General Education Course Information Sheet

Please submit this sheet for each proposed course

Department & Course Number MCDB 70

Course Title Genetic Engineering and Society

Indicate if Seminar and/or Writing II course

1 Check the recommended GE foundation area(s) and subgroups(s) for this course

Foundations of the Arts and Humanities	
• Literary and Cultural Analysis	
• Philosophic and Linguistic Analysis	
• Visual and Performance Arts Analysis and Practice	
Foundations of Society and Culture	
• Historical Analysis	
• Social Analysis	
Foundations of Scientific Inquiry	
• Physical Science	
With Laboratory or Demonstration Component must be 5 units (or more)	
• Life Science	X
With Laboratory or Demonstration Component must be 5 units (or more)	**X**

2. Briefly describe the rationale for assignment to foundation area(s) and subgroup(s) chosen.

This is an interdisciplinary course that includes both rigorous science in terms of genetic engineering –what it is and how we do it—and in-depth discussions and readings on the intersection of science and society, particularly in terms of ethics, law, and public policy as the relate to genetic engineering. In class demonstrations provide hands-on experiences in science, and give students a first-hand look at DNA.

3. "List faculty member(s) who will serve as instructor (give academic rank):
Bob Goldberg, Distinguished Professor, Molecular, Cell, & Developmental Biology (MCDB)

Do you intend to use graduate student instructors (TAs) in this course? Yes X No

If yes, please indicate the number of TAs 3

4. Indicate when do you anticipate teaching this course over the next three years:

2011-2012	Fall		Winter		Spring	Summer 2012	
	Enrollment		Enrollment		Enrollment	Enrollment	100
2012-2013	Fall		Winter		Spring	Summer 2013	100
	Enrollment		Enrollment		Enrollment		
2013-2014	Fall		Winter		Spring	Summer 2014	100
	Enrollment		Enrollment		Enrollment		

5. GE Course Units

Is this an ***existing*** course that has been modified for inclusion in the new GE? Yes X No

If yes, provide a brief explanation of what has changed.

This course was created and approved as a Life Science GE in 96F, but was never taught. The units have been raised from 4 to 5 to reflect the addition of new demonstrations, and a discussion section that involves timely articles that reflect the current impact of genetic engineering on society.

Present Number of Units: 4 Proposed Number of Units: 5

6. Please present concise arguments for the GE principles applicable to this course.

❑ General Knowledge	The course covers topics in both science and society that should be part of the knowledge of any educated citizen in the 21st century -- which is on the threshhold of a revolution in genetic technology -- and the social, legal, and ethical thinking about new emerging gene technologies. In addition to normal lectures, expert guest lecturers and films will be used to give students an insiders view of contemporary thinking in genetic engineering.
❑ Integrative Learning	The course is interdisciplinary in science, public policy, ethics, and the law -- and asks students to integrate knowledge across disciplines.
❑ Ethical Implications	Genetic engineering allows for human intervention in natural biological systems and must, therefore, be carefully and ethically prescribed according to legal, ethical, religious, and social boundaries.
❑ Cultural Diversity	The study of genes in society crosses all cultures and is a liberating way of looking at our common humanity. Genetic engineering has advanced our knowledge of where we have evolved from as human beings, and has provided new insights into different human populations and origins.
❑ Critical Thinking	Students are asked to think critically the scientific method and apply it to experimental situations. Students are taught to think critically about the role of science in society, and its effects upon society both beneficially (in medicine, law, and agriculture) and detrimentally (eugenics for example).
❑ Rhetorical Effectiveness	In addition to mid-term and final examinations, the course requires summarizing current articles on genetic engineering advances to society, and presenting group oral presentations on genetic engineering topics.
❑ Problem-solving	The course raises scientific and ethical questions. Students will learn how scientists solve novel problems by applying the scientific method. Students will have demonstrations that address scientific questions, and will design experiments – both orally and in writing – that address basic issues in genetic engineering.
❑ Library & Information Literacy	The course includes solving problems using the internet and state-of-the-art genomics databases. In addition, students will use many databases to research and explore contemporary issues in genetic engineering.

