

**Course: Functional Genomics- BIOL 491**

**Place:** Trani Life science, room 207

**Time:** Mon, 9-11:45 am, Wed 9-10:45 am

**Dates:** starting Aug 28, 2017 – Dec 11, 2017

**Instructor:** Drs. **Jitender Mehla & Peter Uetz**

Trani 333 (Uetz lab)

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**Office hours:** by appointment

**Recommended texts:** Original research articles and review articles, web based information (as recommended or made available)

**Course Goal:** The aim of the course is to introduce students to current concepts in functional genomics and its applications to understand gene and protein functions.

**Course description:** This course will focus on principles and applications of functional genomics approaches with hands-on research experience. This incorporates a wide range of conceptual approaches followed by assigned laboratory experiments to find the function and interactions for a gene or protein. We will use an integrated approach of computational tools and wet lab experiments to understand unknown proteins function. The computational/bioinformatics tools for predicting putative protein functions, sequence analysis, regulon/operon, structure prediction, gene and protein expression will be used. In the lab experiments such as Gateway cloning, protein overexpression, SDS-PAGE, Western blot, Gene knockouts, Protein-protein interactions screening, Phenotypic screening will be used. The course will be focused on relationship of gene-protein-structure-function. This course is intended and suitable for both undergraduates with some wet lab experience or advanced undergraduates. Most lectures/research labs will be focused on the conceptual approaches in genomics specifically applied to microbes. However, the conceptual learning of functional genomics can be applied to any model organism. Most of the tools, methods and experiments are routine exercises in most of the academic or industry facilities and thus widen the research and job prospects for the undergraduates.

A detailed course program will be distributed during the first week of the course, as we take into account student's research interests.

**Learning outcomes:**

By the end of this course, students are expected:

1. To be familiar with the basic tools and techniques in functional genomics and their applications

2. To learn the basic research techniques commonly used in the labs. For example, plasmid isolation, cloning, protein expression, growth kinetics.
3. To be familiar with analysis and interpretation of the research data specifically for an unknown protein or gene with extensive literature search and writing a small research report.

### **Suggested Topics:**

1. Introduction to course syllabus and approach. Tools and techniques in functional genomics/proteomics, Basics lab handling including pipetting, lab safety/ethics. Calculations, Media preparation/Handling of bacteria or other lab reagents.
2. Introduction to research. Selection of test proteins/gene, Sequence analysis, searching database for gene and protein expression, Protein structure prediction.
3. Plasmid DNA isolation, purity and concentration.
4. Gateway cloning (Introduction), BP cloning/Transformation
5. Plasmid isolation (Practice), Checking its purity and conc?
6. Analyzing sequences/BlastN/P, LR cloning/Transformation
7. Plasmid isolation (Test), check its purity and conc?
8. PPIs (Introduction), Bacterial two hybrid screening/Co-transformation/ Screening of PPIs/clones
9. Gene Knockouts, how to create gene Kos and/or site-directed mutations (Introduction)? And their use and applications?
10. Genomic DNA isolation, Growth kinetics, Phenotypes screening
11. Protein overexpression in *E. coli* B121
12. Protein complementation
13. Data analysis and compilation
14. Present and submit report

**Grading\*:**

- 10% - Class \*attendance/active participation
- 10% - Exam1
- 10% - Exam2
- 20% - Assignment
- 30% - Results report
- 20% - final exam

(\* Only valid reasons exemption)

**Grading Scale\*:**

- 90 to 100 = A
- 80 to <90 = B
- 70 to <80 = C
- 60 to <70 = D
- Below 60 = F

\* subject to change

### **Email Policy**

Electronic mail or "email" is considered an official method for communication at VCU. Please read the policy in its entirety: <http://www.ts.vcu.edu/kb/3407.html>

### **VCU Honor System: Plagiarism and Academic Integrity**

The VCU honor system policy describes the responsibilities of students, faculty, and administration in upholding academic integrity, while at the same time respecting the rights of individuals to the due process offered by administrative hearings and appeals. According to his policy, "members of the academic community are required to conduct themselves in accordance with the highest standards of academic honesty and integrity." In addition, "All members of the VCU community are presumed to have an understanding of the VCU Honor System and are required to:

- Agree to be bound by the Honor System policy and its procedures;
- Report suspicion or knowledge of possible violations of the Honor System;
- Support an environment that reflects a commitment to academic integrity;
- Answer truthfully when called upon to do so regarding Honor System cases, and,
- Maintain confidentiality regarding specific information in Honor System cases.
- Most importantly, "All VCU students are presumed upon enrollment to have acquainted themselves with and have an understanding of the Honor System." (The VCU Insider).

