General Education Course Information Sheet

Please submit this sheet for each proposed course

Department & Course Number MCDB 98T

Course Title The utility of embryonic stem cells: A scientific exploration from the lab to the clinic.

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) _____

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

The course will examine primary scientific literature in the field of embryonic stem cell research

3. "List faculty member(s) who will serve as instructor (give academic rank):
Michaela Patterson (Graduate student/teaching fellow) and William Lowry (Asst. Professor)

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

2010-2011 _____ Winter Enrollment x Spring Enrollment _____

5. GE Course Units

Proposed Number of Units: 5

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

❑ General Knowledge	Students will read and discuss primary and secondary scientific literature to gain general insight into embryonic stem cell research and general scientific techniques.
❑ Integrative Learning	Students will learn about general molecular biology techniques, ethics, writing, etc.
❑ Ethical Implications	A preliminary and follow-up debate will discuss the ethics behind stem cell research.
❑ Cultural Diversity	NA
❑ Critical Thinking	Students will write questions after reading the literature which will spark debate and demonstrate their understanding of the literature. Furthermore, students will apply their knowledge to a final paper
❑ Rhetorical Effectiveness	Discussions and debates on the literature will make up a majority of the class time. Furthermore, students will be required to give an oral presentation in the last three weeks of the quarter.
❑ Problem-solving	Students will write and answer questions on the literature, demonstrating their understanding.
❑ Library & Information Literacy	Students will be reading and finding primary literature. This will require knowledge of literature search tools/databases (ie Pubmed).

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

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

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

1. General Review & Preparation:	**1**	(hours)
2. Reading	**7**	(hours)
3. Group Projects:	**NA**	(hours)
4. Preparation for Quizzes & Exams:	**NA**	(hours)
5. Information Literacy Exercises:	**NA**	(hours)
6. Written Assignments:	**3**	(hours)
7. Research Activity:	**1**	(hours)
(B) TOTAL Out-of-class time per week	**12**	**(HOURS)**
GRAND TOTAL (A) + (B) must equal at least 15 hours/week	**15**	**(HOURS)**

The Utility of Embryonic Stem Cells: A scientific exploration from the lab to the clinic
Course Syllabus

Course ID: MCDB 98T, Winter 2011
Instructor (Teaching Fellow): Michaela Patterson
Email: caelagamoo@ucla.edu
Seminar meeting times and location: TBD
Office hours and location: TBD or by appointment

Course Description:
Due to skewed media representation, most people only associate embryonic stem cells with regenerative medicine and cell-based therapeutics. Their value, however, extends far beyond these clinical applications. This course will explore the utility of embryonic stem cells and the various ways they have been exploited to better understand human development and disease.

A major theme in stem cell research is the exploration of cell fate. How does a single cell, the fertilized egg, develop to become more than 200 different cell types that make up the adult human body? To answer this question, students will explore the various molecular tools scientist use to both: 1) identify various cell types and 2) manipulate the system to coerce cells into a specific fate. Another important focus of the scientific community is the use of model systems to answer fundamental biological questions. Throughout the course, students will be introduced to various models used by scientists and discuss the merits and drawbacks of each one. Following discussion of the laboratory research, students will explore what steps are required to translate these experiments to the clinic.

Course Objectives:
Through the exploration of embryonic stem cell research, students will gain insight into scientific methodologies and learn how to critically read scientific articles. Emphasis will also be placed on writing skills. Through draft writing and a peer review process, students will learn how to write a clear, well-organized thesis.

Texts:
Students are expected to read the assigned literature prior to coming to discussion. Please refer to the course outline for specific assignments. A course reader, containing the scientific articles discussed throughout the quarter can be found at the UCLA bookstore.

Optional: “Stem Cell Now” by Christopher Thomas Scott. This book is a good introduction to the concepts discussed in this class and can therefore be used as a supplement for the required readings. Written for non-science majors.