(A) STUDENT CONTACT PER WEEK (if not applicable write N/A)

1. Lecture:	**4**	(hours)
2. Discussion Section:	**1**	(hours)
3. Labs: ***Note: Demonstrations are in lectures.***		(hours)
4. Experiential (service learning, internships, other):		(hours)
5. Field Trips:		(hours)
(A) TOTAL Student Contact Per Week	**5**	**(HOURS)**

(B) OUT-OF-CLASS HOURS PER WEEK (if not applicable write N/A)

1. General Review & Preparation:	**1 (amortized)**	(hours)
2. Reading	**3**	(hours)
3. Group Projects:	**1 (amortized)**	(hours)
4. Preparation for Quizzes & Exams:	**1 (amortized)**	(hours)
5. Information Literacy Exercises:	**1 (amortized)**	(hours)
6. Written Assignments:	**1 (amortized)**	(hours)

7. Research Activity:	**2 (amortized)**	(hours)
(B) TOTAL Out-of-class time per week		**(HOURS)**
	10	
GRAND TOTAL (A) + (B) must equal 15 hours/week	**15**	**(HOURS)**

MCDB 70 — Genetic Engineering & Society
Professor Bob Goldberg
Syllabus

LECTURES & GUEST LECTURES: Tuesday & Thursday – Two Hours Each

DISCUSSION SECTIONS: One Hour Per Week

REQUIRED TEXTS: *Introduction to Biotechnology, 3rd Edition-2013* (W. J. Thieman & M. A. Palladino)
The Double Helix (J. D. Watson)
Scientific American & *Other Articles*

OFFICE HOURS: Two Hours Per Week → Terasaki Life Sciences 4121
Phone: 310-825-9093; Email: bobg@ucla.edu

GOLDBERG LAB WEBSITE: *http://www.mcdb.ucla.edu/Research/Goldberg*

BRUINCAST: *Course will be BruinCasted and Pod Casted.*

ADMINISTRATIVE ASSISTANT: Jennifer Kwan (kwanj@ucla.edu)
4125 Terasaki Life Sciences; 310-825-3270

LECTURES: Lectures will be webcasted and audio podcasted.

GUEST LECTURES: Guest speakers will be invited to highlight the real-life impacts of genetic engineering on society.

DISCUSSION SECTION: Discussion Section will be taught as an Undergraduate Seminar and focuses on scientific articles that relate to the history of genetic engineering and its current applications. Articles introduce important concepts and teach how to read and think about science.

QUIZZES: A Take-Home Quiz will be handed out after class each discussion. The take-home quizzes focus on articles and concepts covered in each Discussion. Quizzes will count 25,000 points each.

CLASS RECEPTIONS: There will be a catered all-class reception for each guest speaker immediately following their Thursday lecture. This will give you an opportunity to interact with the speakers who are experts in their chosen fields.

DOUBLE HELIX REPORT: You will write a short report on *The Double Helix* by J. D. Watson that will introduce you as to how the structure of DNA was solved.

EXAMS: Exams include a Take-Home Mid-Term Exam and a Final Exam. Take-Home Exam questions will be handed out in class during Week 4, and sample final exam questions will be handed out in class during Week 9.

GRADING: Grades will be based on 1,000,000 points. Points will be divided as follows:

	Total Points	**% Grade**
Double Helix Report	25,000	2.5
Discussion Quizzes	200,000	20
Discussion Participation	50,000	5
Take-Home Exam	400,000	40
Final Exam	200,000	20
TOTAL	**1,000,000**	**100**

