**New Special Topics course (BIO 6973):**

**Frontiers in Human Pluripotent Stem Cells**

Course Director: Jenny Hsieh (jenny.hsieh@utsa.edu)

Fall 2019 / Tues & Thurs / 8:30-9:45am / Location: MBT 1.102 (lecture) SRL 1.146 (lab)

**Course Description:**

The *“Frontiers in Human Pluripotent Stem Cells course”* integrates the fundamental aspects of developmental biology with emerging concepts in embryonic and adult stem cells and regenerative medicine. The course covers interrelated topics such as pluripotency, cell fate specification, differentiation, patterning, organogenesis, morphogenesis, regeneration, and tissue engineering with an emphasis on human pluripotent stem cells and translational applications. The course also highlights emerging technology related to regenerative medicine, such as CRISPR/Cas9 gene editing and 3D organoids. Finally, a discussion of various stem cell applications in industry, military, medicine, and ethics of regenerative medicine is presented.

* Maximum of 12 students
* Preference for PhD students
* Departmental approval required (must speak with Dr. Hsieh)
* Lab fees included
* Verify lab safety training (BSL-2 safety, biohazard, etc)

**Objectives:**

1. Demonstrate an extensive knowledge of development and stem cell biology, and related disciplines in written exams.
2. Understand and critically evaluate current research in development and stem cell biology, and related disciplines in discussion papers.
3. Demonstrate proficiency of knowledge in laboratory techniques related to stem cell biology, and related disciplines in laboratory notebook.

**Methods of instruction:**

* Didatic lectures from course instructor and guest speakers
* Stem cell lab techniques
* Small group discussion papers
* Written exams
* Laboratory notebook

**Course schedule: (Speaker topics/dates – subject to change)**

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| **Week** | **Date** | **Unit** | **Lecturer** | **Topic** |
| **1**  | **8/27/19** | **Preimplantation human development** | **Hsieh** | **Lecture: Introduction to course; early human embryo development** |
|  | **8/29/19** |  | **Hsieh** | **Lecture: Axis formation** |
| **2**  | **9/3/19** |  | **McCarrey**  | **Lecture: Germ cell development** |
|  | **9/5/19** |  | **Hsieh** | **Lecture: Neurulation and the ectoderm, mesoderm and endoderm**  |
| **3** | **9/10/19** |  | **Navara** | **Lecture: Introduction to human pluripotent stem cells**  |
|  | **9/12/19** | **Induced pluripotent stem cell derivation** | **Navara** | **Lab (Set up, media change)** |
| **4** | **9/17/19** |  | **Navara** | **Lab (1st Transfection of fibroblasts for Reprogramming, hESCs splitting with EDTA)** |
|  | **9/19/19** | **Genome editing in human pluripotent stem cells** | **Hsieh** | **Lecture: Introduction to gene editing** |
| **5** | **9/24/19** |  | **Navara** | **Lab (Media change, GFP imaging)** |
|  | **9/26/19** |  | **Navara** | **Lab (manual picking hESCs with accutase, making glass tools for colony hand picking: demo and practice)** |
| **6** | **10/1/19** |  | **Hsieh** | **Lecture: “Disease-in-a-dish” models, part 1** |
|  | **10/3/19** |  | **Navara** | **Lab: (hESCs to embryoid bodies)** |
| **7** | **10/8/19** |  | **Navara** | **Lab (embryoid bodies to 3D organoids)** |
|  | **10/10/19** | **Disease-in-a-dish modeling** | **Hsieh** | **Lecture: “Disease-in-a-dish” models, part 2** |
| **8** | **10/15/19** |  | **Navara** | **Lab (Fix, Perm, Ab Incubation, part 1)** |
|  | **10/17/19** |  | **Navara** | **Lab (Fix, Perm, Ab Incubation, part 2)** |
| **9**  | **10/22/19** |  | **Navara** | **Lab (Imaging of immunofluorescence staining, part 1)** |
|  | **10/24/19** | **Advanced hESC techniques** | **Navara** | **Lab (Imaging of immunofluorescence staining, part 2)** |
| **10** | **10/29/19** |  | **Z. Lybrand** | **Lab (Functional analysis of stem cells)** |
|  | **10/31/19** |  | **Navara** | **Lab wrap up (Cleaning of lab, hoods, and incubator)** |
| **11** | **11/5/19** | **Stem cell applications**  | **Hsieh** | **Lecture: Homeostatic regeneration (adult stem cells)** |
|  | **11/7/19** |  | **Navara** | **Lecture: Engineered regeneration (iPSC-based cell therapy)** |
| **12** | **11/12/19** |  | **Moreira**  | **Lecture: Stem cell therapeutics in the clinical setting** |
|  | **11/14/19** |  | **Rathbone** | **Lecture: Tissue engineering and regenerative medicine**  |
| **13** | **11/19/19** |  | **Frantz**  | **Lecture: Drug screening and personalized medicine** |
|  | **11/21/19** |  | **Block**  | **Lecture: Regenerative medicine and industry applications** |
| **14** | **11/26/19** |  | **M. Lybrand** | **Lecture: Human subjects research** |
|  | **11/28/19** |  | **Thanksgiving Holiday** |
| **15** | **12/3/19** |  | **S. Tekin**  | **Ethics of stem cell research & regenerative medicine** |
|  | **12/5/19** |  | **Hsieh** | **Class presentations/discussion paper** |
| **16** | **12/10/19** | **Finals week** | **Hsieh** | **Class presentations/discussion paper** |
|  | **12/12/19** | **Finals week** | **Hsieh** | **Class presentations/discussion paper** |

**Grades due, 2PM: 12/16/19**