

**GENETIC ENGINEERING IN MEDICINE, AGRICULTURE, & LAW**  
**Professors Bob Goldberg (UCLA), John Harada (UC Davis), and**  
**Channapatna Prakash (Tuskegee)**  
**Winter 2019**

**LECTURES:** Tuesday & Thursday 3:30-6:00 → La Kretz 120

**REQUIRED TEXT:** *Introduction to Biotechnology* (W. J. Thieman & M. A. Palladino, 4<sup>th</sup> Edition, 2019). The HC70A text can be purchased from the bookstore, or as an eBook from either Amazon or VitalSource. The eBook is less expensive than the hardcopy text.

**OFFICE HOURS:** Friday: 1:30 – 2:30 PM → Terasaki Life Sciences Building 4121  
Phone: 310-825-9093; Email: bobg@ucla.edu

**GOLDBERG HC70A WEBSITE:** [http://www.mcdb.ucla.edu/Research/Goldberg/HC70A\\_W19/](http://www.mcdb.ucla.edu/Research/Goldberg/HC70A_W19/)

**HC70A CCLE WEBSITE:** <https://ccle.ucla.edu/course/view/19W-HNRS70A-1>

**BRUINCAST:** <http://www2.oid.ucla.edu/webcasts/courses/2018-2019/2019winter/hnrs70a-1>

**COURSE ADMINISTRATOR:** Dr. Lauren Bowman → Terasaki Life Sciences Building 4125  
Phone: 310-825-3270; Email: laurenbowman@ucla.edu

**DISCUSSION COORDINATOR:** Dr. Kelli Henry (kfhenny@ucla.edu)

**LECTURES:** HC70A lectures are interactive, and in-class “experiments” highlight important genetic engineering concepts. ***Note: Attendance in lecture is required.***

**GUEST LECTURES:** Guest speakers highlight the societal impacts of genetic engineering. ***Note: Attendance in guest lectures is required.***

**CLASS RECEPTIONS:** There will be a catered all-class reception for each guest speaker immediately following their lecture, providing a unique opportunity to interact with guest speakers.

**DISCUSSION SECTIONS:** Discussion Sections are taught as undergraduate seminars in a Socratic style, and focus on articles that relate to the history, applications, and societal impacts of genetic engineering. Focus your reading around four questions: (1) What is the overall scientific question being addressed? (2) What are the technologies being discussed? (3) What is the significance of the technology? (4) What ethical issues arise, if any, as a consequence of new technology? A Discussion participation grade of up to 100,000 points will be assigned at the end of the quarter. ***Note: Attendance in discussion section is required.***

**QUIZZES:** A **Take-Home Quiz** that focuses on the concepts covered in discussion and lecture will be handed out after discussion section. Quizzes count 25,000 points each. **Quizzes are due by 6 PM the Monday following Discussion Section in Terasaki Life Sciences 4121.**

**EXAMS:** Exams include a **Take-Home Exam** and **Two All-Class Oral Exams**. Take-Home Exam questions will be handed out in class during Week 4 and will count 400,000 points. The Mid-Term Oral Exam will cover questions on the Take-Home Exam and Quizzes, and will count 100,000 points. Final Oral Exam questions will be handed out in class during Week 8 and will count 100,000 points. The Exam Schedule is:

**Take-Home Exam: Due Tuesday, February 12 at the beginning of class (Week 6)**

**All-Class Mid-Term Oral Exam: Tuesday, February 12 (Week 6)**

**All-Class Final Oral Exam: Thursday, March 14 (Week 10)**

**COURSE GRADING:** You will be able to earn **ONE MILLION regular points** and a number of **BONUS POINTS** during the quarter. **Your grade will be based on 1,000,000 points**, although you have the potential for earning more than 1,000,000 points. Regular points will be divided as follows:

<b>Assignment</b>	<b>Total Points</b>	<b>% Grade</b>
Lecture Attendance	100,000	10
Discussion Quizzes (8)	200,000	20
Discussion Participation	100,000	10
Take-Home Exam	400,000	40
Mid-Term Oral Exam	100,000	10
Final Oral Exam	100,000	10
<b>TOTAL</b>	<b>1,000,000</b>	<b>100</b>

The following guidelines will be used to assign grades: **A** (>90%), **B** (80-89%), **C** (70-79%), **D** (60-69%), **F** (<60%). Your grade will be assigned using the following formula:

$$\% \text{ Total Points} = \frac{[(\text{Regular points} + \text{Bonus points})] \times [100]}{[1,000,000]}$$