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

LECTURE	TOPIC
Lecture 1	*The Age of DNA: What is Genetic Engineering - Part One* **Films:** *Craig Venter & Designing Life*; *Resurrecting the Extinct*; *Playing God: Origins of Genetic Engineering* **Demonstration**: Isolating "Your" DNA
Film Lecture 1	*Race for the Double Helix*
Discussion 1:	*Recombinant DNA Debate*
Lecture 2	**Lecture 2:** *The Age of DNA: What is Genetic Engineering - Part Two* **Demonstration:** Classical Genetic Engineering: Crop Origins
Film Lecture 2	**Films:** *The Lysenko Affair; History's Harvest; Anti-Science*
Discussion 2:	*Making Drugs in Bacteria*
Lecture 3	*What Are Genes & How Do They Work: Part One* **Demonstrations:** Gel Electrophoresis & Bacteria "Cloning"
Guest Lecture 1	**Speaker: Professor Channapatna Prakash, PhD**: *Engineering Crops For the Developing World* **All-Class Reception**
Discussion 3:	*Transgenic Crops*
Lecture 4	*What Are Genes & How Do They Work: Part Two* **Film:** *Kerry Mullis and PCR* **Demonstration:** Making a DNA Fingerprint
Guest Lecture 2	**Speaker: Harry Klann, Supervising Criminologist, DNA Unit, LAPD:** *DNA Forensics & The Law* **All-Class Reception**
Discussion 4:	*Gene Testing With DNA Markers; Keeping Your Genes Private*
Lecture 5	*How Are Genes Cloned & Engineered: The Hemophilia Story*
Guest Lecture 3	**Speaker: Professor Bob Wayne,** *Engineering Modern-Day Dogs* **All Class Reception**
Discussion 5:	*When Science Takes the Witness Stand; DNA and Justice Denied*
Lecture 6	*The Age of Genomics*
Film Lecture 3	*Extraordinary Measures*
Discussion 6:	*Making Drugs in Transgenic Animals*
Lecture 7	*Identifying Individuals Past & Present Using DNA* **Film:** *Knowledge or Certainty*
Guest Lecture 4	**Speaker: Pei Yun Lee, PhD:** *Stem Cells: Promise, Reality, and Conflict* **All-Class Reception**
Discussion 7:	*The Future of Stem Cells*

LECTURE	TOPIC
Guest Lecture 5	**Professor John Harada:** *Human Genetic Engineering & 21st Century Gene Therapy* **All-Class Reception**
Lecture 9	*Science & the Law: Regulating Science: Part One*
Discussion 8:	*Gene Therapy*
Lecture 9:	*Science & the Law: Regulating Science: Part Two* **Films:** *Inherit the Wind; Judgment Day*
Guest Lecture 6	**Speaker: Michele Evans, MD:** *In Vitro Fertilization & Genetic Testing* **All-Class Reception**
DISCUSSION 9:	*Traces Our Ancestry With DNA; How We Are Evolving;*
Lecture 10:	*Science & the Law: Who Owns Your Genes: Part One*
Lecture 11:	*Science & the Law: Who Owns Your Genes: Part Two*
Discussion 10:	*The Genetic Basis of Cancer; Mapping the Cancer Genome*

TEXT READING ASSIGNMENTS FOR LECTURES AND DISCUSSIONS
INTRODUCTION TO BIOTECHNOLOGY, 3ND EDITON

LECTURE 1	Chapter 1
DISCUSSION 1	Chapters 2 & 3
LECTURE 2	Chapter 2
DISCUSSION 2	Chapters 2, 3, & 5
LECTURE 3	Chapter 2
DISCUSSION 3	Chapters 6, 12, & 13
LECTURE 4	Chapter 3
DISCUSSION 4	Chapters 8 & 11
LECTURE 5	Chapters 3, 8, & 11
DISCUSSION 5	Chapter 8
LECTURE 6	Chapter 8
DISCUSSION 6	Chapters 7, 12, & 13
LECTURE 7	Chapters 5, 6, & 7
DISCUSSION 7	Chapters 11 & 13
LECTURE 8	Chapter 11

DISCUSSION 8	Chapter 11
LECTURE 9	Chapter 12
DISCUSSION 9	Chapter 5
LECTURE 10	Chapters 12 & 13
DISCUSSION TEN	Chapter 11

DISCUSSION SECTION BIBLIOGRAPHY:

DISCUSSION ONE – The History and Science of Genetic Engineering

1. Stanley N. Cohen, *The Manipulation of Genes.* Scientific American, July, 1975, **233 (1)**, 24-33.
2. Clifford Grobstein, *The Recombinant DNA Debate.* Scientific American, July, 1977, **237 (1)** 22-33.
3. Frederic Golden, *Shaping Life in the Lab,* Time Magazine, March 9, 1981, pgs. 1-13.