The Honor System in its entirety can be reviewed on the Web at [http://www.provost.vcu.edu/pdfs/Honor\\_system\\_policy.pdf](http://www.provost.vcu.edu/pdfs/Honor_system_policy.pdf) or it can be found in the current issue of the VCU Insider at <http://www.students.vcu.edu/insider.html>

In this class, because coursework will be collaborative at times, particular issues of integrity arise. You should not copy or print another student's work without permission. Any material (this includes IDEAS and LANGUAGE) from another source must be credited, whether that material is quoted directly, summarized, or paraphrased. In other words, you should respect the work of others and in no way present it as their own.

### **Student Conduct in the Classroom**

According to the *Faculty Guide to Student Conduct in Instructional Settings* (<http://www.assurance.vcu.edu/Policy%20Library/Faculty%20Guide%20to%20Student%20Conduct%20in%20Instructional%20Settings.pdf>), "The instructional program at VCU is based upon the premise that students enrolled in a class are entitled to receive instruction free from interference by other students. Accordingly, in classrooms, laboratories, studies, and other learning areas, students are expected to conduct themselves in an orderly and cooperative manner so that the faculty member can proceed with their [sic] customary instruction. Faculty members (including graduate teaching assistants) may set reasonable standards for classroom behavior in order to serve these objectives. If a student believes that the behavior of another student is disruptive, the instructor should be informed." Among other things, cell phones and beepers should be turned off while in the classroom. Also, the University Rules and Procedures prohibit anyone from having ".in his possession any firearm, other weapon, or explosive, regardless of whether a license to possess the same has been issued, without the written authorization of the President of the university..." For more information, visit the VCU Insider online at <http://www.students.vcu.edu/insider.html>

Certainly the expectation in this course is that students will attend class with punctuality, proper decorum, required course material, and studious involvement.

The *VCU Insider* contains additional important information about a number of other policies with which students should be familiar, including Guidelines on Prohibition of Sexual Harassment, Grade Review Procedure, and Ethics Policy on Computing. It also contains maps, phone numbers, and information about resources available to VCU students.

### **Students with Disabilities**

SECTION 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 as amended, require that VCU provides "academic adjustments " or "reasonable accommodations" to any student who has a physical or mental impairment that substantially limits a major life activity. To receive accommodations, students must request them by contacting the Disability Support Services Office (DSS) on the Monroe Park Campus (828-

2253) or the Division for Academic Success on the MCV campus (828-9782). More information is available at the Disability Support Services webpage: <http://www.students.vcu.edu/dss/>; or the Division for Academic Success webpage at [www.specialservices.vcu.edu/disabilityss/](http://www.specialservices.vcu.edu/disabilityss/).

If you have a disability that requires an academic accommodation, please schedule a meeting with me at your earliest convenience. Additionally, if your coursework requires you to work in a lab environment, you should advise me or department chairperson of any concerns you may have regarding safety issues related to your disability. This statement applies not only to this course but also to every other course in this University.

### **Campus Emergency information**

What to Know and Do To Be Prepared for Emergencies at VCU:

- Sign up to receive VCU text messaging alerts (<http://www.vcu.edu/alert/notify>). Keep your information up-to-date. Within the classroom, the professor will keep his or her phone on to receive any emergency transmissions.
- Know the safe evacuation route from each of your classrooms. Emergency evacuation routes are posted in on-campus classrooms.
- Listen for and follow instructions from VCU or other designated authorities. Within the classroom, follow your professor's instructions.
- Know where to go for additional emergency information (<http://www.vcu.edu/alert>).
- Know the emergency phone number for the VCU Police (828-1234). Report suspicious activities and objects.