**DISCUSSION GRADING CRITERIA:** Each Discussion is worth 10,000 points. Points will be assigned as follows:

<b>Grading Criteria</b>	<b>Total Points</b>
Attend Discussion	2,500
Participate in Discussion ( <i>i.e., answer &amp; ask questions</i> )	2,500
Demonstrate You Read Assigned Articles ( <i>i.e., knowing the main questions addressed in each figure and article as a whole</i> )	2,500
Demonstrate an Understanding of Article Concepts	2,500
<b>TOTAL</b>	<b>10,000</b>

<b>DATE</b>	<b>LECTURE &amp; DISCUSSION SCHEDULE (Weeks 1 to 6)</b>
1/8	<b>Lecture 1:</b> <i>The Age of DNA: What is Genetic Engineering - Part One</i> <b>Experiment:</b> Isolating DNA
1/10	<b>Film:</b> <i>Race For the Double Helix (2 Hours)</i>
<b>DISCUSSION 1:</b>	<i>What Do You Think About Genetic Engineering and GMOs?</i>
1/15	<b>Lecture 2:</b> <i>The Age of DNA: What is Genetic Engineering - Part Two</i> <b>Demonstration:</b> Genetic Engineering of Food Crops
1/17	<b>Film:</b> <i>The Gene Engineers (1 Hour); Playing God (1 Hour)</i>
<b>DISCUSSION 2:</b>	<b>Origins of Genetic Engineering-1:</b> <i>Manipulation of Genes; The Recombinant DNA Debate</i> <b>Lab Demonstration:</b> DNA Gel Electrophoresis <b>QUIZ #1</b>
1/22	<b>Lecture 3:</b> <i>What Are Genes &amp; How Do They Work: Part One</i>
1/24	<b>Film:</b> <i>Extraordinary Measures (1.75 Hours)</i>
<b>DISCUSSION 3</b>	<b>Origins of Genetic Engineering-2:</b> <i>Useful Proteins from Recombinant DNA</i> <b>Lab Experiment:</b> Bacteria "Cloning" & DNA Sequencing <b>QUIZ #2</b>
1/29	<b>Lecture 4:</b> <i>What Are Genes &amp; How Do They Work: Part Two</i> <b>Tuskegee Students Visit UCLA</b>
1/31	<b>Lecture 5 – How Are Genes Cloned &amp; Engineered: The Hemophilia Story</b> <b>TAKE-HOME EXAM QUESTIONS HANDED OUT</b> <b>All-Class Reception</b>
<b>DISCUSSION 4:</b>	<b>From Gene to Drug:</b> <i>Molecular Genetics of Hemophilia</i> <b>BACTERIA "CLONING" REPORT DUE</b> <b>QUIZ#3</b>
2/5	<b>Lecture 6 – A 21<sup>st</sup> Century Genetic Engineering Revolution</b>
2/7	<b>Film:</b> <i>Food Evolution (1.5 Hours)</i> <b>Speaker:</b> Channapatna Prakash, Ph.D. <b>All-Class Reception</b>
<b>DISCUSSION 5:</b>	<b>Genetic Engineering Crops &amp; Farm Animals:</b> <i>Are Genetically Engineered Foods Evil?; Transgenic Livestock As Drug Factories; Gene Edited Farm Animals Are Coming; GM Salmon Declared Fit For Dinner Plates</i>
2/12	<b>ALL-CLASS MIDTERM ORAL EXAM</b> <b>TAKE HOME EXAM DUE</b> <b>UC Davis Students Visit UCLA</b>
2/14	<b>Speaker:</b> Harry Klann, Supervising Criminologist, LAPD, Retired <i>DNA Forensics &amp; The Law – All Class Reception</i> <b>Experiment:</b> Making Your Own DNA Fingerprint!
<b>DISCUSSION 6:</b>	<b>DNA &amp; The Law:</b> <i>When Science Takes the Witness Stand; Science Makes it Impossible to Get Away With Crime; Cousin's DNA and Family Trees to Crack Cold Cases; Genetic Databases Could Identify Millions of Americans</i> <b>QUIZZES #4 &amp; 5</b>