DISCUSSION TWO – Using Genetic Engineering to Make Drugs in Bacteria

1. Walter Gilbert and Lydia Villa-Komaroff, *Useful Proteins From Recombinant Bacteria.* Scientific American, April, 1980, **242 (4)**, 74-94.

DISCUSSION THREE – Using Genetic Engineering to Make Better Crops

1. Charles S. Gasser and Robert T. Fraley, *Transgenic Crops.* Scientific American, June, 1992, **266 (6),** 62-69.
2. Terri Raney and Prabhu Pingali, *Sowing a Gene Revolution.* Scientific American, September, 2007, **297 (3),** 104-111.
3. William H. R. Langridge, *Edible Vaccines*. Scientific American, September, 2000, **283 (3),** 66-71

DISCUSSION FOUR – Using DNA to Identify Human Disease Genes

1. Ray White and Jean-Marc Lalouel, *Chromosome Mapping with DNA Markers***.** Scientific American, February, 1988, **258 (2)**, 40-48.
2. Mark A. Rothstein, *Keeping Your Genes Private,* Scientific American , September, 2008, **299 (3),** 64-69.
3. Melinda Wenner Moyer, *Too Much Information,* Scientific American, April, 2011, **304 (4),** 27.

DISCUSSION FIVE – DNA Testing in the Courtroom

1. Peter J. Neufeld and Neville Colman, *When Science Takes the Witness Stand***.** Scientific American, May, 1990, **262 (5)**, 46-53.
2. Sheldon Krimsky and Tania Simoncelli, *DNA and Justice Denied*. LA Times, **December 22, 2010**
3. Greg Miller, *Familial DNA* Testing. Science **329,** 262 (2010)
4. Christine Soares, *Portrait in DNA,* Scientific American, May, 2010, 302 (4), 14-15.
5. Editors, *Stop the DNA Dragnet,* Scientific American, December, 2011, **305 (6),** 14.

DISCUSSION SIX – Using Genetic Engineering to Make Drugs in Farm Animals

1. William H. Velander, Henryk Lubon, and William N. Drohan, *Transgenic Livestock as Drug Factories.* Scientific American, January 1997, **276 (1)**, 70-74.
2. Ian Wilmot, *Cloning For Medicine.* Scientific American, December 1998, **279 (6)**, 58-63.
3. Gary Stix, *The Land of Milk & Honey*, Scientific American, November 2005, **293 (5)**, 102-104.

DISCUSSION SEVEN – Stem Cells: Studying and Curing Human Diseases

1. Clive Cookson et al., *The Future of Stem Cells.* Scientific American Special Report, July, 2005, **A6-A21**.
2. Konrad Hochedlinger, *Your Inner Healers.* Scientific American, May, 2010, **302 (4),** 47-53.
3. Stephen S. Hall, *Diseases in a Dish,* Scientific American, March, 2011, **304 (3),** 41-45.
4. Robin Marantz Henig, *Pandora's Baby*, Scientific American, June, 2003, **266 (6)**, 63-68.

DISCUSSION EIGHT – Gene Therapy: Fixing Human Genetic Defects

1. Inder M. Verma, *Gene Therapy***.** Scientific American, November, 1990, **263 (5)**, 68-84.
2. Theodore Friedman, *Overcoming the Obstacles to Gene Therapy.* Scientific American, June, 1997, **276 (6)**, 96-101.

