GNET 646 Syllabus: Mouse Models of Human Disease (Spring 2019 – 1 credit) – Newly updated!

Instructors: Scott Bultman, PhD (scott_bultman@med.unc.edu) and Folami Ideraabdullah, PhD (folami@email.unc.edu)

Course goals and key learning objectives: This is a lecture-styled module that will focus on the laboratory mouse as a model organism to learn fundamental genetic concepts while discussing how recently developed mouse models combined with state-of-the-art experimental approaches are being used to elucidate gene function relevant to human development, physiology, and disease. There will be an emphasis on understanding the impact of genetic, physiological, environmental, and microbial differences in developing appropriate mouse models for human disease. Lectures will cover approaches for both manipulating the mouse genome and for utilizing naturally occurring genetic variation among mouse strains to identify and characterize genes responsible for phenotypes. The latter portion of the class will cover the use of mouse models (either via genetic manipulation or through comparative analyses of strains) for studying the epigenetic basis of disease. A common theme of the course is to understand optimal approaches for using technology and resources (consortiums & databases) to develop and analyze mouse models for translational studies in pre-clinical settings.

Target audience statement: This is an advanced course is for students seeking in depth understanding of how to harness the power of genetic mouse models to study human phenotypes. Course is cross-listed in SOM and SPH.

Course requirements: Students are expected to have a basic understanding of genetics and molecular biology and are expected to read assigned materials and complete assigned homework before coming to class and be prepared for class discussion. Students are strongly encouraged to take notes during class and PowerPoint slides of lectures will be made available on Sakai within 24hrs of each class. In weekly recitation, students will discuss assigned readings and homework.

Grading:

- 10% homework and participation (full credit for attending every class and submitting all homework)
- 90% final exam (split between Scott Bultman's section & Folami Ideraabdullah's section)

Honor Code applies to all homework & exam

Course resources: Readings will be provided for each lecture. Recommended reading: *Mouse Genetics* by Lee Silver

Accessibility Statement: Any student in this course who requires special accommodations to complete this course successfully should contact the instructors before starting the course and contact UNC Disability Services as soon as possible and we will do our best to accommodate them.

Schedule (*Draft - May change*)

- Lecture: Tuesday & Thursday, 12:30-1:45 PM; Recitation: Fridays
- Location: TBD
- Course dates: January 9, – February 11, 2020; Exam on 2/12/20 (after last recitation)

Date	Topics (*tentative schedule & topics*)	Instructor	Recitation
1/9	#1: Laboratory mouse as a genetic model: Inbred strains and characteristics, experimental crosses, MGI and genome browser databases	SB	TBD
1/14	#2: Genetic screens to identify novel causative variants: Chemical & transposable element mutagenesis, linkage analyses & gene validation	SB	TBD
1/16	#3: Targeted mutagenesis & genetically-engineered models: Transgenics, knockouts, and CRISPR/Cas9	SB	TBD
1/21	#4: "Humanized" mouse models: Human gene knock-ins, gnotobiotic models colonized with human microbiota to study microbiome, and patient-derived xenograft (PDX) models for precision medicine in cancer	SB	TBD
1/23	#5: Genetic reference populations: Recombinant inbred mice history, characteristics, and use in gene mapping	FI	TBD
1/28	#6: Intro to Epigenetic mechanisms: Types, distributions, functions, and regulation	SB	TBD
1/30	#7: Tools for detection and manipulation of epigenetic mechanisms: Targeted vs. genome-wide methods; publicly available datasets; CRISPR/Cas9	FI	TBD
2/4	#8: Models for studying epigenetic mechanisms of disease: Parent of origin effects, genomic imprinting, developmental programming, aging	FI	TBD
2/6	#9: Models for studying heritable epigenetic disease: Epigenetic inheritance; gene x epigenome interactions, genetic susceptibility	FI	TBD
2/7	Last recitation & review session – Exam distribution at 5pm		
2/11	Final exam due by 5pm		