

METHODS: ANALYSES

BIO 6020 (Course Ref. No. 12099)

SYLLABUS, FALL, 2019

Credits: 4

Time and Place: M 2:30 pm - 4:20 pm Biological Sciences, Room 1169
W 1:00 pm - 6:50 pm Shapero Hall, Room 0405

Instructor: Dr. Markus Friedrich
Biological Sciences Building, Room 3117
Phone: 313 577 9612

Goals: Introduction to essential principles in design, execution and analysis of experiments in molecular biology

Approach: Conducting a group supervised molecular cloning, sequencing, and gene expression analysis project in invertebrate model species: The red flour beetle [Tribolium castaneum](#) and the fruit fly [Drosophila melanogaster](#)

Limited to 20 students.

Prereq: BIO 5330 or BIO 6330 or consent of instructor.

Material fee: \$50.00

Format: Lectures and lab practicals accessible in google drive class environment:
<https://drive.google.com/drive/folders/1SOzZOCUSqc15hce7IwX4-mN02XclbKXy>

Lab safety requirement: Lab coat

Contact and communication after lecture or via email: mf@biology.biosci.wayne.edu

Office hours: After lecture or by appointment

TOPICS COVERED

1. Laboratory safety rules
2. Lab notebook management
3. Preparation of buffers and stock solutions
4. Principles of experimental design (positive and negative controls)
5. Nucleic acid isolation
6. PCR
7. Restriction digest
8. DNA sequencing
9. Computational sequence analysis
10. Immunohistochemistry
11. Light microscopy
12. Epifluorescence microscopy

LEARNING OBJECTIVES/OUTCOMES

As a result of mastering the materials in this course, you will be able to:

1. Conduct research in a molecular biology lab under supervision
2. Generate proper documentation of experimental results for academic and industrial settings keeping a digital lab notebook
3. Perform basic DNA and RNA analysis experiments
4. Analyze Sanger sequencing chromatograms
5. Plan and conduct cloning using conventional plasmids
6. Perform basic immunohistochemistry experiments
7. Discuss and analyze experimental results
8. Archive sequence and image data

Textbook:

Current Protocols: Essential Laboratory Techniques, Wiley

Supplementary Textbooks:

Kathy Barker: At the Bench: A Laboratory Navigator (Spiral-bound)

Safety Sense: A Laboratory Guide, Second Edition by Cold Spring Harbor Lab

Exams: Class performance will in part be measured in form of one quiz per week. The lowest scoring quiz (this includes missed quizzes) can be dropped. There will be **NO** makeup exams or bonus points.

Grading: 50% of the final grade will be based on the average score determined for the weekly quiz results. The second 50% of the final grade will be based on accuracy and organization of the online laboratory notebook in which you will document your experimental work during the lab sessions. The online laboratory notebook will be reviewed for accuracy and completeness every next Monday after each Wednesday lab class. The final grade for the lab manual will be given at the end of the class. The final grade for the lab manual will equal the percentage of correctly completed revisions in response to the review comments.

90% or more:	A
87.5% – 89.4:	A-
85.5 – 87.4:	B+
80.0 – 84.4:	B
77.5 – 79.4:	B-
72.5 – 77.4:	C+
68.5 – 72.4:	C
65.5 – 68.4:	C-
62.5 – 65.4:	D+
60.5 – 62.4:	D
58.5 – 60.4:	D-
Less than 58.4:	F

Cheating policy: A student found to be cheating during an exam (using a “cheat sheet”, looking at another’s paper, or allowing another to look at yours) will receive a zero for that test or report with no opportunity to drop or replace that score. A second episode of cheating will result in a grade of E for the course and may also result in initiation of university disciplinary action.

Add/Drop policy: Add forms will not be signed after the second week of class (except for the purpose of changing lab sections when and if appropriate). Drop forms must be signed before the end of “study day”, which is the day after the last day of classes. Note that “**incomplete**” grades will not be issued to students in poor standing who are seeking an alternative to late drop.

Students with disabilities: If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TDD only). Once you have your accommodations in place, I will be glad to meet with

you privately during my office hours to discuss your special needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

Credit requirement policy: Note that prerequisite requirements will be strictly enforced except for cases of extreme urgency, which will be decided on at the instructor's discretion.

TENTATIVE lecture and lab schedule:

28	AUG, WED	● 1 – 6:30pm	BIO 6020: Introduction, pipette check and warm up quiz
2	SEP, MON	● All day	Labor Day
4	SEP, WED	● 1 – 6:30pm	BIO 6020: Lab safety/Lab notebooks/Pouring Agar plates
9	SEP, MON	● 2:30 – 4:20pm	BIO 6020: First quiz + Lecture: Making buffers
11	SEP, WED	● 1 – 6:30pm	BIO 6020: Preparation of stock solutions
16	SEP, MON	● 2:30 – 4:20pm	BIO 6020: Nucleic acid purification
18	SEP, WED	● 1 – 6:30pm	BIO 6020: Genomic DNA extraction
23	SEP, MON	● 2:30 – 4:20pm	BIO 6020: Polymerase chain reaction
25	SEP, WED	● 1 – 6:30pm	BIO 6020: Genomic PCR
30	SEP, MON	● 2:30 – 4:20pm	BIO 6020: Analysis of gene expression

2	OCT, WED	● 1 – 6:30pm	BIO 6020: cDNA synthesis and first round RT-PCR
7	OCT, MON	● 2:30 – 4:20pm	BIO 6020: DNA cloning
9	OCT, WED	● 1 – 6:30pm	BIO 6020: RT-PCR product analysis
14	OCT, MON	● All day ● 2:30 – 4:20pm	Columbus Day (regional holiday) BIO 6020: Plasmids as DNA vectors
16	OCT, WED	● 1 – 6:30pm	BIO 6020: TA PCR product ligation and DNA transformation with white/blue screening
21	OCT, MON	● 2:30 – 4:20pm	BIO 6020: PCR applications
23	OCT, WED	● 1 – 2pm	BIO 6020: TA PCR product ligation and DNA transformation with white/blue screening
28	OCT, MON	● 2:30 – 4:20pm	BIO 6020: Restriction enzymes
30	OCT, WED	● 1 – 6:30pm	BIO 6020: Alcaline lysis plasmid prep and restriction digest
3	NOV, SUN	● All day	Daylight Saving Time ends
4	NOV, MON	● 2:30 – 4:20pm	BIO 6020: Sanger sequencing and Next generation sequencing methods
6	NOV, WED	● 1 – 6:30pm	BIO 6020: Preparing sequencing grade plasmid DNA using spin columns
11	NOV, MON	● All day ● 2:30 – 4pm	Veterans Day BIO 6020: Next generation sequencing platforms
13	NOV, WED	● 2:30 – 4:20pm	BIO 6020: Visit of WSU ATGC sequencing facility [NO Quiz TODAY!]
18	NOV, MON	● 2:30 – 3pm	BIO 6020: Bioinformatic sequence analysis
20	NOV, WED	● 1 – 6:30pm	BIO 6020: Sequence analysis computer lab (UGL lab A)
25	NOV, MON	● 2:30 – 3pm	BIO 6020: NCBI databases
28	NOV, THU	● All day	Thanksgiving Day
2	DEC, MON	● 2:30 – 4:20pm	BIO 6020: Bio-labeling: Gene expression analysis in tissues
4	DEC, WED	● 1 – 6:30pm	BIO 6020: Bio-labeling of Drosophila eye-antennal imaginal discs
9	DEC, MON	● 2:30 – 4:20pm	BIO 6020: Microscopy