Assignments and Grading:

1) **Questions on Literature (10%)**
   In addition to reading the assigned articles, students will be expected to turn in written questions on the readings. With each question, students will write a short paragraph explaining the significance of the question. These questions are to be turned in by email by midnight the night before discussion.
2) **Participation (15%)**
   Students will be expected to participate DAILY in discussions on the assigned literature. Students will receive a 0 for the day if they do not participate. Discussions will focus on experimental techniques, questions that remain after reading the literature, and future directions of the research. Questions turned in the night before (see above) will be used to direct discussions in the event that students are not participating.

3) **Major Research Paper (40%)**
Students will be expected to complete a major (15-20 page) research paper on the prompt stated below:

> Explore a disease or ailment (other than Parkinson's disease) for which embryonic stem cell technology can be applied. Students should: (1) Provide background on the disease including cause, symptoms, current treatments, and remaining problems; (2) Describe how ES cells can be applied to the disease providing specific examples of preclinical research; (3) Discuss the anticipated issues with the technology and the proposed solutions.

Each student must choose a different disease (no duplication, no exceptions). Students must check availability with instructor before proceeding; diseases will be assigned on a first come/first serve basis. This assignment will be built upon throughout the quarter. The final submission due on the last day of class will be graded based on quality of writing, literature search performed (relevance), and improvement from previous drafts (see peer review below).

4) **Peer Review 1 (10%)**
Students will submit their first draft on the background to their disease (part 1 of prompt) for anonymous peer review. Reviewers will have 5 days to read and edit two other students' papers. Reviewers will be graded on the quality of their feedback. Remember, reviews should be CONSTRUCTIVE! (Note: Students will also receive feedback from the instructor).

5) **Peer Review 2 (10%)**
Students will submit their first draft on the application of ES cells to their disease (part 2 of prompt) for anonymous peer review. Again, reviewers will be assigned two fellow students' papers and will have 5 days to read and edit those works. (Note: Students will also receive feedback from the instructor.)

6) **Final Presentation (15%)**
In the last two weeks of class, students will give a 15-20 minute oral presentation outlining the topic discussed in their research paper. A powerpoint presentation is recommended, but not required.

Course Schedule:

	Assigned Readings:
Week1:	
Discussion 1: Course Overview. Preliminary Debate on ES cells. Students will discuss their current understanding of ES cell research and the ethical implications as they understand them. ➢ **Introduction to Pubmed and scientific literature searches.** ➢ **Introduction on how to read primary literature.**	
Discussion 2: What is an Embryonic Stem Cell? Definition and History. Students will first outline the various qualities that define an ES cell and then discuss what laboratory methods can be used to characterize these cells.	1) Pedersen, R.A. Embryonic Stem Cells for Medicine. *Scientific American*; April, 1999: pgs 68-73. **(Introduction)** 2) Rippon, H.J. and A.E. Bishop. 2004. Embryonic stem cells. *Cell Proliferation*; 37: pgs 23-34. **(Review)** 3) Thomson J.A. et al. 1998. Embryonic Stem Cell Lines Derived from Human Blastocyst. *Science*; 282: pgs 1145-1147. **(Primary)**
Week 2:	
Discussion 3: Application 1: Generation of Animal Models Students will discuss the first true application of (mouse) ES cells and how it has revolutionized our ability to study human disease.	1) Capecchi, M.R. Targeted Gene Replacement. *Scientific American*; March, 1994: pgs 52-59. **(Introduction)** 2) Fleming, S.M. et al. 2005. Genetic Mouse Models of Parkinsonism: Strengths and Limitations. *NeuroRx*; 2: pgs 495-503. **(Review)** 3) Abeliovich, A. et al. 2000. Mice Lacking a-Synuclein Display Functional Deficits in the Nigrostriatal Dopamine System. *Neuron*; 25: 239-252. **(Primary)**
Discussion 4: Human Development. How does a cell become specialized? Students will discuss human development on a molecular level and discuss how scientists have used this information to coax ES cells to become any cell type of the human body ➢ **Introduction to writing a research paper**	1) Tjian, R. Molecular Machines that Control Genes. *Scientific American*; February, 1995: pgs 54-61. **(Introduction)** 2) Nusslein-Volhard, C. Gradients that Organize Embryo Development. *Scientific American*; August 1996: pgs 54-61. **(Introduction)** 3) Murry, C.E. and G. Keller. 2008. Differentiation of Embryonic Stem Cells to Clinically Relevant Populations: Lessons from Embryonic Development. *Cell*; 132: pgs 661-680. **(Review)**
Week 3:	
Discussion 5: Application 2: Regenerative Medicine, Parkinson's disease Discussion will focus on the cause and treatments of Parkinson's disease, how the current treatments fall short, and what ES cells offer. Finally, as a class we will discuss the results and figures of a preclinical study and what further experiments are needed.	1) Youdim, M.B.H. and P. Riederer. Understanding Parkinson's Disease. *Scientific American*; January, 1997: pgs 52-59. **(Introduction)** 2) Lozano, A.M. and S.K. Kalia. New Movement in Parkinson's. *Scientific American*; July 2005: 68-75. **(Introduction)** 3) Yan, Y. et al. 2005. Directed Differentiation of Dopaminergic Neuronal Subtypes from Human Embryonic Stem Cells. *Stem Cells*; 23: 781-790. **(Primary)**