3. Matthew P. Morrow and David B. Weiner, *DNA Drugs Come of Age,* Scientific American, July, 2010, **303 (1),** 48-53
4. Steve Mirsky and John Rennie, *What Cloning Means for Gene Therapy?* Scientific American, June, 1997, **276 (6),** 122-123

DISCUSSION NINE – Using DNA to Trace Ancestry and Human Origins

1. Gary Stix, *Traces of a Distant Past,* Scientific American, July, 2008, **298 (6),** 56-63
2. Jonathan K. Pritchard, *How We Are Evolving,* Scientific American, October, 2010, **303 (4)**, 41-47.
3. Emily Anthes, *Three Diseases We May Be Able To Blame On Our Ancient Ancestors,* Discover Magazine, December, 2008

DISCUSSION TEN – Understanding and Defeating Cancer

1. Webster K. Cavenee and Raymond L. White, *The Genetic Basis of Cancer.* Scientific American, March 1995, **273 (3),** 72-79.
2. Francis S. Collins and Anna D. Barker, *Mapping the Cancer Genome*, Scientific American, March, 2007, **296 (3),** 50-57.
3. Jeff Wheelwright, *Cancer's Wandering Gene,* Discover Magazine, December, 2011, pgs. 64-70.

Course Revision Proposal

	Molecular, Cell, & Developmental Biology 70 Genetic Engineering and Society	
	Requested revisions that apply:	
	☐ Renumbering ☐ Title ☑ Format ☐ Requisites ☑ Units ☑ Grading ☑ Description Multiple Listing: ☐ Add New ☐ Change Number ☐ Delete Concurrent Listing: ☐ Add New ☐ Change Number ☐ Delete	
	CURRENT	PROPOSED
Course Number	Molecular, Cell, & Developmental Biology 70	Molecular, Cell, & Developmental Biology 70
Title	Genetic Engineering and Society	Genetic Engineering and Society
Short Title	GENETIC ENGR&SOCTY	GENETIC ENGR&SOCTY
Units	Fixed: 4	Fixed: 5
Grading Basis	Letter grade only	Letter grade or Passed/Not Passed
Instructional Format	Primary Format Lecture	Primary Format Lecture - 4 hours per week
	Secondary Format None	Secondary Format Discussion - 1 hours per week
TIE Code	LECN - Lecture (No Supplementary Activity) [T]	LECS - Lecture (Plus Supplementary Activity) [T]
GE	No	Yes
Requisites	None	None.
Description	Lecture, three hours; discussion, two hours. Designed for nonmajors. Not open to students with credit for Life Sciences 3 or 4. Basic principles of genetic engineering. Overview of genetic engineering techniques and relationship of genetic engineering to medicine, agriculture, and society. Emphasis on specific genetic engineering applications to generate discussion on its use in society. Letter grading.	Lecture, four hours; discussion, one hour. Designed for nonmajors. Not open to students with credit for Life Sciences 3 or 4. Basic principles of genetic engineering. Overview of genetic

		engineering concepts and specific applications of genetic engineering to medicine, agriculture, law, and society. Emphasis on genetic engineering history and foundations to generate discussion on its use in society. P/NP or letter grading.
Justification		This course was created and approved as a life science GE in 96F, but was never taught. The units have been raised from 4 to 5 to reflect the addition of new demonstrations, and a discussion section that involves timely articles that reflect the current impact of genetic engineering on society. Per E. Kaufman's question regarding P/NP: Historically, all courses offered in the MCDB department, except for GE courses, are for letter grading only. All MCDB courses that are also GE's are P/NP or letter grade.
Syllabus		File *MCDB70-Syllabus_REV.pdf* was previously uploaded. You may view the file by clicking on the file name.
Supplemental		

Information		
Effective Date	Fall 1996	Fall 2011
Department	Molecular, Cell, & Developmental Biology	Molecular, Cell, & Developmental Biology
Contact		Name CONSTANCE FIRESTONE
Routing Help		E-mail cfire@mcdb.ucla.edu

ROUTING STATUS

Role:	Registrar's Office
Status:	Processing Completed

Role:	Registrar's Publications Office - Hennig, Leann Jean (lhennig@registrar.ucla.edu) - 56704
Status:	Added to SRS on 3/28/2012 12:16:37 PM
Changes:	TIE Code, Description
Comments:	Edited course description into official version.

