets might contribute to their future personal and professional goals in the future. The self-reflection component serves as a means for students to assess their intellectual and personal growth, fostering a deeper understanding of their journey in this course and its potential impact on their academic and professional trajectories.

## VI. Required Policies

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### Attendance Policy

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

### Students Requiring Accommodation

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### UF Evaluations Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period

opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

## University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

## Counseling and Wellness Center

Contact information for the Counseling and Wellness Center: <http://www.counseling.ufl.edu/>, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

## The Writing Studio

The writing studio is committed to helping University of Florida students meet their academic and professional goals by becoming better writers. Visit the writing studio online at <http://writing.ufl.edu/writing-studio/> or in 2215 Turlington Hall for one-on-one consultations and workshops.

## In-Class Recordings

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same



class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.