<i>DATE</i>	<i>LECTURE &amp; DISCUSSION SCHEDULE (Weeks 7 to 10)</i>
2/19	<b>Lecture 7 – Age of Genomics: Three Parent Babies, Human Origins, &amp; Race</b> <b>Short Film: Knowledge or Certainty</b>
2/21	<b>Speaker: Pei Yun Lee, PhD: Stem Cells: Promise, Reality, and Conflict</b> <b>All-Class Reception</b>
<b>DISCUSSION 7:</b>	<b>How to Mark Your Genes:</b> <i>Chromosome Mapping With DNA Markers; Genomics For the People; Full Genome Sequencing For Newborns</i> <b>QUIZ #6</b>
2/26	<b>Lecture 8 –Professor John Harada: Human Genetic Engineering</b> <b>FINAL ORAL EXAM QUESTIONS HANDED OUT</b>
2/28	<b>Speaker: Michele Evans, MD: In Vitro Fertilization &amp; Genetic Testing</b> <b>All-Class Reception</b>
<b>DISCUSSION 8:</b>	<b>Human Gene Therapy – The Beginnings:</b> <i>Gene Therapy; Gene Therapy’s Second Act</i> <b>QUIZ #7</b>
3/5	<b>Lecture 9: Genetic Engineering &amp; The Law: Regulating Science &amp; GMOs</b>
3/7	<b>Speaker: Daisy Robinton: The Future of Genetic Engineering &amp; Health</b> <b>All-Class Reception</b>
<b>DISCUSSION 9:</b>	<b>Human Gene Therapy – 21<sup>st</sup> Century Applications – Unlocking the Mysteries of ALS; Out of the Silence</b> <b>QUIZ #8</b>
3/12	<b>Lecture 10: Genetic Engineering &amp; The Law: Who Owns Your Genes?</b>
3/14	<b>FINAL ALL-CLASS ORAL EXAM</b> End of Class Reception
<b>DISCUSSION 10:</b>	<b>The CRISPR Revolution:</b> <i>The DNA Revolution; Chinese Scientist’s Claim of Gene Edited Babies Creates an Uproar; This Fertility Doctor is Pushing the Boundaries of Human Reproduction With Little Regulation</i>  <i>What Do You Think About Genetic Engineering and GMOs Now?</i>

## TEXT READING ASSIGNMENTS:

**Note:** No textbook is perfect and follows the lecture sequence of every class – including HC70A! Your textbook contains most of the conceptual information covered in HC70A lectures and discussion sections – *but not in the same order*. The textbook index section will connect you to specific concepts covered in lecture and discussion. *For the textbook reading assignments I have extracted the most relevant pages that review and complement topics covered in lectures and discussions. Study the information presented in these assignments, as it will help you understand the major concepts presented in HC70A, and help solve problems on the exams and quizzes.*

### **Introduction to Biotechnology, 4th Edition (2019)**

<b>Lecture 1</b>	Chapters 1 & 3 (pgs. 60-70)
<b>Discussion 1</b>	No Text Reading
<b>Lecture 2</b>	Chapters 3 (pgs. 60-70)
<b>Discussion 2</b>	Chapter 2 (pgs. 33-36) & Chapter 3 (pgs. 60-70)
<b>Lecture 3</b>	Chapter 2
<b>Discussion 3</b>	Chapter 2, Chapter 3 (pgs. 70-84), & Chapter 5 (pgs. 130-144)
<b>Lecture 4</b>	Chapter 2
<b>Discussion 4</b>	Chapter 5 (pgs. 130-144)
<b>Lecture 5</b>	Chapter 3 (pgs. 70-84)
<b>Guest Lecture on GMOs</b>	Chapter 6
<b>Discussion 5</b>	Chapters 6, 7, & 12
<b>Lecture 6</b>	Chapter 2 (57-58) & Chapter 3 (pgs. 88-89)
<b>Guest Lecture on Forensics</b>	Chapter 8
<b>Discussion 6</b>	Chapter 8
<b>Lecture 7</b>	Chapter 3 (pgs. 89-104) & Chapter 13 (pgs. 356-358)
<b>Guest Lecture on Stem Cells</b>	Chapter 11 (309-327)
<b>Discussion 7</b>	Chapter 11 (279-290)
<b>Lecture 8</b>	Chapter 11 (pgs. 299-309)
<b>Discussion 8</b>	Chapter 11 (pgs. 299-309)
<b>Lecture 9</b>	Chapter 12
<b>Discussion 9</b>	Chapter 11 (pgs. 299-309) & Chapter 12
<b>Lecture 10</b>	Chapter 12
<b>Discussion 10</b>	Chapter 2 (pgs. 57-58) & Chapter 3 (pgs. 88-89)