Discussion 6: Application 2: Parkinson's disease (cont.) Students will discuss the results of a transplantation experiment into an animal model. ➢ **Introduction to reviewing or editing a manuscript** ➢ **First draft on disease background due for review**	1) Roy, N.S. et al. 2006. Functional engraftment of human ES cell-derived dopaminergic neurons enriched by coculture with telomerase-immortalized midbrain astrocytes. *Nature Medicine*; 12(11): 1259-1268. **(Primary)** 2) Christophersen, N.S. and P. Brundin. 2007. Large stem cell grafts could lead to erroneous interpretations of behavioral results? *Nature Medicine*; 13(2): 118-119. **(Response)** 3) Carson, C.T. et al. 2006. Stem cells: the good, bad and barely in control. *Nature Medicine*; 12(11): 1237-1238. **(Response)**
Week 4:	
Discussion 7: Application 3: Model human development Discussions will focus on the use of ES cells as a model system. Student's should acknowledge the merits and drawbacks of the system and will discuss the results of a cutting edge work. ➢ **Turn in Reviews**	1) Dvash T. and N. Benvenisty. 2004. Human embryonic stem cells as a model for early human development. *BP&R Clinical Obgyn*; 18(6): pgs 929-940. **(Review)** 2) Kopper, O. et al. 2010. Characterization of Gastrulation-Stage Progenitor Cells and Their Inhibitory Cross Talk in Human Embryoid Bodies. *Stem Cells*; 28: pgs 75-83. **(Primary)**
Discussion 8: Application 4: Drug discovery and toxicity testing Students will discuss the fourth use of ES cells while looking at the example of drug toxicity to cardiac cells. Again, emphasis will be placed on the benefits and drawbacks of the system. ➢ **Reviews returned to writer**	1) Ebert, A.D. and C.N. Svendsen. 2010. Human stem cells and drug screening: opportunities and challenges. *Nature Reviews*; 9: pgs 1-6. **(Introduction)** 2) Braam, S.R. et al. 2009. Cardiomyocytes from human pluripotent stem cells in regenerartive medicine and drug discovery. *Trends in Pharmacological Sciences*; 30(10): pgs 536-545. **(Review)** 3) Braam, S.R. et al. 2009. Prediction of drug-induced cardiotoxicity using human embryonic stem cell-derived cardiomyocytes. *Stem Cell Research*; 4: pgs 107-116. **(Primary)**
Week 5:	
Discussion 9: New Discoveries: iPS cells. What are they? Students will learn about an artificially generated stem cell. Discussion on the primary literature should refer back to discussion 2.	1) Hornyak, T. Turning Back the Cellular Clock. *Scientific American*; December 2008: pgs 112-14. **(Introducition)** 2) Hochedlinger, K. Your Inner Healers. *Scientific American*; May 2010: pgs 47-53. **(Introduction)** 3) Takahashi, K. et al. 2007. Induction of Pluripotent Stem Cells from Adult Human Fibroblasts by Defined Factors. *Cell*; 131: pgs 861-872. **(Primary)**
Discussion 10: New Discoveries: iPS cells Application Students will observe two ways scientists feel iPS can be used to advance research on human disease and treatment: 1) Patient-specific transplantations; and 2) Disease mechanisms. ➢ **First draft on ES cell application due for review**	1) Hanna, J. et al. 2007. Treatment of Sickle Cell Anemia Mouse Model with iPS Cells generated from Autologous Skin. *Science*; 318: pgs 1920-1923 **(Primary)** 2) Colman, A. 2008. Induced Pluripotent Stem Cells and Human Disease. *Cell Stem Cell*; 3: pgs 236-237. **(Preview)** 3) Park, I.H. et al. 2008. Disease-Specific Induced Pluripotent Stem Cells. *Cell*; 134: pgs 877-886. **(Primary)**