Role:	Registrar's Scheduling Office - Thomson, Douglas N (dthomson@registrar.ucla.edu) - 51441
Status:	Added to SRS on 3/15/2012 6:46:12 PM
Changes:	TIE Code, Effective Date
Comments:	No Comments

Role:	L&S FEC Coordinator - Castillo, Myrna Dee Figurac (mcastillo@college.ucla.edu) - 45040
Status:	Returned for Additional Info on 3/14/2012 10:47:10 AM
Changes:	TIE Code
Comments:	Routing to Doug Thomson in the Registrar's Office

Role:	FEC Chair or Designee - Kaufman, Eleanor K. (eleanork@ucla.edu) - 68155
Status:	Approved on 3/13/2012 10:30:53 PM
Changes:	TIE Code
Comments:	No Comments

Role:	L&S FEC Coordinator - Castillo, Myrna Dee Figurac (mcastillo@college.ucla.edu) - 45040
Status:	Returned for Additional Info on 3/9/2012 11:05:56 AM
Changes:	TIE Code
Comments:	Routing to Eleanor Kaufman for FEC approval

Role:	Department Chair or Designee - Firestone, Constance Louise (cfire@mcdb.ucla.edu) - 57109

Status:	Returned for Additional Info on 3/8/2012 5:09:08 PM
Changes:	TIE Code
Comments:	Please see approval from Chair Designee for the revisions. Lecture hours in description corrected to match syllabus; rational for P/NP grading added to justification; grading breakdown corrected on syllabus; I will email GE Information sheet to Eleanor Kaufman

Role:	Department Chair or Designee - Hurley, Pamela S (pamelah@mcdb.ucla.edu) - 44256
Status:	Approved on 3/8/2012 4:44:24 PM
Changes:	TIE Code
Comments:	Pamela Hurley, Ed.D. is acting on behalf of Professor Utpal Banerjee, MCDB Department Chair

Role:	Department/School Coordinator - Firestone, Constance Louise (cfire@mcdb.ucla.edu) - 57109
Status:	Returned for Additional Info on 3/8/2012 4:41:29 PM
Changes:	TIE Code, Description, Justification
Comments:	Lecture hours in description corrected to match syllabus; rational for P/NP grading added to justification; grading breakdown corrected on syllabus; I will email GE Information sheet to Eleanor Kaufman

Role:	L&S FEC Coordinator - Castillo, Myrna Dee Figurac (mcastillo@college.ucla.edu) - 45040
Status:	Returned for Additional Info on 3/8/2012 3:50:07 PM
Changes:	TIE Code
Comments:	Routing back to Connie Firestone. Please see FEC Vice Chair's comments below.

Role:	FEC Chair or Designee - Kaufman, Eleanor K. (eleanork@ucla.edu) - 68155
Status:	Returned for Additional Info on 3/7/2012 10:24:27 PM
Changes:	TIE Code
Comments:	Hours listed in description do not match new lecture and discussion format. Give rationale for why it is now a P/NP although units are higher. If possible, can the proposal sent to GE governance committee be included. Grading breakdown on syllabus does not add up to 100%=1,000,000 points.

Role:	L&S FEC Coordinator - Castillo, Myrna Dee Figurac (mcastillo@college.ucla.edu) - 45040
Status:	Returned for Additional Info on 3/7/2012 4:18:49 PM
Changes:	TIE Code
Comments:	GE proposal received. Routing to Eleanor Kaufman for FEC approval.

Role:	Department Chair or Designee - Firestone, Constance Louise (cfire@mcdb.ucla.edu) - 57109
Status:	Approved on 3/6/2012 5:35:34 PM
Changes:	TIE Code
Comments:	See Department Chair Approval from Pamela Hurley.

Role:	Department Chair or Designee - Hurley, Pamela S (pamelah@mcdb.ucla.edu) - 44256

Status:	Approved on 3/6/2012 5:27:07 PM
Changes:	TIE Code
Comments:	Pamela Hurley, Ed.D. is acting on behalf of Professor Utpal Banerjee, MCDB Department Chair

Role:	Initiator/Submitter - Firestone, Constance Louise (cfire@mcdb.ucla.edu) - 57109
Status:	Submitted on 3/6/2012 4:27:13 PM
Comments:	Initiated a Course Revision Proposal

Back to Course List

Comments or questions? Contact the Registrar's Office at
cims@registrar.ucla.edu or (310) 206-7045