

FRNSC 821 (4) FORENSIC MOLECULAR BIOLOGY II



Welcome back!!

Our primary goals in FRNSC 821 are to:

Learn about the methods and applications of probabilistic genotyping for the analysis of STR-mixtures; including the impact of differential DNA degradation for mixtures involving 2-4 persons and when using the newly developed MaSTR software from SoftGenetics.

Complete an internal validation study on one of the two new YSTR kits; YfilerPlus or PowerPlex Y23. The study will include development of a protocol and forms necessary to perform YSTR testing at Penn State.

FRNSC 821 is an important course in your forensic science curriculum as it combines what you learned in FRNSC 421W with advanced principles and new techniques and provides you with expanded depth of knowledge as a forensic DNA scientist. Along with the material from FRNSC 421W, this course will prepare you well for employment in a crime-laboratory setting, or in a general molecular biology laboratory.

This is a fun, yet challenging course, so be sure to read through the syllabus where you'll find important resources and information that will help you meet your personal goals.

As the Instructor for this advanced course, we will work closely together to accomplish the goals. My primary role is to provide you with the information you need to be successful, and to further develop your ability to work independently. Your role is to take the necessary initiative to successfully complete the assignments.

My ***contact information*** is:

Mitchell Holland, 014 Thomas Basement, mmh20@psu.edu, 865-5286

Office Hours: By appointment

Please don't hesitate to make an appointment with me ***whenever*** you need help or just want to talk about the course material.

Our **Safety Officer** is Shelby Bain:

Please be sure to follow all safety and quality assurance measures as outlined in protocols and through your training. If you have any questions or concerns about safety, please contact Shelby or me immediately.

NOTE: Students working in the laboratory must have completed Bloodborne pathogen (BBP) training.

We'll meet in Thomas Basement this semester:

Lecture will be held on MW from 10:10 to 11:00 AM in **015 Thomas**

Laboratory will be held on TR from 1:25-5:30 PM in **03A, 03B, 03C and 015 Thomas**

NOTE: There will be times when you will need to be in the laboratory during hours other than TR 1:25-5:30, with an average of ~8 hours of laboratory time each week. Please plan accordingly.

Required Text & Resources:

Butler, J., *Forensic DNA Typing*, 2nd Edition (optional)

Additional resources are Biochem, Genetics, MolBio textbooks, journal articles, PSU protocols & forms

Course Resources:

You can find most of the material for this course at the FRNSC 821 site on CANVAS (<https://canvas.psu.edu/>); for example, PowerPoint pdf's, journal articles, the syllabus, protocols and forms. In addition, you are strongly encouraged to use the University library system to search for journal articles on topics encountered throughout the course (www.lias.psu.edu). This is an excellent way to supplement your knowledge on some of the challenging topics we'll be discussing.

Learning Objectives: *Achieved through lectures, reading journal articles, formal and informal discussion sessions, laboratory exercises, and your hard work. Assessed through exams (written and oral), laboratory work products, and class participation.*

PLEASE READ THE LEARNING OBJECTIVES

At the end of this course, you should better understand ...

- ❖ ... the scientific basis behind probabilistic genotyping (PGing)
- ❖ ... the application of PGing to the analysis of differentially degraded DNA samples when performing STR analysis on 2-4 person mixtures
- ❖ ... the methods involved in the analysis of samples when using one of the advanced YSTR typing kits; YfilerPlus or PowerPlex Y23
- ❖ ... the methods used to perform an internal validation study, conduct such a study, and produce the supporting documents necessary to perform YSTR analysis on mock case samples.