Week 6:	
Discussion 11: New Discoveries: ES vs. iPS Discussion will focus on the benefits and drawbacks of ES and iPS cells respectively. Furthermore, we will discuss if the emergence of iPS cell technology makes ES cell research obsolete. Discussion on the primary literature should refer back to discussion 2. ➢ **Turn in reviews**	1) Belmonte, J.C.I. et al. 2009. Induced pluripotent stem cells and reprogramming: seeing the science through the hype. *Nature Reviews: Genetics*; 10: pgs 878-883. **(Interview)** 2) Hyun, I. et al. 2007. New Advances in iPS Cell Research Do Not Obviate the Need for Human Embryonic Stem Cells. *Cell: Stem Cell*; 1: pgs 367-36. **(Review)** 3) Chin, M.H. et al. Induced pluripotent stem cells and embryonic stem cells are distinguished by gene expression signatures. *Cell: Stem Cell*; 5(1): pgs 111-123. **(Primary)**
Discussion 12: Visit to the lab of Dr. William Lowry Students will visit a lab on campus exploring the molecular biology of ES and iPS cells. ➢ **Reviews returned to writer**	No readings assigned. Students should prepare questions for Dr. Lowry.
Week 7:	
Discussion 13: Translation: Moving into the Clinic. Students will discuss how clinical trials work and what steps must be taken in order to get these cells to the clinic. Insight will be drawn from historical clinical trials in gene therapy.	1) Zivin, J.A. Understanding Clinical Trials. *Scientific American*; April 2000: pgs 69-75. **(Review)** 2) Wilson, J.M. 2009. Lessons learned from the gene therapy trial for ornithine transcarbamylase deficiency. *Molecular Genetics and Metabolism*; 96: pgs 151-157. **(Commentary)** 3) Daley, G.Q. 2010. Stem cells: roadmap to the clinic. *The Journal of Clinical Investigation*; 120(1): 8-10. **(Review)** 4) Pucéat, M. and A. Ballis. 2007. Embryonic Stem Cells: From Bench to Bedside. *Clinical Pharmacology & Therapeutics*; 82(3): pgs 337-339. **(Review)**
Discussion 14: 1st Clinical Trials: *Geron* and *ACT* Students will explore the first two ES cell clinical trials in the United States.	1) No Author. 2008. Getting embryonic stem cell therapy right. *Nature Medicine* ; 14(5): pg 467. **(Editorial)** 2) Alper, J. 2009. Geron gets green light for human trial of ES cell-derived product. *Nature Biotechnology*; 27(3): pgs 213-214. **(News)** 3) Lebkowski, J. 2009. Discussions on the development of human embryonic stem cell-based therapies. *Regenerative Medicine*; 4(5): pgs 659-661. **(Interview)**
Week 8-10:	
Discussion 15: Debate revisited. Students will revisit the original debate held on the first day of class considering both ES and iPS cells. Each student should express if their opinion on the field has changed, what questions they had answered and what questions remain.	1) Hyun, I. 2010. The bioethics of stem cell research and therapy. *The Journal of Clinical Investigation*; 120(1): 8-10. **(Review/Commentary)** 2) Lo, B. et al. 2010. Cloning Mice and Men: Prohibiting the Use of iPS Cells for Human Reproductive Cloning. *Cell Stem Cell*; 6: 16-20. **(Commentary)**
Discussions 16-20: Student Presentations ➢ **Final paper due**	

