

# UCONN | THE GRADUATE SCHOOL

## SPECIAL TOPICS COURSE, FALL 2017

**Course number, title and other information:** MEDS6498; *Topics in Bioinformatics and Computational Biology*, 3 credits; fall 2017.

The course will meet on Mondays, 2-5pm, in Classroom A8 in the Academic Building (outside the Rotunda). The course will begin on 8/28/17 and end on 12/11/17.

**Course Director(s) information:** Reinhard Laubenbacher, Ph.D., Center for Quantitative Medicine, 195 Farmington Ave. AND Jackson Laboratory for Genomic Medicine, [laubenbacher@uchc.edu](mailto:laubenbacher@uchc.edu), 860.436.7516;  
Krish Karuturi, Ph.D., Jackson Laboratory for Genomic Medicine, [krish.karuturi@jax.org](mailto:krish.karuturi@jax.org).

**Prerequisites:** Introductory courses in or some familiarity with bioinformatics, concepts related to probability and statistics, and basic concepts in machine learning. Experience with bioinformatics tools in genomics will be useful.

**Course description and objectives:** The focus of the course is on the study of cutting edge computational problems related to the study and treatment of diseases, and discussion of relevant technologies. The course provides a practical introduction to current bioinformatics and computational biology topics of interest in cancer biology, immunology, microbiome and statistical genetics research, along with genomics, systems biology, single cell technologies, and cloud-based computing. The course will prepare participants for further in-depth study of these topics. Brief description of course and learning objectives

**Course format.** The course consists of lectures and discussion on 7 topics. Each topic will be introduced by scientists working in the respective area, followed by hands-on-assignments and topical presentations. In addition, material for reading and resources will be provided on significance assessment, clinical genomics, and ethics in genomic science. In addition, students will be expected to do a mini-project relevant to the course.

**Course materials:** Hand-outs, slides.

**Exam, quiz schedule and policy:** No exams or quizzes

**Homework policy:** Homework assignments are due as stated. No acceptance of late assignments

**Grading rubric:** Assignments and presentations 30%; final project 30%; class participation 40%

**Other expectations:** None

## **Preliminary Schedule of Sessions:**

1. Genome Analytics (2 3hr-sessions, 8/28 and 9/11)  
*Anuj Srivastava, PhD/Mohan B, PhD – JAX GM*
  - a. Advances in Genomic Technologies, Analytics & Resources
  - b. Single Cell Genomics & Resources
2. Cancer Informatics (2 3hr-sessions, 9/18 and 9/25)  
*Jeff Chuang, PhD/Joshy George, PhD – JAX GM*
  - a. Overview of Cancer Biology
  - b. Cancer Evolution & Heterogeneity
  - c. Subtyping, Tumor Classification and biomarkers
  - d. Resources (Tools, Data & Websites)
3. Microbiome & Metabolomics (2 3hr-sessions, 10/2 and 10/9)  
*TBD/Preeti Bais, PhD – JAX GM*
  - a. Overview
  - b. Analytics
  - c. Resources (Tools, Data & Websites)
4. Statistical Genetics (2 3hr-sessions, 10/16 and 10/23)  
*Don Lee, PhD/Guru A, PhD – JAX GM*
  - a. GWAS
  - b. Imputation
  - c. Evolutionary principles in Statistical Genetics
5. Network Biology (1 3hr-session, 10/30)  
*Pedro Mendes, PhD UConn Health, Center for Quantitative Medicine*
6. Systems Biology (1 3hr-session, 11/6)  
*Paola Vera-Licona, PhD UConn Health, Center for Quantitative Medicine*
7. Bioinformatics on Cloud (1 3hr-session, 11/13) – TBD
  - a. Introduction to Cloud computing *Paola Vera-Licona*
  - b. Analytics on Cloud
  - c. Resources on cloud
8. Selected topics (2 3hr-sessions, 11/20 and 11/27)
9. Project presentations (2 3hr-sessions, 12/4 and 12/11)

## **Topics for further reading:**

1. Significance Assessment in Bioinformatics: Issues and Methods – Krish *Karuturi*
2. Clinical Genome Informatics – *Guru A*
  - a. Clinical Genomics for Personalized Medicine
  - b. Designing Genomic Diagnostics
  - c. Resources & Tools
3. Ethics in genomic science and medicine - TBD