Graded Opportunities:

- I. *Student Led Discussions:* Journal articles will be assigned to each student covering mixture analysis and probabilistic genotyping. Students will prepare two separate presentations reflecting the material in their assigned papers, and lead discussion sessions during assigned class times. It is ***expected*** that, when necessary, background material in support of the assigned papers will be included in the presentation and discussion. In addition, it is expected that students will read the journal articles

assigned to other students prior to class and participate in the discussion sessions. Student led discussions should be just that, i.e., discussions pertaining to the journal articles led by the student, and not simply a regurgitation of the findings. Be sure to address any interesting aspects of the methods (including comparisons to methods you have used or learned about), provide detailed descriptions and aspects of the findings (including critical interpretation of the conclusions drawn; i.e., do not simply state the findings without assessing them critically), and tie the information to your previous knowledge.

- II. *Exams*: One (1) exam will be given during the semester. The schedule for the exam is provided below. **NOTE: *The exam will be 3-4 hours in length***

- III. *Special Project*: YSTR analysis is performed in crime laboratories to address a variety of casework-related scenarios; to include when sexual assault samples have high levels of female DNA, when questions of identity arise and only distant paternal relatives are available for comparison, and for confirmation testing when familial searches have identified a possible match to a paternal relative in the CODIS database. We will be performing an internal validation study on either YfilerPlus or PowerPlex Y23. This will give students an opportunity to practice going through this type of study, which is commonly performed in crime laboratories. The materials, protocols, forms, and other supporting material will be used going forward in FRNSC 421W.

Grading:

Student Led Discussions

Two (2) student-led presentations
75 pts each

= **150 pts (15%)**

Exam 1

250 pts

= **250 pts (25%)**

Special Project

70% lab work & 30% written materials

Details on the project will be provided as the semester progresses

= **600 pts (60%)**

TOTAL = **1000 pts (100%)**

Grading Scheme:

Grading will follow the University's guidelines. The following is a typical grading scheme used in previous semesters:

93-100 = A, 88-92 = A-, 84-87 = B+, 80-83 = B, 76-79 = B-
73-75 = C+, 70-72 = C, 60-69 = D, <60 = F

COVID-19 Policies:

Recent studies support that wearing a mask in public can help prevent the spread of COVID-19 in the community (Lyu & Wehby, 2020; CDC, 2020; Johns Hopkins Medicine, 2020). In accordance with PA Department of Health regulations and guidance from the Centers for Disease Control and Prevention (CDC, see below), Penn State University has determined that

VERSION 24 August 2020

everyone will be required to wear a face mask in university buildings, including classrooms. Therefore, you **MUST** wear a mask appropriately (i.e., covering both your mouth and nose) in the building if you are attending class in person. Masks have been provided for students, instructors, and staff, and everyone is expected to wear one while inside any university building.

Students who choose not to wear a mask may participate in class remotely and may not attend in person. This is to protect their health and safety as well as the health and safety of their classmates, instructor, and the university community. Anyone attending class in person without a mask will be asked to put one on or will be required to leave the classroom. If a student refuses to appropriately wear a mask or leave the classroom the class will be ended. Students who refuse to wear masks appropriately or adhere to other stated requirements may face disciplinary action for Code of Conduct violations.

Students may consult with Student Disability Resources for accommodations if they cannot wear a mask. Students requiring such accommodations may be advised to take advantage of and participate in the course through synchronous remote learning.

Students should also be sure they are situated at least six feet away from their fellow students and in a seat that is designated to ensure proper social distancing.

Finally, students who are experiencing COVID-19 related symptoms should not attend class in person and are encouraged to contact a health care provider.

Centers for Disease Control and Prevention. (2020, July 16th) *Recommendation Regarding the Use of Cloth Face Coverings, Especially in Areas of Significant Community-Based Transmission*. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover-guidance.html>. If the link is inactive, search the title for an updated version.

Johns Hopkins Medicine. (2020, July 2nd) *Coronavirus Face Masks & Protection FAQs*. <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/coronavirus-face-masks-what-you-need-to-know>. If the link is inactive, search the title for an updated version.

Lyu, W. and Wehby, G.L. (2020, June 16th) *Community Use Of Face Masks And COVID-19: Evidence From A Natural Experiment Of State Mandates In The US*. Health Affairs. https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2020.00818?url_ver=Z39.88-2003&rft_id=ori%3Arid%3Aacrossref.org&rft_dat=cr_pub++0pubmed&". If the link is inactive, search the title for an updated version.