New Course Proposal

	Molecular, Cell, & Developmental Biology 98T The Utility of Embryonic Stem Cells: A scientific exploration from the lab to the clinic
Course Number	**Molecular, Cell, & Developmental Biology 98T**
Title	**The Utility of Embryonic Stem Cells: A scientific exploration from the lab to the clinic**
Short Title	
Units	Fixed: **5**
Grading Basis	**Letter grade only**
Instructional Format	**Seminar - 3 hours per week**
TIE Code	**SEMT - Seminar (Topical) [T]**
GE Requirement	**Yes**
Major or Minor Requirement	**No**
Requisites	**Satisfaction of entry-level Writing requirement. Freshmen and sophomores preferred.**
Course Description	**The value of embryonic stem cells (ESCs) extends far beyond the commonly associated regenerative medicine application. This course will explore the utility of ESCs & how they have been exploited to better understand human development & disease.**
Justification	**Part of the series of seminars offered through the Collegium of University Teaching Fellows.**
Syllabus	File *MCDB 98T syllabus.doc* was previously uploaded. You may view the file by clicking on the file name.
Supplemental Information	**Professor William Lowry is the faculty mentor for this seminar.**
Grading Structure	**questions on literature - 10%; participation - 15%; major research paper - 40%; peer review 1 - 10%; peer review 2 - 10%; Final Presentation -15%**
Effective Date	**Winter 2011**
Discontinue Date	**Summer 1 2011**
Instructor	Name: **Michaela Patterson** Title: **Teaching Fellow**
Quarters Taught	☐ Fall ☐ Winter ☐ Spring ☐ Summer
Department	**Molecular, Cell, & Developmental Biology**
Contact	Name: **CATHERINE GENTILE** E-mail: **cgentile@oid.ucla.edu**
Routing Help	

ROUTING STATUS

Role:	Registrar's Scheduling Office
Status:	Pending Action

Role:	FEC School Coordinator - Soh, Michael Young (msoh@college.ucla.edu) - 45040
Status:	Returned for Additional Info on 10/13/2010 3:42:12 PM
Changes:	No Changes Made
Comments:	Routing to Registrar's Office

Role:	FEC Chair or Designee - Knapp, Raymond L (knapp@humnet.ucla.edu) - 62278
Status:	Approved on 10/13/2010 3:40:34 PM
Changes:	No Changes Made
Comments:	No Comments

Role:	L&S FEC Coordinator - Soh, Michael Young (msoh@college.ucla.edu) - 45040
Status:	Returned for Additional Info on 10/6/2010 4:21:37 PM
Changes:	No Changes Made
Comments:	Routing to FEC Chair Ray Knapp for approval

Role:	Dean College/School or Designee - Skrupa, Julie A. (jskrupa@college.ulca.edu)
Status:	Approved on 10/6/2010 11:38:18 AM
Changes:	No Changes Made
Comments:	Victoria Sork, Dean of Life Sciences, has appoved this course with no changes to be made. Thank you. J. Skrupa

Role:	L&S FEC Coordinator - Soh, Michael Young (msoh@college.ucla.edu) - 45040
Status:	Returned for Additional Info on 8/25/2010 10:51:26 AM
Changes:	No Changes Made
Comments:	Routing to Julie Skrupa on behalf of Dean Sork for approval

Role:	CUTF Coordinator - Gentile, Catherine (cgentile@oid.ucla.edu) - 68998
Status:	Approved on 5/27/2010 4:43:59 PM
Changes:	Subject Area
Comments:	on behalf of Professor Kathleen Komar, chair, Collegium of University Teaching Fellows

Role:	Initiator/Submitter - Gentile, Catherine (cgentile@oid.ucla.edu) - 68998
Status:	Submitted on 5/27/2010 4:39:23 PM
Comments:	Initiated a New Course Proposal

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