University Code of Conduct, 2019 (policy AD-57).

Exam Policy:

Other than unexpected illnesses, all requests for a makeup exam must be made by email to me no later than two weeks prior to the scheduled exam. If an unexpected illness keeps a student from attending the exam, an email must be sent to me prior to the class period in order for the student to be allowed to take a makeup exam.

The exam will involve primarily short and long-answer questions. Students should practice both verbalizing and writing out their understanding of the course material. Using each approach will help in their preparation for the exams.

Academic Integrity:

In an examination setting, unless the instructor gives explicit prior instructions to the contrary, violations of academic integrity shall consist of any attempt to receive assistance from written or printed aids, from any person or papers or electronic devices, or of any attempt to give assistance, whether the student doing so has completed his or her own work or not. Other violations include, but are not limited to, any attempt to gain an unfair advantage in regard to an examination, such as tampering with a graded exam or claiming another's work to be one's own. Failure to comply will lead to sanctions against the student in accordance with the [Policy on Academic Dishonesty](#) in the Eberly College of Science. All University and Eberly College of Science policies regarding academic integrity/academic dishonesty apply to the students enrolled in this course. Refer to the following URL for further details on the academic integrity policies of the Eberly College of Science: <http://science.psu.edu/current-students/Integrity/Policy.html>.

Matters of academic dishonesty will be turned over to the University disciplinary system and may result in a failing grade for the course.

Disability Policy:

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at [814-863-1807](tel:814-863-1807) (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at <http://equity.psu.edu/ods/>.

You must contact ODS and request academic adjustment letters at the beginning of each semester. In order to receive consideration for course accommodations, you must contact ODS and provide documentation (<http://equity.psu.edu/ods/guidelines/documentation-guidelines>). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying the appropriate adjustments. Please share this information and discuss the adjustments with your instructor as early in the course as possible.

Mutual Respect and Cooperation:

The Eberly College of Science Code of Mutual Respect and Cooperation (<http://science.psu.edu/climate>) embodies the values that we hope our faculty, staff, and students possess and will endorse to make The Eberly College of Science a place where every individual feels respected and valued, as well as challenged and rewarded.

Reporting Bias:

Students who experience intolerance or bias, or who observe intolerance or bias, can visit the following website (<http://equity.psu.edu/reportbias>) to report the incident(s).

Counseling & Psychological Services:

Students are encouraged to reach out to CAPS in the Student Health Center (<https://studentaffairs.psu.edu/counseling>) for help when needed.

How to be Successful in this Course:

Reading, discussion, and practice; reading, discussion, and practice; and reading, discussion, and practice. And just in case it wasn't clear - *reading, discussion and practice*. Study the PowerPoint presentations, read the journal articles carefully, spend quality time in the laboratory, and engage in healthy and active discussions on course topics. If you're struggling with the course material, schedule one-on-one meetings with me. Make sure you have *a clear, deep understanding of the course material*, as the exam will **NOT** be memorization-oriented, but instead will require you to apply your knowledge to address advanced concepts.

TENTATIVE TOPICS

Class Discussions:

**Introduction & refresher on YSTR analysis
24 & 26 August (Mitch Holland)**

31 August to 5 October will be used to develop the experimental design and address topics associated with YSTR analysis (Group)

**Probabilistic genotyping
12 October to 10 November (Group)**

**Laboratories:
YSTR analysis
25 August to 19 November**

**PGing software (MaSTR)
13 October to 19 November
During various laboratory periods as time permits**

**Presentations on PGing:
TBD**

NOV 12 (During Lab): **[EXAM: YSTR analysis and PGing](#)**

NOV 23-27: NO CLASSES or LABORATORIES THIS WEEK (FALL BREAK)

NO LABS after Fall break
CLASSES will be delivered via Zoom